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Faculty Forum President's Letter

by Jenny Lowery

Welcome back to a new semester and a new beginning. This fall promises to be different from all others. It cannot help but be so, coming after a spring like no other. The experiences of this campus over the past 9 months have tested faculty, students and administration like never before. We have cried together, laughed together, mourned together and rejoiced together more frequently and more intensely than any time in Union's history.

This issue of *JUFF* stands as a testament to the faculty's commitment to scholarship and creativity even in the midst of tornado disrupted schedules and displaced offices. I applaud each contributor who took the time and effort to add to this volume and hope you will take time to enjoy the efforts of your colleagues. If you are not among the contributors, please consider adding your voice to next year's edition.

The Faculty Forum has traditionally served as a vital link between Union's faculty and administration. With the continued involvement and support of faculty members we can continue this role as we seek to move forward as a renewed community. The other officers for 2008-09 (Vice-president Randy Schwindt, Secretary David Thomas and *JUFF* Editor Beverly Absher) and I are ready to serve alongside you. We hope you will be involved, offer your ideas and share your concerns. We look forward to seeing and hearing from you.

Dedicated to Roger Stanley

Assistant Professor of English
JUFF Editor 1995–2007

A Word from the Editor

Now that the dust is finally settling from the post-tornado repair and construction, I hope all of you will take some time to enjoy this 28th volume of *JUFF*, Union University's in-house faculty publication. I appreciate so much the support of Roger Stanley, the former and long-time editor of *JUFF*, who encouraged me as I attempted to step into his very big shoes as editor, and provided advice on soliciting contributions and getting the journal to print.

A debt of gratitude goes to Dr. Carla Sanderson and to the Center for Faculty Development for their continued financial support in the production of this publication, and to Sarah Belcher, Graphic Design Specialist, for assistance with lay-out and design.

It is exciting to have the large number of contributions this year and to also have representation from so many different disciplines across our campus. Contributions cover a broad spectrum of topics that run the gamut from business to sacred hymns and from medical research to literature. As a reminder, *JUFF* welcomes articles in your respective field or discipline; however, creative work is welcomed along with critical work, and poetry as well as prose. Material also under consideration for external publication is acceptable or even material previously published beyond Union University.

We will be calling for submissions once again in May 2009, and I hope that each of you will make plans now to be a contributor to the next issue of *JUFF*.

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Attraction and Retention of Females and Minorities in Christian Higher Education

by Beverly M. Absher

*Note: This article has been accepted in the second issue of 2009 of the *Journal of Research on Christian Education*.

Introduction

A number of studies have been conducted over the past fifty years examining the factors responsible for attracting and keeping faculty members in higher education. Beginning in the 1960s, researchers began to look at the differences gender played in the importance of these factors. In recent years, studies have also been conducted in an effort to determine the greatest motivators in recruitment and retention among people of color. However, it appears there is little, if any, existing research that has examined factors influencing recruitment and retention in *Christian higher education*, particularly among female and minority faculty members.

Considering the benefits to students, faculty members, and society as a whole, it should be the goal of all universities to focus on the effective recruitment and retention of a diverse faculty. Faith-based institutions have a responsibility to meet the expectations of the church as well as those of society in this regard. This is often reflected in their mission statements that focus on spiritual and character development as well as educational development. To meet these expectations and continuously improve in the future, religious colleges and universities must be able to hire a talented and diverse group of faculty. To retain these employees, administrators and human resource managers need a better understanding of the motivators that cause employees to stay. Strategic action must also be taken to reduce the stress factors and sources of dissatisfaction that cause employees to leave.

Due to an aging faculty population, record numbers of new faculty members will be needed during the next 10-15 years. By understanding the factors that most influence faculty recruitment and retention in faith-based colleges and universities, particularly among females and minorities, administrators and human resources professionals in these schools can act strategically to hire some of the nation's best and brightest new faculty members. Due to the unprecedented enrollment growth of faith-based higher education (Mahurin, 2006), a study on this topic was appropriate at this time.

The purpose of this study was to identify the variables that have the greatest influence in the recruitment and retention of faculty members, particularly females and minorities, in Christian higher education. Comparisons were made based on gender and ethnicity as to the overall importance and satisfaction level of factors affecting faculty members' overall career choices and persistence in academia.

Review of Literature

The number of females and minorities completing undergraduate, graduate, and doctoral programs has increased rapidly in the last four decades. In 1969 there were 4,008,000 men and 2,876,000 women undergraduate students enrolled in college (National Center for Education Statistics, [NCES] 2002). Between 1969 and 2000 the number of men undergraduates increased by 1,570,000 or by 39%. During this same period the number of women undergraduates increased by 4,501,000 or by 157%. Women earned 44% of doctorates awarded in 2000, a substantial increase from the 1960s when they represented just 12% (Trower & Chait, 2002). Minority college student enrollment has experienced similar growth, with over a 93% increase in enrollment between 1976 and 2002 (NCES, 2002).

Changes at the faculty level have been much lower. In 2000, Whites still accounted for 88% of faculty jobs, not a lot different from 1975 when they constituted 96% of the faculty. For the 2000-01 academic year, 94% of full professors in science and engineering were White, and 90% were male; 91% of the full professors in research universities were White, and 75% were male; 87% of all full-time faculty members in the U.S. were White, and 75% were male; and only 5% of the full professors in the U.S. were African American, Hispanic, or Native American (Trower & Chait, 2002). In addition, the gap between the percentage of tenured men as compared to the percentage of tenured women did not change in the years between 1970 and 2001. The small increase in numbers of minority faculty has been primarily Asian Americans. African Americans, Hispanics, and Native Americans remain underrepresented in doctoral programs and as faculty members.

There are a number of reasons that women and minorities might find an academic career unappealing within the current academic model and culture. A study by Trower and Chait (2002) indicates the "social isolation, chilly environment, bias, and hostility" of academia as one of the biggest obstacles to achieving diversity and equity among faculty members. Some of the common concerns noted by female and minority faculty were limited opportunities to participate in departmental and institutional decision making; excessive and "token" committee assignments; infrequent occasions to assume leadership positions or achieve an institutional presence; research that is trivialized and discounted; lack of mentors; and little guidance about the academic workplace or the tenure process.

Astin, Antonio, Cress, and Astin (1997) used national data from 1995-1996 consisting of 33,986 full-time college faculty, including approximately 8.7% of whom were faculty of color, in their study. They reported that faculty of color are "less satisfied with nearly every aspect of their jobs" (p. 25). Some of the sources of stress and dissatisfaction have been revealed in other studies, such as compensation levels, rank and tenure status, and lack of recognition and appreciation by students, peers, and administration. However, the study found that the three greatest reasons for dissatisfaction were in the areas of autonomy and independence, job security, and the opportunity to develop new ideas.

Recent studies indicate that females and faculty of color perceive the academy in different ways, in large part, due to their minority presence at most colleges and universities (Astin, Antonio, Cress, & Astin, 1997; Laden & Hagedorn, 2000; Tack & Patitu, 1992). As part of the "few," they often experience different issues and barriers than the majority faculty, including low to nonexistent social and emotional support, and heightened feelings of loneliness and isolation (Laden & Hagedorn, 2000). These are just some of the factors that might make the essence and definition of job satisfaction different for women and faculty of color as compared to White males.

The American Faculty Poll (Sanderson, Phua, & Herda, 2000) was a nationwide survey administered by the National Opinion Research Center (NORC) that attempted to measure and evaluate faculty members' opinions and satisfaction levels pertaining to their academic work. "Attractive salary and benefits package," "job security" and "flexible work schedule" were rated as relatively more important for women and racial/ethnic minorities than for White males. One of the lowest levels of satisfaction reported by female faculty members was in regard to their perceived "opportunities for professional recognition," with only 9% indicating that they were "very satisfied."

According to Bronstein and Farnsworth (1998), there is ample qualitative evidence to suggest that key factors hindering advancement for females may be found in the work environment itself. In an effort to provide quantitative evidence, they surveyed nearly 1200 research university faculty members. Although most of the 556 respondents in the study reported satisfaction with their jobs, substantially higher percentages of women than men reported having encountered difficulties. Women reported more experiences of demeaning, harassing, intimidating, and excluding behaviors within the work environment, and more instances of unfairness during advancement processes. Coupled with the retention data from the institution, the findings did provide some evidence that discriminatory practices may slow, and occasionally curtail, women's advancement in academia.

Turner and Myers (2000) identified different, however, related reasons for job dissatisfaction among minorities. Because of distinct physical characteristics, faculty of color report that their credentials may be largely ignored in scholarly settings on campus, with skin color and ethnic features and behaviors being emphasized over their scholarly achievements. Another source of dissatisfaction was reported as "tokenism," being treated as token representatives versus valued members of the faculty. Being a faculty member of color on a campus that is predominantly White often adds an element of unnecessary discomfort.

Being awarded tenure and progressing through the academic ranks are among the most visible signs of accomplishment for all faculty members in higher education (Perna, 2001). However, even after more than 30 years of attention and to sex and racial or ethnic group differences in employment status, substantially smaller proportions of women and minorities have received these rewards. Disciplines and fields notwithstanding, Fred Bonner (2004), reported universal themes from his African American colleagues in their quest for tenure. First, they all felt that they had to prove themselves over and over again, not only to administrators and colleagues; however, to their students as well. Some of the minority professors felt as if their students were always questioning their credentials. There was also a common feeling that students expected them to be twice as prepared or they would come across as lazy and incompetent, yet they were also expected to make the class entertaining and fun. Other common themes included being kept out of the loop, playing a dual role between the two disparate worlds of "academia" and "being Black," and generally feeling unwelcome in academe. These issues often cause minorities to wonder just how much of themselves they are willing to give up in order to gain tenure.

A number of studies have shown that faculty of color report spending much greater amounts of time in advising and mentoring students, particularly students of color (Astin, Antonio, Cress, & Astin, 1997; CCCU, 2004; Cuadraz, 1998; Laden & Hagedorn, 2000; Nieves-Squires, 1991; Turner & Myers, 2000). It raises the question, at least, that the longer road to tenure and promotion (and a major source of job dissatisfaction) is due to the large blocks of time that minority faculty spend mentoring students, serving on committees, and performing community service. These activities are emphasized by administration and leave minorities little time to pursue pure academic research. However, they appear to be undervalued when evaluating faculty for promotion and tenure according to findings from Garza, 1988; and Washington and Harvey, 1989 (as cited in Laden & Hagedorn, 2000). Additional evidence of this fact was reported by Laden and Hagedorn (2000) in their National Study of Postsecondary Faculty research. Although Asian Americans reported significantly more time spent in research than any other groups, Whites reported spending significantly more time than other minorities. However, African Americans were shown to spend significantly more time in service than Whites, and all faculty of color reported spending significantly more time in informal contact with students outside the classroom.

Faith-based Institutions

The enrollment rate among intentionally Christ-centered schools outpaced the rest of higher education by more than 42% during the decade of the 1990s (Mahurin, 2006). Naomi Schafer Riley (2006), reports that there has been a 67% increase in enrollment at evangelical colleges from 1992 to 2002. Members of the Council for Christian Colleges and Universities (CCCU) reported an enrollment surge of nearly 71% from 1990 to 2004 (MacQuarrie, 2005).

This tremendous growth in student enrollment has not been paralleled with proportionate increases in women and minority faculty members. However, the need for female and minority role models is just as important in Christian higher education. Research supports the notion that in environments lacking a diverse workforce, the underrepresented groups are regarded as symbols or "tokens" rather than as individuals (CCCU, 2004; Hurtado, Milem, Clayton-Pedersen, & Allen, 1999). According to research by Kanter (as cited in Hurtado et al., 1999), this type of tokenism "contributes to heightened visibility of the underrepresented group, exaggeration of differences among groups, and the distortion of individuals' images to fit existing stereotypes" (p. 19).

Female faculty representation at Christian institutions has been comparable, however, slightly less than that of secular institutions in the past (Garlett, 1997). In 1995, 30% of the faculty at Christian institutions were women versus 35% at secular institutions. By 2006, religious institutions surpassed that of secular institutions with 41.4% of faculty being female compared to slightly over 39% at secular institutions (American Association of University Professors [AAUP], 2006). However, faith-based institutions appear to be lagging further behind secular colleges and universities in promoting women to upper-level leadership roles.

Theological interpretations regarding female roles may be a contributing factor in preventing women from holding high-level administrative and leadership positions in Christian organizations (Moreton & Newsom, 2004). In 2002, 14% of chief academic officers in CCCU institutions were women compared to 26% in non-CCCU schools. In some Christian schools, the male-based traditional culture and specific denominational ideology may create a contradiction of cultures for female faculty between their expectations and experiences of Christian higher education (Walker, 2001). Even if the female faculty member identifies comfortably with both a religious mission and the academic profession, students may hold views of women and professionals mutually exclusive because of these religious gender interpretations.

CCCU (2004) reported that in a 1998 survey of their member schools, faculty of color reported more stress in faculty meetings and in the areas of subtle discrimination than did Whites. Minority faculty were significantly less satisfied than White faculty with salary and fringe benefits, the quality of students, their professional relationships with other faculty, their job security, relationships with administration, and in their overall job satisfaction. Faculty of color also indicated that they were more interested in research than Whites, and reported that they spent significantly more time advising students than did their White colleagues.

It is important for female and minority students, in particular, to experience cultural and ethnic values that vary from the White male majority if they are to be expected to lead in the future (Maruyama, Moreno, Gudeman, & Marin, 2000). Faith-based schools may have initially introduced race and gender sensitive practices partly to redress past wrong; however, many colleges and universities are seeing how these policies support essential educational goals. The Socratic model of learning by dialogue across similarities and differences of beliefs, theories, and experiences can be expanded to include gender, race, and ethnicity as valued forms of difference. This multicultural environment optimizes the teaching and learning experience for all participants, and also supports what should be foundational core values for every Christian school. Faith-based institutions, perhaps more than other colleges and universities, generally have missions that extend beyond acquiring expertise in one or more disciplines. Spiritual, personal, and social growth tends to be part of their mission, and attention to multicultural learning improves the capacity of all institutions of higher education to achieve these particular objectives (Maruyama et al., 2000).

Research Method

The population of this study consisted of 1212 faculty members employed by faith-based institutions in North America that are members of the CCCU. Respondents were asked to complete an online survey in an effort to determine their attitudes and opinions regarding issues affecting their employment and the current higher education environment. Comparisons were made between the responses of participating faculty members based on gender and ethnicity regarding the overall importance and satisfaction level of factors affecting their career in a Christian college or university.

Variables Considered

Previous studies (Astin, Antonio, Cress & Astin, 1997; Bonner, 2004; Johnsrud & Rosser, 2002; Laden & Hagedorn, 2000; Nienhuis, 1994; Tack & Patitu, 1992; Trower, 2002; Trower & Chait, 2002; Van Ummersen, 2005) identified a number of factors believed to influence recruitment and retention for underrepresented groups that include: job satisfaction, compensation, workload and lifestyle stressors, recognition and appreciation, family-friendly policies, cultural

diversity climate, and faculty rank and tenure status. To represent these factors, 27 independent variables were investigated in this study: opportunity to educate students; teaching load; teaching courses that interest you; quality of the students you teach; working in a collegial environment; working in an intellectually challenging environment; opportunity to advance knowledge in your field; having institutional support for your scholarly inquiry; opportunity for professional recognition; opportunity to work independently; flexible work schedule; having time for family and other personal needs; a competitive salary; an attractive medical benefits package; an attractive retirement benefits package; job security; physical working conditions; reputation of your department; reputation of your institution; tenure; opportunities for advancement/promotion; opportunities for personal development; relationships with superiors; relationships with peers; meaningful and satisfying work; supportive mentoring experience; and appreciation and recognition. In addition, three variables were added that are relevant to faith-based colleges and universities: "opportunities for spiritual growth and development," "Christian working environment," and "vocational calling to Christian higher education."

Survey Design

A confidential, Web-based survey was developed to provide convenience and complete anonymity for participants. Respondents were able to use a Likert-type evaluation scale to rate a number of independent variables as to their importance in attracting them to a faith-based institution as well as their importance in job satisfaction and retention. Many of the questions in the survey instrument were taken from the *American Faculty Poll,* administered by the National Opinion Research Center at the University of Chicago, as reported by Sanderson, Phua, and Herda (2000). Only minor changes were made related to the work and career factors that were contained in the original survey instrument. However, measures were taken to maintain validity of the revised instrument. First, it was pre-tested with a sample of faculty members from different disciplines and of varying gender and ethnicity, and revised according to their suggestions. Second, a panel of faculty experienced in research methods and measurement reviewed it for content and clarity, made minor revisions, and deemed the questionnaire to have face validity. Finally, an advisory team of scholars from the CCCU reviewed the instrument to check for any other needed modifications to ensure clarity, reliability, and validity.

Results

Demographic Information

Approximately 94% of the 1212 survey respondents were full-time faculty members, with 1017 describing their employment as permanent, full-time, and 121 indicating they were temporary, full-time. There were 36 permanent, part-time and 38 temporary, part-time faculty members responding. Of the total permanent, full-time employees, nearly two-thirds were males, and less than 8% were minorities. Females and minorities employed by CCCU member schools were much more likely than White males to have a part-time position, either temporary or permanent.

The vast majority, 91.2%, of the respondents listed their ethnicity as White/Caucasian. The most significant minority group was African American followed by Hispanic/Latino, Asian/Pacific Highlander, Native American/Alaska Native, and Other. The "Other" group consisted of slight variations of the above categories that were important distinctions to the individual being surveyed (i.e., Mexican versus Hispanic/Latino, Hispanic/Caucasian versus White/Caucasian, etc.) and mixed race individuals.

Due to the small number of minority respondents, they were combined into a single category for analysis in this study. Multivariate analysis of the *importance* ratings for all of the work and career factors among the minority groups identified only one significant difference. The Latino/Hispanic respondents rated the importance of an attractive medical benefits package significantly more important than did the Asian/Pacific Highlander group ($p < .05$). The analysis indicated only four significant differences in the levels of *satisfaction* among the different minority groups on all of the work and career factors. It should be noted that all four of these differences were caused by the responses of a small minority group made up of only six respondents. In addition to the extremely small sample size (less than one-half percent) being inadequate for statistical significance of inferential tests applied to the data, reporting responses from a group this small might also compromise the anonymity that was promised to the respondents.

Nearly 40% of the 1212 faculty members responding to the survey had been employed with their current institution for more than ten years, and 15.3% had been with the same institution for more than twenty years. The largest category reported for length of employment was "1-5 Years," with 31.5% of the respondents indicating this range.

The length of employment was lower among the 473 females responding, with just over 12% indicating they had been employed by their current institution for more than twenty years. More than 64% of the female respondents reported that their length of employment with their current institution had been ten years or less. The remaining number, approximately 24%, had been at their current school "11-15 Years."

Racial and ethnic minorities reported significantly fewer years as a faculty member, reflecting their more recent increase in faculty positions in higher education, particularly among CCCU institutions. Over three-fourths of the mi-

nority respondents had been employed at their current college or university for ten years or less, and half had been there five years or less. Less than 4% had been employed longer than fifteen years.

The greatest number of responses in terms of academic rank came from full professors. Of the 375 full professors responding, nearly three-fourths of those were males, and less than 4% were minorities. The next highest level of response came from associate professors. Females and minorities made up a larger portion of this group than the two higher ranks of Dean/Administrator and Professor, with 40.3% females and 8.5% minorities among the 365 respondents. There were significantly higher percentages of females than males in the lower academic rank of "Instructor;" however, the largest proportion of females as compared to males was shown in the categories of "Adjunct" and "Non-teaching Faculty," with females comprising 61.2% and 86.7%, respectively. Minorities tended to follow the same pattern as females, with more respondents being in the lower ranks of "Assistant Professor," "Instructor," or "Adjunct."

Work and Career Factors

Faculty members were asked to share their opinions regarding the 30 work and career factors along two dimensions. First they were asked to rate how important each of these items was to them personally in determining their overall satisfaction with their current position. Next respondents were asked to indicate how satisfied they were with each factor at their current institution.

Important work and career factors. By far the most important consideration for faculty members was the "opportunity to educate students," with over 89% of the respondents indicating that it was "very important." Over half the faculty members also listed this as one of the top three "most important" factors among the 30 choices. "Meaningful and satisfying work" (79.8%), "time for personal and family needs" (72.9%), and "teaching courses that interest you" (70.7%) were the next highest ranking factors in terms of importance to the faculty members. Six other factors, for a total of ten, were rated by at least half of the faculty members as being very important: collegial environment (68.2%); relationships with peers (58.3%); Christian working environment (51.8%); flexible work schedule (51.7%); vocational calling to Christian higher education (51.1%); and job security (50.9%). Table 1 shows the ten highest rated work and career factors in terms of importance based on ratings from all respondents.

Table 1

Ten Most Important Factors based on Gender and Minority Status

Work and Career Factor	**Top Ten Ratings**				
	Overall	Males	Females	Non-minority	Minorities
Opportunity to educate students	1	1	1	1	1
Teaching Load	N/A	9	N/A	N/A	6/7
Teaching courses that interest you	4	3	5	4	4
Collegial environment	5	5	4	5	5
Working in an intellectually challenging environment	N/A	7	9	7	9
Flexible work schedule	8	N/A	7	8	8
Time for family & personal needs	3	4	3	3	3
Attractive medical benefits package	N/A	N/A	N/A	N/A	10
Job security	10	N/A	8	9	N/A
Relationships with superiors	N/A	N/A	10	N/A	N/A
Relationships with peers	6	6	6	6	6/7
Meaningful and satisfying work	2	2	2	2	2
Christian working environment	7	8	N/A	10	N/A
Vocational calling to Christian higher education	9	10	N/A	N/A	N/A

Of the overall "top ten" list, females rated six of them as being significantly more important than did males. In all, females rated sixteen factors as being more important. There were highly significant differences in the ratings on "flexible work schedule," "job security," "reputation of the department," "reputation of the institution," "relationships with superiors," and "meaningful and satisfying work" ($p = .000$); and on "collegial environment," "opportunity to work independently," "physical working conditions," and "supportive mentoring experiences" ($p < .001$). "Time for family and personal needs," "competitive salary," "retirement benefits package," "opportunity for professional development,"

"opportunity for spiritual growth/development," and "relationships with peers" were also rated as being significantly more important to females than males ($p < .05$).

There was less variance in the importance level ratings of minority groups versus non-minority groups than in the variance observed between males and females. Six of the work and career factors that had been rated in the "top ten" list for minorities were also part of the ten highest rated in importance for non-minorities. However, minorities did rate "flexible work schedule" as significantly more important ($p = .01$) than non-minorities even though it was rated high in importance for both groups. "Teaching load" and "attractive medical benefits package" were not among the ten highest rated by non-minorities; however, both were on the list for the minority group. These two factors were considered significantly more important for minorities than for non-minorities ($p < .05$). When considering all 30 factors, highly significant differences were also noted in the greater importance that minorities placed on "opportunity to advance knowledge in the field" ($p = .000$) and "institutional support for scholarly inquiry" ($p < .001$). Minorities also rated," "opportunity for professional recognition," "competitive salary," "physical working conditions," "reputation of your institution," "opportunity for advancement/promotion," "opportunity for professional development," and "opportunity for spiritual growth/development" as being significantly more important than did Whites/Caucasians ($p < .05$).

Minorities placed a greater importance on nearly all (28 of 30) of the work and career factors than other faculty members, and females rated all except four of the thirty as having a greater importance than did males. The top ten work and career factors for females in order ranking were: (1) opportunity to educate students, (2) meaningful and satisfying work, (3) time for family and personal needs, (4) collegial environment, (5) teaching courses that interest you, (6) relationships with peers, (7) flexible work schedule, (8) job security, (9) working in an intellectually challenging environment, and (10) relationships with superiors.

Minorities and females were in agreement on the top five most important work and career factors; however, minorities rated "teaching courses that interest you" and "collegial environment" in fourth and fifth place, respectively, a switch in the order they were ranked by females. Three of the five factors in the lower half of the top ten list for minorities were also factors that had held this rating for females: "relationships with peers," "flexible work schedule," and "working in an intellectually challenging environment." However, minorities did not rate "job security" or "relationships with superiors" in the ten most important factors as did females, replacing them with "attractive medical benefits package" and "teaching load."

A distribution of all the work and career factors and the percentage of faculty that rated them as being very important are shown in Table 2. This table also shows the percentage of females and minorities that rated each factor as being very important.

Table 2

Distribution of Very Important Work and Career Factors

Work and Career Factors	Percentage Rating Very Important			
	All	White Males	Females	Minorities
Opportunity to educate students	89.3	88.4	90.3	90.7
Teaching Load	48.3	45.0	51.4	63.6
Teaching courses that interest you	70.7	69.6	71.9	71.0
Quality of students you teach	38.2	34.0	42.1	48.6
Collegial environment	68.2	64.4	74.0	67.3
Working in an intellectually challenging environment	48.9	46.3	50.7	58.9
Opportunity to advance knowledge in your field	34.9	31.8	37.8	46.7
Institutional support for scholarly inquiry	40.8	38.5	41.6	57.9
Opportunity for professional recognition	16.0	13.8	18.2	22.4
Opportunity to work independently	39.4	35.1	46.3	41.1
Flexible work schedule	51.7	44.1	61.7	62.6
Time for family & personal needs	72.9	69.1	77.4	75.7
Competitive salary	37.4	34.0	40.2	50.1
Attractive medical benefits package	48.6	45.1	51.8	61.7
Attractive retirement benefits package	47.0	43.4	50.7	58.9
Job security	50.9	46.8	57.1	53.3
Physical working conditions	23.6	19.0	28.8	36.4
Reputation of your department	38.4	31.0	47.6	45.8
Reputation of your institution	42.2	36.6	49.3	47.7
Tenure	30.4	29.6	30.0	35.5
Opportunity for advancement/promotion	29.9	26.6	31.9	46.7
Opportunity for professional development	39.6	33.7	45.9	55.1
Opportunity for spiritual growth/development	45.1	40.7	49.0	57.0
Relationships with superiors	45.5	41.2	52.0	43.0
Relationships with peers	58.3	54.4	63.0	58.9
Meaningful and satisfying work	79.8	74.7	86.3	80.4
Supportive mentoring experience	20.5	15.1	27.3	25.2
Christian working environment	51.8	51.6	51.4	51.4
Vocational calling to Christian higher education	51.1	52.5	49.0	43.0
Appreciation and recognition	22.2	20.7	23.7	20.6

Satisfaction with work and career factors. For the same 30 work and career factors that were rated for importance, respondents were asked to rate their level of satisfaction as by indicating either "very satisfied," "satisfied," "not very satisfied," or "not at all satisfied." Many faculty members were most satisfied with the same factors that they considered most important. Eight of the highest rated factors in terms of faculty member satisfaction were also among the ten highest rated ones in terms of importance. Faculty members indicated the highest level of satisfaction with "opportunity to educate students," which was also the work and career factor that they had rated as most important. The next seven highest rated factors in terms of satisfaction were "flexible work schedule," "teaching courses that interest you," "collegial environment," "relationships with peers," "Christian working environment," "vocational calling to Christian higher education," and "meaningful and satisfying work." There is a sizable gap between these top eight factors and the remaining ones. Two work and career factors that had been rated high in importance for faculty members that were not among the top ten in terms of satisfaction were "time for family and personal needs" and "job security (see Table 3).

Table 3

Distribution of Very Satisfied Work and Career Factors

Work and Career Factors	Percentage Rating Very Satisfied			
	All	White Males	Females	Minorities
Opportunity to educate students	55.2	53.7	56.4	50.5
Teaching Load	21.8	21.5	22.8	15.9
Teaching courses that interest you	44.0	41.5	47.6	40.2
Quality of students you teach	15.7	12.4	20.3	14.0
Collegial environment	42.9	41.0	46.7	34.6
Working in an intellectually challenging environment	24.1	21.9	27.5	18.7
Opportunity to advance knowledge in your field	12.1	11.0	13.7	10.3
Institutional support for scholarly inquiry	13.4	12.6	14.6	11.2
Opportunity for professional recognition	9.0	9.1	8.7	9.3
Opportunity to work independently	31.6	27.9	37.2	25.2
Flexible work schedule	45.0	44.3	46.5	43.0
Time for family & personal needs	29.3	30.9	27.3	27.1
Competitive salary	8.4	8.2	8.9	9.3
Attractive medical benefits package	14.2	12.6	16.7	15.9
Attractive retirement benefits package	17.4	16.9	18.2	15.0
Job security	24.9	24.6	26.4	17.8
Physical working conditions	21.6	20.6	22.4	22.4
Reputation of your department	22.3	20.6	24.5	22.4
Reputation of your institution	19.6	17.4	23.5	16.8
Tenure	17.4	18.1	16.9	10.3
Opportunity for advancement/promotion	14.4	14.7	14.2	11.2
Opportunity for professional development	15.1	13.7	17.1	14.0
Opportunity for spiritual growth/development	29.3	27.4	31.5	30.8
Relationships with superiors	28.7	28.4	29.4	29.0
Relationships with peers	42.6	41.0	45.2	36.4
Meaningful and satisfying work	41.3	39.6	44.8	31.8
Supportive mentoring experience	12.7	11.2	15.6	9.3
Christian working environment	41.4	41.6	41.6	38.3
Vocational calling to Christian higher education	41.3	40.9	42.1	32.7
Appreciation and recognition	15.6	16.3	15.0	11.2

There were significant differences in the responses of females and males regarding the work and career factors with which they were most satisfied ($p < .05$). The overall significance is caused by eight factors. There was a high level of significance ($p < .01$) in the differences in satisfaction that females had regarding "quality of students you teach" and "reputation of your institution" and a significant difference ($p < .05$) regarding "working in an intellectually challenging environment," "opportunity to work independently," and "meaningful and satisfying work," with females being more satisfied with each of these factors. Men were much more satisfied when considering "time for family and personal needs" ($p < .001$), and significantly more satisfied with "tenure" and "opportunity for advancement/promotion" ($p < .05$).

Minorities were significantly less satisfied than the "White/Caucasian" group on six of the work and career factors. Highly significant differences were indicated for satisfaction with "teaching load," "job security," "tenure," and "meaningful and satisfying work" ($p < .01$). Significantly lower ratings in satisfaction were also reported by minority groups in the factors of "working in an intellectually challenging environment" and "opportunity for advancement/promotion" ($p < .05$).

Very important versus very satisfied. Although satisfaction was generally high for most of the same factors that faculty

members considered important, comparing "importance" versus "satisfaction" response across all 30 work and career factors produces some noticeable disparities between what faculty members consider very important and with what they are very satisfied. This is particularly true of "time for family and personal needs," where "very satisfied" lags behind "very important" by at least 44 percentage points for all gender and racial/ethnic groups. Other gaps of at least 34 percentage points for all faculty members exist with "meaningful and satisfying work," "opportunity to educate students," and "attractive medical benefits package."

There were gaps in importance and satisfaction ratings for females and minorities that did not exist for White/Caucasian males. Females had a gap of at least 30 percentage points, and minorities had a gap of at least 40 percentage points between the importance they placed on "competitive salary" and "attractive retirement benefits package" and their level of satisfaction with these factors. Minorities indicated the widest ranging disconnect between what was very important to them in their careers and with what they were most satisfied. In addition to the six factors already mentioned, eleven other work and career factors had large disparities in ratings. Four of these, "teaching load," "working in an intellectually challenging environment," "institutional support for scholarly inquiry," and "opportunity for professional development," had gaps of 40 percentage points or more. The remaining seven factors had gaps of 30 percentage points or more and included: "teaching courses that interest you," "quality of students you teach," "collegial environment," "opportunity to advance knowledge in your field," "job security," "reputation of your institution," and "opportunity for professional development."

Differences in Attraction and Retention Factors Based on Gender

Females differed significantly from males on the importance they placed on 16 of the 30 work and career factors that were considered important for attracting new faculty members and determining their overall satisfaction in their position. The most significant differences between males and females were due to the increased importance that females placed on "flexible work schedule," "job security," "meaningful and satisfying work," "relationships with superiors," "reputation of the department," and "reputation of the institution." Ten other factors that were significantly more important to females than males were: "collegial environment," "supportive mentoring experiences," "opportunity to work independently," and "physical working conditions," "time for family and personal needs," "competitive salary," "attractive retirement benefits package," "opportunity for professional development," "opportunity for spiritual growth/development," and "relationships with peers."

Lacking a sense of community at one's institution is one of the most important predictors of females leaving academia (Barnes, Agago & Coombs, 1998). The need that females have for a "sense of community and belonging" may also be one of the reasons that they place more importance than males on the "reputation of the department," and "reputation of the institution." According to Johnsrud and Rosser (2002), not having flexible work schedules and time for family and personal needs are life-style stressors that affect females more than males, and often lead to decisions to leave the institution or to leave higher education entirely.

The level of importance that females placed on "meaningful and satisfying work," in this study adds credence to previous studies that women often believe their work is discounted or that they feel a sense of "tokenism" in the types of work and assignments in which they are involved (Tack & Patitu, 1992; Trower & Chait, 2002). Research has shown that one of the top ways to produce job satisfaction is to ensure that females perceive that their efforts will have a significant impact.

Many of the work and career factors that were most important to female faculty members, such as "opportunity to work independently," "opportunity for professional development," and "opportunity for spiritual growth/development", underscore their concern about the climate of the hiring university. Previous studies, including Barnes, Agago and Coombs, 1998; Bronstein and Farnsworth, 1998; Holley and Young, 2005; Trower and Chait, 2002; and others, have found that females desire a climate that supports their growth and development, provides a collegial and mentoring environment, is free of bias and hostility, allows them to participate in departmental and institutional decision making, and provides job security and tenure.

A very obvious connection to other studies is both the high level of importance and low level of satisfaction that females expressed regarding salary, appreciation and recognition of accomplishments, and physical working conditions. Females also placed a significantly high level of importance on having an attractive retirement benefits package, which is likely connected to the finding that significantly more females than males have part-time and lower-ranking positions.

Females also reported significantly less satisfaction with 8 of the 30 work and career factors. Responses from males and females on job satisfaction measures indicated highly significant differences in their ratings when considering "quality of the students you teach" and "reputation of your institution," and significant differences in the way they rated "meaningful and satisfying work," "working in an intellectually challenging environment," and "opportunity to work independently." Females reported a higher level of satisfaction on all of these work and career factors. Significant differences in ratings that were due to a higher level of satisfaction reported by males were for "time for family and personal needs," "tenure" and "opportunity for advancement and promotion." This is an important survey finding in that these

last three factors were rated as being significantly more important to females; however, females reported a much lower level of satisfaction in these areas. This suggests that work schedules that offer flexibility and/or more family and personal time, along with clear paths for acquiring tenure and opportunity for advancement and promotion would have an impact on attracting and retaining more female faculty members.

Differences in Attraction and Retention Factors Based on Ethnicity

There were also significant differences in the factors influencing the attraction and retention of minority faculty members versus non-minority faculty members. Highly significant differences were noted in the greater importance that minorities placed on "opportunity to advance knowledge in the field" and "institutional support for scholarly inquiry". This was a noteworthy finding in light of the fact that previous studies have identified obstacles, such as the greater amount of time spent mentoring students, excessive committee assignments, and other peripheral duties that often prevent minorities from pursuing pure academic research (Astin, Antonio, Cress, & Astin, 1997; CCCU, 2004; Cuadraz, 1998; Laden & Hagedorn, 2000; Nieves-Squires, 1991; Trower, 2002). This provides some indication that CCCU and other faith-based schools could attract and retain more minority faculty members by expending additional efforts to assist them in pursuit of scholarly inquiry.

Minorities also rated "teaching load," "opportunity for professional recognition," "opportunity for advancement/promotion," "opportunity for professional development," and "opportunity for spiritual growth/development" as being significantly more important than did Whites/Caucasians. These findings again point to the importance of faith-based schools developing new and innovative ways to assist minority faculty members in all areas of their professional and spiritual development as a strong recruiting and retention tool.

Four other work and career factors that were rated as being significantly more important for minority faculty members were: "flexible work schedule," "competitive salary," "attractive medical benefits package," "physical working conditions," and "reputation of your institution." As with females, the greater number of non-tenured, lower academic-ranking minority group members may be a contributing factor to the importance they place on some of these factors that are tied to time spent on the job, working conditions and salary.

Minorities were significantly less satisfied than the "White/Caucasian" group on six of the work and career factors. The greatest differences were indicated for satisfaction with "teaching load," "job security," "tenure," and "meaningful and satisfying work." Significantly lower ratings in satisfaction were also reported in regard to "working in an intellectually challenging environment" and "opportunity for advancement/promotion."

The gap between high importance and low satisfaction for minorities is most evident in work and career factors related to the work schedule, salary and benefits, meaningful and satisfying work, and support for scholarly inquiry. As indicated in other studies (Astin, Antonio, Cress & Astin, 1997; Bronstein & Farnsworth, 1998; Holley & Young, 2005; Laden & Hagedorn; Nieves-Squires, 1991; Trower & Chait, 2002), it appears that a competitive salary and a more flexible work schedule with time for scholarly pursuits and a clear path for advancement and tenure, would go a long way in attracting and retaining minority faculty.

Discussion & Implications

Results from this study indicate that there are significant differences in the level of importance that females and minorities place on a number of work and career factors. Respondents were asked to rate these factors based on how important they were to them personally in determining their overall satisfaction in their current position. Therefore, faith-based schools that focus their efforts on improving work and career factors that were rated most important by females and minorities increase the likelihood of attracting and keeping them as faculty members.

Factors that were rated significantly more important to females than males as a determinant of their overall job satisfaction included: "flexible work schedule," "job security," "reputation of the department," "reputation of the institution," "relationships with superiors," "meaningful and satisfying work," "collegial environment," "opportunity to work independently," "physical working conditions," "supportive mentoring experiences," "time for family and personal needs," "competitive salary," "retirement benefits package," "opportunity for professional development," "opportunity for spiritual growth/development," and "relationships with peers."

It appears that the work and career factors that are most important for females fall into three primary categories: (a) *flexibility* (schedules that allow some independence and accommodate family needs as well as personal development); (b) *security* (secure position with competitive pay and attractive benefits; and (c) *environment* (meaningful work with opportunities for professional growth, good relationships with peers and superiors, mentoring opportunities, and good reputation of department and institution).

Minorities and females were in agreement on their ratings for most of the highest rated work and career factors. Two other factors that were of significant importance for minorities that were not among the highest rated for females were "attractive medical benefits package" and "teaching load." Interestingly, both of these factors will fit into the three

broad categories of importance that have been identified for females: flexibility, security, and environment. This finding suggests that a culture that focuses on these areas in lieu of the rigid structure of many existing policies and practices would attract and keep a higher number of qualified female and minority faculty members.

A finding that should be noted is the highly significant difference in the greater importance that minority respondents placed on "opportunity to advance knowledge in your field" and "institutional support for scholarly inquiry." Previous studies have shown that many minorities feel that they are so busy advising and mentoring students, serving on committees or handling token assignments, or just trying to "prove themselves" that they do not have time to pursue academic research (Astin, Antonio, Cress & Astin, 1997; Bonner, 2004; Cuadraz, 1998; Laden & Hagedorn, 2000; Nieves-Squires, 1991). Therefore, increased efforts to provide avenues for minorities to be involved in research and other scholarly pursuits might be an additional way to attract and keep these individuals at faith-based institutions.

With the growth in enrollment in faith-based institutions and the projected need for new faculty members in the next decade, there may never be a better time to focus efforts on attracting and keeping qualified females and minorities. Administrators and human resources professionals should act now to develop recruitment materials, interview messages and benefit packages that focus on the factors that are most important in the recruitment and retention of these underrepresented individuals.

Rigid internal policies and procedures should be reviewed to ensure that they are not creating barriers rather than support in attempts to attract and keep female and minority faculty members. Considering changes that support the three key areas identified in this study as most important to these underrepresented groups could be a good place to start. They include: (a) *flexibility* (schedules that allow some independence and accommodate family needs as well as personal development); (b) *security* (secure position with competitive pay and attractive benefits; and (c) *environment* (meaningful work with opportunities for scholarly pursuits and professional growth, good relationships with peers and superiors, mentoring opportunities, and good reputation of department and institution).

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The Times They Are A-Changin':
Time to Revisit Quill Corporation v. North Dakota

by A. David Austill

Come senators, congressmen
Please heed the call
Don't stand in the doorway
Don't block up the hall
For he that gets hurt
Will be he who has stalled
There's a battle outside
And it is ragin'.
It'll soon shake your windows
And rattle your walls
For the times they are a-changin'.

Bob Dylan
The Times They Are A-Changin'

Introduction

States and municipalities always need additional revenues. They have limited ability to increase their revenues for governmental operations. Several states, such as the author's state of Tennessee, do not collect broad-based individual income taxes. Those states without a broad-based individual income tax system depend principally upon sales taxes. Furthermore, local governments usually derive the bulk of their revenues from sales taxes and property taxes. When taxable sales transactions decline, which usually occurs during recessionary periods, state and local governments suffer the consequences of reduced revenues.

During the 1980s an old type of business transaction became a common commercial practice, namely, catalog (or mail-order) sales. Retailers knew that their sales to nonresidents when those goods were shipped to a state in which the retailer had no physical presence or agents would be free from state sales and they could not be forced to collect use taxes on the transactions. Thus, those remote sellers were provided an economic advantage over those "brick and mortar" sellers. They could sell cheaper because the net cost to the purchaser was less. When the net cost to the purchaser was the same, the remote seller obtained a higher profit margin than their brick and mortar competitors. States and local governments also lost tax revenues on those sales to remote sellers based on U.S. Supreme Court decision limiting the power of states to force these remote sellers from collecting use taxes.

In 1992, when this nation was in an economic recession, the states were eager for the U.S. Supreme Court to decide *Quill Corp. v. North Dakota*[1] (discussed infra). The Court rejected the state's claim that *National Bellas Hess, Inc. v. Department of Revenue of Illinois*[2] should be overruled on both its Due Process Clause and Dormant Commerce Clause grounds. Continuing the old policy, with the Due Process Clause factor removed, states still could not force remote sellers to collect and remit use taxes paid by the purchasers of goods shipped into the state by the remote sellers. This was before the vast changes in commerce due to the Internet.

The growth of the Internet for commercial purposes represented a radical change in business strategy, marketing techniques, and was ideal for exploiting sales transactions free of sales and use consequences to buyers from remote sellers. It is this radical change in the business model for many companies, new and old, that exacerbates the sales and use tax collection problem for the states and creates inequity to purchasers based on economic wherewithal and a Congressional preference for remote sellers over brick and mortar sellers.

For instance, e-commerce sales accounted for about 2.2 percent of total sales in the U.S. during the third quarter of 1995.[3] Forrester Research, Inc., a Cambridge, Massachusetts technology and market research company, in 2005 forecast the level of e-commerce for 2005 to 2010. Forrester estimated the following:

1 504 U.S.298 (1992).
2 386 U.S. 753 (1967).
3 The Census Bureau of the Department of Commerce, U.S. Census Bureau News: Quarterly Retail E-Commerce Sales: 3rd Quarter 2005 (Nov. 28, 2005), available at http://www.census.gov/mrts/www.data/pdf/01Q3.pdf.

1. $172 billion in online retail sales in 2005;
2. Online retail sales were expected to grow to $329 billion in 2010;
3. In 2010 e-commerce would represent 13% of total U.S. retail sales.
4. Annual growth rate in e-commerce was expected to be about 14 percent; and
5. By 2010, 29% of small appliances sales will migrate online, 14% of jewelry sales will be online, health and beauty products will grow at an annual rate of 22 percent.[4]

In early 2007, JupiterResearch estimated U.S. online retail sales to be $116 billion in 2007, a 16% growth over 2006. It estimated U.S. online retail sales would reach $171 billion in 2011.[5] Finally, CNNMoney.com reported that 2006 online sales in the U.S. were $146.4 billion, excluding travel, and represented 6 percent of overall retail sales in 2006. Online sales for 2006 rose by 29 percent over 2005. Online retail sales were expected to increase by 19.1% to $174.5 billion in 2007, excluding travel. Including travel, the National Retail Federation and Shop.org estimated total online sales in 2007 to be $259.1 billion.[6]

The effect of online retail sales to state and local governments has been substantial. Researchers at the University of Tennessee found that in 2004 the estimated tax losses to state and local governments was $15.5 billion. It was expected to climb to about $21.5 billion in 2008.[7] State governments relied on sales taxes for approximately one-third of their total tax revenue in 2003.[8]

This paper argues that the U.S. Supreme Court should revisit *Quill Corp.* and that Congress should pass legislation to override the judicial effect of *Quill Corp.* to allow states the right to force remote sellers to collect and remit use taxes just like brick and mortar retailers are obligated to collect and remit sales taxes. The need for Quill Corp. has passed given our new Internet economy. The times they are a-changin'.

Quill Corp. v. North Dakota

In 1987, Quill Corporation ("Quill") was a supplier of office supplies through its mail-order business. It had offices and warehouses in Illinois, California, and Georgia. It owned little, if any, tangible property and had no employees in North Dakota. Quill solicited business in North Dakota through catalogs and flyers, advertisements in national periodicals, and telephone calls. Its annual sales exceeded $200 million; about $1 million were made to about 3,000 customers in North Dakota. Delivery of goods to its North Dakota customers was by mail or common carrier from its out-of-state locations.[9]

North collected both sales and use taxes. A "sales tax" is defined, generally, as "[a] tax imposed on the sale of goods and services."[10] If the sale does not take place in a state, then the transaction is generally subject to a use tax, defined as "[a] tax imposed on the use of certain goods that are bought outside the taxing authority's jurisdiction."[11] The tax rates are usually the same. North Dakota "imposed a use tax upon property purchased for storage, use, or consumption within the State… [and required] every retailer maintaining a place of business in the State to collect the tax from the consumer and remit it to the State."[12] North Dakota defined the term "retailer" to include "every person who engages in regular or systematic solicitation of a consumer market in the state."[13] Under North Dakotan regulations[14] "regular and systematic" was defined to mean three ore more advertisements within a 12-month period. Thus, the North Dakota Tax Commissioner took the position that under North Dakota tax law Quill was obligated to collect the use tax from North Dakotan purchasers and to remit it to the State.

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4 Irene Cherkassky, *Target Marketing Tipline*, September 21, 2005, available at http://ga1.org/tmgroup/notice-description.tcl?newsletter_id=1960075&r=#3 (last visited March 25, 2008).

5 Internet Marketing NewsWatch, January 16, 2007 http://www.imnewswatch.com/archives/2007/01/us_online_retai_5.html?visitFrom=2 (last visited March 26, 2008).

6 CNNMoney.com, Online sales spike 19 percent, May 14, 2007, available at http://cnnmoney.printthis.clickability.com/pt/cpt?action=cpt&title=Total+online+sales+ex (last visited March 26, 2008).

7 Donald Bruce & William F. Fox, State and Local Sales Tax Revenue Losses from E-Commerce: Estimates as of July 2004 (The University of Tennessee Center for Business and Economic Research), 4 (2004), available at http://cber.bus.utk.edu/ecomm/Ecom0704.pdf.

8 Steven Maguire, State and Local Sales and Use Taxes and Internet Commerce, CRS Report for Congress 1 (Jan. 2005), available at http://www.ipmall.info/hosted_resources/crs/RL31252_050128.pdf.

9 *Quill Corp.*, supra note 1, at 302.

10 Black's Law Dictionary 1498-99 (8th ed. 2004).

11 Id. at 1499.

12 Quill Corp., supra note 1, at 302.

13 Id.

14 N.D. Admin. Code 81-04.1-01-03.1 (1988).

Holding that the facts in the case were indistinguishable from *National Bellas Hess, Inc. v. Department of Revenue of Illinois*[15], the trial court found for Quill. The U.S. Supreme Court in *Bellas Hess* had held that a similar Illinois tax statute violated the Fourteenth Amendment's Due Process Clause and created an unconstitutional burden on interstate commerce. A seller whose only connection with the customers in the State is by common carrier or the mail lacked the requisite minimum contacts with the State. The trial court found that the State had not shown that it had spent tax revenues for the benefit of the mail-order business and that there was not a substantial nexus between Quill and the State.[16]

The North Dakota Supreme Court reversed the trial court's decision. It concluded "that 'wholesale changes' in both the economy and the law made it inappropriate to follow *Bellas Hess* today."[17] The Court noted (1) the "remarkable growth" of the mail-order business in the economy, (2) the advances in computer technology that greatly eased the burden of compliance, and (3) that *Complete Auto Transit, Inc. v. Brady*[18] had rejected the line of cases holding that the direct taxation of interstate commerce was impermissible and had adopted a consistent and rational method of inquiry focusing on the practical effect of the challenged tax.[19] Furthermore, the State had provided sufficient services and benefits to Quill by creating an economic climate that fostered demand for Quill's products and in maintaining "a legal infrastructure that protected [Quill's] market, and disposed of 24 tons of catalogs and flyers mailed by Quill into the State every year".[20] The Court concluded that "Quill's 'economic presence' in North Dakota depended on services and benefits provided by the State, and therefore generated 'a constitutionally sufficient nexus to justify imposition of the purely administrative duty of collecting and remitting the use tax'."[21]

In a majority opinion by Justice Stevens, the U.S. Supreme Court reversed. The Court considered the two applicable constitutional provisions, namely, the Due Process Clause and the Commerce Clause, that were the bases for *Bellas Hess*. The Court noted that although the two clauses are closely related in this tax issue, they pose distinct limits on the taxing powers of the States. Under the Due Process Clause, there is a requirements of some "definite link, some minimum connection, between a state and the person, property or transaction it seeks to tax."[22] Following *International Shoe Co. v. Washington*[23], the relevant inquiry was whether a defendant had minimum contacts with the taxing jurisdiction such that maintenance of the suit did not offend traditional notions of fair play and justice. The Court in *Burger King, Inc. v. Rudzewicz*[24] stated that if a foreign corporation purposefully avails itself of the benefits of an economic market in the forum State, it may subject itself to the State's in personam jurisdiction even if it has no physical presence in the State. As it pertains to the Due Process Clause, a corporation has fair warning that it is subject to the imposition of collection of use taxes and due process is met when a mail-order company is engaged in continuous and widespread solicitation of business within a State even if it does not have a physical presence in the State. The Court found that Quill had directed its activities at North Dakota residents and the nexus was sufficient to make Quill subject to use tax collection and remittance in North Dakota. The Court overruled *Bellas Hess* to the extent that *Bellas Hess* required physical presence in the taxing state to meet the due process requirement for taxation.[25]

Bellas Hess prohibits remote sellers from being subject to collecting and remitting use taxes unless the remote seller has a substantial nexus with the taxing State. The purpose of the substantial nexus requirement is to limit the reach of state taxing authority so as to ensure that state taxation does not unduly burden interstate commerce. A seller may have sufficient minimum contacts to meet the Due Process Clause but lack a substantial nexus with the taxing State required by the Commerce Clause.[26] In construing the Commerce Clause, the Court in *Complete Auto* emphasized the importance of looking past the formal language of the tax statute to its practical effect. There the Court established a four-part test to determine whether a remote seller was subject to state taxation under the Commerce Clause. Under the Complete Auto's four-part test, a court "will sustain a tax against a Commerce Clause challenge so long as the tax (1) is applied to an activity with a substantial nexus with the taxing State, (2) is fairly apportioned, (3) does not discriminate against interstate commerce, and (4) is fairly related to the services provided by the State."[27] The first of the tests was at issue in *Quill* as it was in *Bellas Hess*.

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15 386 U.S. 753 (1977).
16 Quill Corp., supra note 1, at 303.
17 Id.
18 430 U.S. 274 (1977).
19 Quill Corp., supra note 1, at 303.
20 Id. at 304.
21 Id.
22 Id.
23 326 U.S. 310 (1945).
24 471 U.S. 462 (1985).
25 Quill Corp., supra note 1, at 305.
26 Id. at 313-314.
27 Id. at 313, citing Complete Auto, supra note 12, at 279.

The Court considered the bright-line test for substantial nexus in *Bellas Hess* and the policy behind using a bright-line test requiring a remote seller to maintain a physical presence, through having a small sales force, a plant, or office, in the taxing State before there is substantial nexus to meet the dormant Commerce Clause requirement. The Court noted that such "a bright-line rule in the area of sales and use taxes also encourage settled expectations and, in doing so, fosters investment by businesses and individuals."[28] It also based its reasoning for reaffirming its bright-line rule in *Bellas Hess* requiring a physical presence on the doctrine of *stare decisis*. The bright-line rule had "engendered substantial reliance, [b]ecome part of the basic framework of a sizable industry", and was necessary for stability and orderly development of the law.[29] Finally, the Court noted that with the issue of due process settled, Congress had the ultimate power "to decide whether, when, and to what extent the States may burden interstate mail-order concerns with a duty to collect use taxes.[30] The Court has left the final resolution of the issue to Congress and reversed the decision of the North Dakota Supreme Court.

Justice White dissented to the majority's opinion on the Commerce Clause. In his dissenting opinion he stated that *Bellas Hess* should be overruled on Commerce Clause grounds as it requires physical presence. Justice White argued that the nexus requirement for due process providing jurisdiction to tax interstate commerce was sufficient to meet the Commerce Clause nexus requirement. He argued that the four-pronged test in *Complete Transit* was "traceable to concerns grounded in the Due Process Clause, and not the Commerce Clause…. For the Court now to assert that our Commerce Clause jurisprudence supports a separate notion of nexus is without precedent or explanation." He stated:

> Even were there to be such an independent requirement under the Commerce Clause, there is no relationship between the physical-presence /nexus rule the Court retains and Commerce Clause considerations that allegedly justify it. Perhaps long ago a seller's "physical presence" was a sufficient part of a trade to condition imposition of a tax on such presence. But in today's economy, physical presence frequently has very little to do with a transaction a State might seek to tax. Wire transfers of money involving billions of dollars occur every day; purchasers place orders with sellers by fax, phone, and computer linkup; sellers ship goods by air, road, and sea through sundry delivery services without leaving their place of business. It is certainly true that the days of the door-to-door salesperson are not gone. Nevertheless, an out-of-state direct marketer derives numerous commercial benefits from the State in which it does business. These advantages include laws establishing sound local banking institutions to support credit transactions; courts to ensure collection of the purchase price from the seller's customers; means of waste disposal from garbage generated by mail-order solicitations; and creation and enforcement of consumer protection laws, which protect buyers and sellers alike, the former by ensuring that they will have a ready means of protecting against fraud, and the latter by creating a climate of consumer confidence that inures to the benefit of reputable dealers in mail-order transactions. To create, for the first time, a nexus requirement under the Commerce Clause independent of that established for due process purposes is one thing; to attempt to justify an anachronistic notion of physical presence in economic terms is quite another….The majority clings to the physical-presence rule not because of any logical relation to fairness or any economic rationale related to principles underlying the Commerce Clause, but simply out of the supposed convenience of having a bright-line rule.[31]

Justice White's dissent also points out, and rightfully so, that the physical-presence requirement to establish substantial nexus for the dormant Commerce Clause creates an "interstate commerce shelter for one form of business—mail-order sellers—but no countervailing advantage for its competitors. It creates an unfairness among retailers. One can argue that this sales/use tax advantage in large part has created a growth in mail-order and Internet retail sales to the disadvantage over brick and mortar retailers, which as a significant payer of property taxes should be favored to assist municipalities to fund governmental services. Finally, he rejected the majority's argument that *Bellas Hess*' bright-line test should be retained under the doctrine of *stare decisis* and that changing the law should be left to Congress. He argued that the physical presence test could no longer be rationally justified and that the Supreme Court should not wait on Congress to correct an unfair law. He stated, "The Commerce Clause aspect of *Bellas Hess*, along with its due process holding, should be overruled."[32]

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28 Id. at 315.
29 Id.
30 Id. at 316.
31 Id. at ____.
32 Id.

Congressional Action

In response to the development of the Internet and the States' desire for new taxes, Congress has chosen to limit state and local governments' ability to tax the Internet. However, this restriction is limited. Understanding of Congressional attitudes and political strategy may be more revealing about the Internet Tax Freedom Act of 1998 (ITFA).[33] The ITFA has been extended several times to prevent it from lapsing. The last extension was in 2007 which extended the Act to 2014.[34]

The ITFA is actually a moratorium on state and local taxes on Internet access fees.[35] Contrary to popular opinion, it does not prevent state and local sales or use taxes to be collected by states. These taxes were authorized before the ITFA was enacted. Furthermore, they are not "multiple or discriminatory taxes on electronic commerce."[36] The ITFA defines "multiple or discriminatory taxes on electronic commerce" as any state or local tax on electronic commerce that is not generally imposed and legally collectible by such state or local taxing authority on transactions involving "similar property, goods, services, or information accomplished through other means."[37]

In passing the Act Congress included its wishes to protect the Internet. The sense of Congress was stated that "the President should seek bilateral, regional, and multinational agreements to remove barriers to global electronic commerce through" various important trade organizations and trade agreements. Furthermore, the sence of Congress states negotiating objectives of the United States which shall be "(1) to assure that electronic commerce is free from (A) tariff and nontariff barriers; (B) burdensome and discriminatory regulation and standards; and (C) discriminatory taxation."[38] This indicates an unwillingness to allow the States to tax the Internet and to grant them their full sovereignty under federalism. Why did Congress pursue this policy regarding taxation of the Internet? ITFA reflects a strong free-market philosophy and the political restraints associated with the political fear of being labeled "a tax and spender". [39]

There have been bills introduced in Congress that would allow States to collect sales and use taxes on remote sellers using the phone or Internet, but they all have died. Senator Ernest Hollings (D.S.C.) introduced a bill in the 106th Congress that would have imposed a five percent national retail sales tax on Internet sales, but it was rejected by the Senate Finance Committee.[40]

Responses to *Quill*

There have been two significant responses to counteract the effect of *Quill*. First, in a response to the Supreme Court's preference to have Congress give legislative authorization for states to require remote sellers to collect and remit use taxes, many states initiated the Streamlined Sales Tax Project ("SSTP"). The SSTP is an attempt by the states to standardize their sales and use tax laws and to create computer software for use by remote sellers to reduce the sellers' administrative burden in collecting and remitting sales and use taxes. Although Justice Stevens in *Quill* noted the unreasonable burden of having the out-of-state seller subject to over 6,000 taxing jurisdictions, a number which seems overwhelming, Sean P. Nehill claims that there are now are more than 7,500 taxing jurisdictions.[41] Success of the SSTP will more likely make Congress less hostile to enacting legislation overriding *Quill*. The second response is a decision by the California Court of Appeals in *Borders Online, LLC. V. State Board of Equalization*[42] that narrowly construed the Supreme Court's dormant Commerce Clause requirement of substantial nexus which limits a State's right to force a remote seller to collect and remit use taxes. It is from either of these two avenues that the states will most likely eventually be allowed to collect these use taxes.

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33 Title XI, P.L. 105-277, 112 Stat. 2681 (1998); 47 U.S.C. 151 note.
34 Internet Tax Freedom Act Amendments Act of 2007.
35 ITFA, id. at §1101(a)(1).
36 Id. at §1101(a)(2).
37 Id. at §1104(2).
38 Id. at §1203(a) and (b).
39 See, Eric Menhart, Taxing the Internet: Analyzing the States' Plan to Derive Online Sales Revenue, Jul-Aug. J. State Tax. 23, 29 (2007).
40 Id.
41 Walter J. Baudier, 5 Duke Law & Tech. Rev. (2006), at ¶19, note 59, copied from Sean P. Nehill, The Tax Man Cometh? An Arguyment for the Taxation of Online Purchases, 13 CommLaw Conspectus 193, 208 (2004).
42 29 Cal. Rptr. 3d 176 (Cal. Ct. App. 2005). As of March 26, 2008, the California Court of Appeals has not ruled on this case.

Borders Online

In 1998 and 1999, the tax years at issue here, Borders Online, LLC (Online) was a Delaware company with its headquarters in Michigan. Online sold books, book accessories, magazines, compact discs, videotapes and similar tangible goods on the Internet totaling about $1.5 million to California purchasers. Online did not own or lease any property or have any employees or bank accounts in California during 1998 and 1999. Online and Borders stores, which were distinct separate companies, they were owned by a common parent, Borders, Inc. (Borders) A policy of Borders allowed customers to exchange items purchased from Online or receive a credit card refund at Borders stores. Merchandise purchased from Online that was returned to Borders stores was absorbed into Borders' own inventory or disposed of by Borders. Borders stores did not charge Online for accepting the returns. Borders and Online also engaged in incidental cross-marketing practices to benefit the Borders brand. Borders operated stores in California. Employees of Borders stores were encouraged to refer customers to Online.[43]

The State of California collects a use tax "on the storage, use, or other consumption in [the] state of tangible personal property purchased from any retailer . . . for storage, use, or other consumption in [the] state."[44] If a retailer is "engaged in business" in the State, it is required to collect and remit a use tax.[45] The tax statute defines a retailer engaged in business as "[a]ny retailer having any representative, agent, salesperson, canvasser, independent contractor, or solicitor operating in this state under the authority of the retailer or its subsidiary for the purpose of selling, delivering, installing, assembling, or the taking of orders for any tangible personal property."[46]

In 1999, Online was ordered by the Board of Equalization by letter to collect and remit use taxes on all sales to California purchasers because of Online's affiliate Borders stores acted as Online's agent by accepting returned merchandise and this act constituted selling for purposes of the statute. The Board broadly construed "selling" to include "all activities that are an integral part of making sales."[47] Online filed suit in California seeking a refund and took the position that under Quill Corp. it was not subject to collect and remit California use taxes. The trial court issued summary judgment for the State in holding that (1) Online was subject to the tax based on Online's merchandise return policy which constituted having agents in the State to effectuate Online's return policy and (2) imposition of the tax on Online did not violate the Commerce Clause as Online had a sufficient physical presence in California to support a finding of "substantial nexus".[48]

On appeal, the California Court of Appeals affirmed the trial court's decision. Online argued that Borders stores were not agents of Online, that Online did not intend for them to act as agents, that the return policy was also Borders' policy, and that a four-factor test to determine the existence of an agency relationship should be applied, and that test included the ability of the agent to alter the legal relationships of the principal. The Court rejected the argument that it had to apply the four-factor test as a bright-line test. The Court noted that an agency relationship could be based on conduct and circumstances, as well as ratification by the principal of the agent's act.

The Court cited *Scholastic Book Clubs, Inc. v. State Board of Equalization*[49] in which the Court had found an agency relationship had existed between the appellant-out-of-state mail-order vendor of children's books and school teachers who received the vendor's book catalogs, distributed the offer sheets to the students, and forwarded orders to the vendor. The mail-order vendor had argued that no agency relationship existed with the teachers, but the Court found an agency relationship based on apparent authority from the facts that the vendor had accepted the orders and the payments, and had shipped the merchandise, all of which was a ratification of the acts of the teachers and confirmation of their authority as the vendor's agents or representatives.[50] By accepting Online's merchandise for return pursuant to Online's return policy, Borders acted on behalf of Online as its agent or representative in California.[51]

The second reason the Court gave for concluding the tax statute applied to Online was that Online's return policy constituted "selling" in the State under the statute. As selling was defined broadly by the California legislature, and giving "selling" its common usage, the Court concluded that the authorization of remote sellers to allow in-state persons to receive merchandise returns on behalf of the remote seller constitutes an integral part of the remote seller's selling efforts.[52] The Court rejected Online's narrow definition of "selling" as "the act of making a sales transaction". Thus, under Online's definition of "selling", an agent would only count if it was actively involved in the solicitation or the

43 Id. at ___.
44 Cal. Rev. & Tax §6201.
45 Id. §6203(a).
46 Id. §6203(c)(2).
47 *Borders Online*, supra note 34, at ___.
48 Id. at ___.
49 207 Cal. App.3d 734 (1989).
50 Id.
51 *Borders Online*, supra note 34, at ____.
52 Id. at ___.

transaction itself.[53] The Court also focused on the fact that the return policy was Online's policy intended to benefit Online and to induce sales in California. Logically, Online's return policy would give greater confidence to California consumers of Online's operations since the return, exchange, or refund could be affected locally at one of Borders' stores. In concluding that the return policy was an integral part of Online's selling in the State, the Court noted that the return made the sale more attractive, convenient, and gave trustworthiness to the seller, all of which is important in the context of e-commerce.[54] Finally, the Court reasoned that Online's policy of allowing California customers to receive a store credit at Borders for merchandise returns also was contemplated in the statutory definition of "sale" for sales tax purposes.

In construing *Quill* and the bright-line test of physical presence for substantial nexus to satisfy the Commerce Clause, the Court broadly construed what constitutes substantial nexus between a taxing state and a remote seller. The Court cited an earlier case, *Tyler Pipe Industries v. Dept. of Revenue*[55], in which the U.S. Supreme Court stated that "the crucial factor governing nexus is whether the activities performed in [the] state on behalf of the taxpayer are significantly associated with the taxpayer's ability to establish and maintain a market in [the] state for the sales."[56] In assessing whether the out-of-state seller had employees or agents within a state to meet the physical presence test, the California Court of Appeals took a more liberal position as to what constitutes an agent of the out-of-state seller. Consistent with Justice White's dissent in *Quill,* the Court stated:

> The pivotal question when testing a state's taxing authority against the dormant commerce clause is not whether the foreign company has agents soliciting sales in the state. The question, rather, as articulated in *Tyler Pipe*, is whether the activities of the retailer's in-state representatives are 'significantly associated with [its] ability to establish and maintain a market in [the] state for the sales.[57]

Finally, the Court reviewed recent cases that considered the substantial nexus requirement of the dormant Commerce Clause to state taxation of out-of-state sellers.[58] The New York Court of Appeals in *Orvis Co. v. Tax Tribunal*[59] concluded that the Supreme Court in *Quill* had reluctantly reaffirmed the bright-line rule in *Bellas Hess* and required some physical presence to support taxation while at the same time endorsing more flexible approach of later Commerce Clause jurisprudence. In this later jurisprudence "the quid pro quo for State taxation could be found in the benefits and protections the State confers in providing for a stable and secure legal-economic environment for a mail-order vendor's substantial marketing efforts aimed at the taxing State."[60] The New York Court of Appeals articulated the Commerce Clause physical presence standard as follows:

> While a physical presence of the vendor is required, it need not be substantial. Rather, it must be demonstrably more than a 'slight presence' And it may be manifested by the presence in the taxing State of the vendor's property or the conduct of economic activities in the taxing State performed by the vendor's personnel or on its behalf.

The California Court of Appeals agreed with the *Orvis* Court that such a construction of the dormant Commerce Clause requirement of physical presence in the taxing State was "more in keeping with the realities of 21st century marketing and technology, which increasingly affords opportunities for out-of-state vendors to establish a strong economic presence in California, utilizing California's 'legal-economic environment,' while maintaining only a minimal or vicarious presence here."[61]

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53 Id. at ___.
54 Id. at ___.
55 483 U.S. 232 (1987).
56 Id. at 250.
57 Borders Online, supra note 34, at ___.
58 *Town Crier, Inc. v. Department of Revenue,* 733 N.E.2d 780 (Ill. Ct. App. 2000); *Dept. of Revenue v. Care Computer Systems*, 4 P.3d 469 (Ariz. Ct. App. 2000); *In re Appeal of Intercard, Inc.*, 14 P.3d 1111 (Kan. 2000); *Dept. of Revenue v. Share International*, 676 So.2d 1362 (Fla. 1996); and *Orvis Co. v. Tax Tribunal,* 86 N.Y.2d 165 (1995).
59 Id.
60 Orvis Co., supra note 50, at 175, c.f. Borders Online, supra note 34, at ___.
61 Borders Online, supra note 34, at ___.

Streamlined Sales Tax Project

Currently, 45 states and the District of Columbia impose sales or use tax.[62] States have begun to work together to satisfy the Supreme Court's concerns about burdening interstate commerce with state and local sales and use taxes on Internet or mail-order sales. Since the late 1990s and still in progress, the States and the District of Columbia began the Streamlined Sales Tax Project ("SSTP"), the mission of which is to "develop measures to design, test and implement a sales and use tax system that radically simplifies sales and use taxes" for out-of-state sellers.[63] This is a multi-state agreement among a majority of the states (presently, 42 plus the District of Columbia). This process, much like the harmonization of tariffs and efforts to achieve greater transparency in international trade under the General Agreement of Tariff and Trade (GATT) and creates uniform definitions, reduces or limits the number of sales/use tax rates. For instance, states will be allowed one state tax rate for each uniformly defined good, and will be allowed a second tax rate for very narrowly defined goods such as food or pharmaceuticals.[64]

There are other significant provisions of the SSTP. First, a retailer would only have to file a tax return with each of the participating states. Each state would have the burden of accounting for and administering compliance and distribution of sales taxes to its municipalities. This will remove the stigma, which is unfairly used as an argument in favor of *Quill's* holding, of having to potentially comply with some 7,500 taxing jurisdictions. Second, participating states have chosen to give amnesty for those retailers who have not in the past collected use taxes on their Internet, phone, or mail-order sales to consumers out of state.[65] Third, there are sourcing rules following a set hierarchy to determine what state is to receive the sales/use tax. Last, the agreement requires each state to participate in the registration of sellers.[66] The development of the computer software is in process.

Recommendations

Several arguments and strategies should be put forth by States and municipalities to effectively overrule *Quill*.

1. The SSTP should proceed quickly to afford the most opportune time politically for Congressional action. The most opportune time may depend on the national elections in 2008. If the SSTP is successful, much of the argument by the majority in *Quill* will be defeated. There will not be a large number of taxing jurisdictions to make tax compliance unduly burdensome.
2. States must aggressively lobby Congress to change the political objection to allowing States to tax Internet transactions with sales or use taxes. Congress must accept that States are limited in their ability to raise revenues.
3. States should be allowed to tax international sellers consistent with the E.U. VAT policy. Presently, U.S. remote sellers are at a disadvantage to foreign sellers on the Internet. States should try to make their collective case that *Borders Online* was correctly decided by the California Court of Appeals. They should argue as Justice White argued in his dissenting opinion in *Quill* that there should be no difference in the minimum contacts requirement for due process and the substantial nexus requirement of the Commerce Clause. Alternatively, as in *Borders Online* the substantial nexus requirement of physical presence does not require much physical presence and can be found with some component of sales activity and surrogates of the seller acting as agents or representatives of the remote seller. They should argue that present law is a combination of outdated thinking, and practical infeasibility, and misguided policy.[67]
4. States should show a willingness to provide less administrative burden on remote sellers by having an exception or exclusion from filing by small sellers (i.e., a small number of low-dollar transactions) and underwriting some or all of the cost of the computer software for small retailers.[68]
5. States should argue that U.S. remote sellers should be treated the same as U.S. Internet retailers that sell and ship goods to the European Union. In the E.U., a retailer, domestic or foreign and even one that sells via the Internet, must collect and remit a value-added tax (VAT) on sales to E.U. customers. For this purpose, domestic and foreign sellers in the E.U. must register with the European taxing authorizes to be able to charge, collect, and remit VAT for their sales. EU tax authorities consider such a tax policy imposing the tax burden on non-EU sellers fair because it places foreign goods under the same tax standards assigned to EU products. Under the

62 Mary McLaughlin, The Streamlined Sales Tax Project, The CPA Journal (Dec. 2003), available at http://www.nysscpa.org/cpajournal/2003/1203/dept/d125803.htm (last visited Mar. 26, 2008).

63 See, Streamlined Sales Tax Governing Board, Inc., Structure and Operating Rules Streamlined Sales Tax Project (Adopted March 20, 2000), available at http://www.streamlinedsalestax.org/oprules.html (last visited Mar. 26, 2008); see also, Mary McLaughlin, id. ; Eric Menhart, supra note 39, at 30-32..

64 Eric Menhart, supra note 39, at 30.

65 Id. at 31.

66 Mary McLaughlin, supra note 62.

67 Eric Menhart, supra note 30, at 31.

68 Id. at 32.

2002 EU Directive, physical presence is not a requirement for obligating the collection of VAT on goods sold to or used by EU residents.[69]

Conclusion

Since 1992 with the U.S. Supreme Court's decision in *Quill* and Congress' inability to face its obligation of federalism, States have been locked into a frozen policy on mandating remote sellers to charge, collect, and remit sales and use taxes when they sell goods to consumers of those States. Quill's policy is outdated given the present state of electronic commerce using the Internet. First, the California Supreme Court should affirm Borders Online soon. Second, the U.S. Supreme Court should grant a writ of certiorari on the Borders Online case and overrule Quill by following Justice White's dissent in Quill. Finally, the participating States in the SSTP should strive to persuade Congress to overrule Quill and grant those States the right to collect use taxes from remote sellers. This may be done by restricting the right for local governments from taking action against remote sellers unless they are acting pursuant to the SSTP.

69 Martha L. Arias, Internet Law – Do Non-European Merchants Have to Collect Value Added Taxes?, IBLS Internet Law – News Portal, available at http://idls.com/internet_law_news_portal_view_prn.aspz?s=latestnews&id=1999 (last visited Mar. 25, 2008).

The 'Barbarian/Hut' Centenionalis and Vergilian Iconography

By Gavin T. Richardson

For decades scholars have debated the significance of the Imperial bronze reverse type popularly known as the "barbarian and hut" centenionalis. Beginning in A.D. 348, Constans and Constantius II minted this bronze issue weighing approximately 4.5 grams and measuring 19-23 millimeters in diameter. The obverse of the Constans centenionalis depicts the diademed, draped, and cuirassed bust of the emperor facing left, holding a globe in his right hand, with the legend DN CONSTANS PF AVG; the Constantius II version differs only in the emperor's name. The reverse legend for both reads FEL TEMP REPARATIO, which is customarily glossed as "The Restoration of Happy Times" (*Felicium Temporum Reparatio*).[1] These coins were minted in huge numbers and were struck at every operative mint in the empire, from Trier to Alexandria. The obverse has provoked little discussion while the reverse has sparked considerable debate. The reverse depicts a large figure in military attire striding right, holding a spear in his left hand while grasping the right hand of a smaller figure often interpreted as a barbarian youth; the soldier's head is turned toward the smaller figure as he leads him away from an architectural feature often identified as a hut, which stands beneath an overhanging tree. The die engravers of each mint city wrought slight variations on this theme; the mint workers at Aquilea engraved angular images in less detail, whereas the die engravers of Antioch carved exquisite features such as the drapery folds of the military cloak worn by the Roman soldier. On some coins the smaller figure appears to be a youth stooping over (e.g., the issues at Thessalonica), while at other mints (e.g., Alexandria and Antioch) the soldier towers above the smaller figure to such an extent that the latter seems to be a small child.

A number of questions still surface regarding this reverse. Is the smaller figure a barbarian child whose youth makes him a suitable candidate for Romanization, or is the size disparity simply a metaphor for the cultural differences between Roman and barbarian? Is the smaller figure a barbarian at all? Is the soldier dragging him in an act of subjugation and humiliation, or is he leading him into *Romanitas* in a charitable act of cultural assimilation? Is the soldier to be identified with the Emperor himself? Is the architectural feature on the left a hut or some other structure? Does the tree possess a specific symbolism, or does it merely signify a rustic setting? What is this scene's relationship to the legend FEL TEMP REPARATIO? And why is this reverse type disproportionately associated with Constans rather than Constantius II? Major scholarly views concerning these questions are detailed below, but in brief, Harold Mattingly argued that the smaller figure is the child mentioned in Vergil's Fourth Eclogue who will usher in a new Golden Age for Rome, while Annalina Caló Levi and Konrad Kraft maintained that the reverse type depicts barbarian settlements, especially those associated with the reign of Constans.[2]

In this essay I also offer a Vergilian reading of this reverse type, but one that does not draw on Vergil's Fourth Eclogue. Rather, I argue that the reverse type alludes to the familiar iconography of Aeneas leading Ascanius from a burning Troy as detailed in Book 2 of the *Aeneid*—a motif widely popular in early Imperial art, and one featured on coinage designed to coincide with the 900th anniversary of Rome's foundation. The occasion for such an allusion in the fourth century may be both the 1100th anniversary of Rome, as well as the assimilation of the Franks and other barbarian tribes into the empire as detailed by Kraft. Read in this context, the "barbarian and hut" centenionalis simultaneously looks back at the origins of Rome while looking to its present and future through a restoration of happy, or blessed, times.

I. THE MAJOR ARGUMENTS

Serious scholarship on the "barbarian and hut" reverse begins with Harold Mattingly's 1933 essay "Fel. Temp. Reparatio" in *The Numismatic Chronicle and Journal of the Royal Numismatic Society*; its significance was demonstrated by its reprinting some forty years later. Mattingly's interpretation of the "barbarian and hut" centenionalis is part of a larger

1 See J.P.C. Kent, *The Roman Imperial Coinage* [*RIC*], vol. VIII: The Family of Constantine I, A.D. 337-364 (London, 1981). These coins were struck from A.D. 348-350 at most mints, with only Heraclea, Constantinople, and Nicomedia continuing the issue to A.D. 351. Regarding the reverse legend, Harold Mattingly suggests an alternate expansion: *Felix Temporum Reparatio*, a "happy renewal of times," which may focus more attention on the fortunate renewal, or may simply be a hypallage for the "renewal of happy times"; see "Fel. Temp. Reparatio," *Numismatic Chronicle*, Fifth Series 13 (1933): 182-201, reprinted in the Numismatic Chronicle Reprint Series (New York, 1977). References to Mattingly will employ the reprint page numbering.

2 Mattingly (1977) 13-14; Annalina Caló Levi, *Barbarians on Roman Imperial Coins and Sculpture* (New York, 1952) 47-8; and Konrad Kraft, "Die Taten der Kaiser Constans und Constantius II," *JNG* 9 (1958): 141-86, at 173-5, reprinted in *Gesammelte Aufsätze zur antiken Geldgeschichte und Numismatik I* (Darmstadt, 1978). References to Kraft will employ the *JNG* page numbering.

Vergilian reading of the entire FEL TEMP REPARATIO series.[3] In his Fourth Eclogue, Vergil prophesies that a new Golden Age will arise, heralded by the birth of a child whose lifetime will witness unparalleled abundance, and who will "consort with the gods" (line 15) and "rule a world his father's virtues have brought to peace" (line 17).[4] No one has convincingly identified this child, assuming he can be identified at all. Medieval writers such as Dante asserted that the Fourth Eclogue reflected a kind of Christian prescience granted to the pagan Vergil, and that the Golden Child was Vergil's own prediction of Jesus Christ.[5] Modern scholars have posited figures such as the son of Vergil's patron, C. Asinius Pollio, or some hoped-for heir to Augustus.[6] For Mattingly's purposes such specific identification was unnecessary; he simply suggested that the child represents the promise promulgated by the coin's reverse legend:

> Is it possible to trace … the thought of the *Eclogue* and to see in the type a soldier leading the growing boy of the *Eclogue* to learn his "*tirocinium*" [first military service] in war, half reluctantly leaving behind his cradle--the cradle which had flowered for him—"*ipsa tibi blandos fundent cunabula flores*"?

Mattingly continued by offering a second symbolism drawn from Rome's foundation:

> Or, if we risk a more pagan solution, can we say that Mars is leading his son Romulus from the "*casa Romuli*" beside the *ficus ruminalis* to enter on his military career? The small figure is not, as a rule at least, marked out by dress or feature as a barbarian, and the soldier leads rather than drags him. It is advisable to be cautious in accepting such interesting, but unproved suggestions as these. Perhaps it is not too much to claim that we have shown that the author of our type may have been familiar with the thought and imagery of Virgil's poem.[7]

Mattingly believed the entire FEL TEMP REPARATIO series was struck to commemorate Rome's eleventh centenary. A.D. 348 was an especially propitious time for such a commemoration since the 1100th anniversary of Rome furnished a unique intersection of regular centennial observation and the Etruscan 110-year *saeculum* so important in the Roman reckoning of time: "With the eleventh centenary we come to A.D. 348, the year of our issue. It may be observed that as 1,100 is not only 11 times 100, but also 10 times 110, the 1,100th year of Rome could be regarded, if you so pleased, as the point where the two series of '*saecula*' of 100 and 110 years met and were reconciled."[8] Although Mattingly's observations about the year 348 are compelling, less convincing are his suggestions that the centenionalis reverse depicts the child of the Fourth Eclogue, or Romulus, judging by continued reference to this reverse type as the "barbarian and hut" centenionalis, and Kent's description of the "Small Æ 2" in *The Roman Imperial Coinage*, vol. VIII.[9]

In her study of barbarians in Roman art published in 1952, Annalina Caló Levi accepted the possibility that the saecular anniversary was a likely stimulus for the FEL TEMP coinage, but she did not affirm Mattingly's Vergilian reading. She asserted that the "barbarian and hut" coin (identified as Type B in her monograph) depicts precisely that, and commented specifically on the iconographic attributes of the small "barbarian":

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3 The complete FEL TEMP REPARATIO coinage series of A.D. 348-51 included four reverse types, commonly referred to as the "barbarian and hut," "emperor on a galley," "soldier spearing a fallen horseman," and "phoenix on a pyre" types. Since these reverse types were instituted simultaneously, some scholars (e.g., Mattingly) have wished to see thematically or iconographically unified readings for the entire series. I disagree with the view that the series must possess a unity of this kind, and my Vergilian reading of the "barbarian and hut" centenionalis does not extend beyond this single reverse type. Even if the series is designed to reflect contemporary events, as Konrad Kraft argues, the iconography of the reverse type may still allude to the Flight from Troy as the centenionalis may simultaneously dramatize barbarian settlement.

4 *Vergil's Eclogues*, trans. Barbara Fowler (Chapel Hill, 1997) 11. R. A. B. Mynors, *P. Vergili Maronis Opera* (Oxford, 1969): "ille deum uitam accipiet diuisque uidebit / permixtos heroas et ipse uidebitur illis / pacatumque reget patriis uirtutibus orbem."

5 See *Purg* 22.64-72, where the crypto-Christian Statius credits this eclogue with helping lead him to Christianity.

6 See the notes to Fowler's translation, 37.

7 Mattingly (1977) 14.

8 Mattingly (1977) also suggests that the denominational term *centenionalis* is related to this centennial chronology, 8.

9 See, for example, the discussions found in popular guides such as David Van Meter, *The Handbook of Roman Imperial Coins* (Nashua, NH, 1991) 297; and Victor Failmezger, *Roman Bronze Coins from Paganism to Christianity, 294-364 A.D.* (Washington, D.C., 2002) 12, 41. Kent (1981) designates the issue as "Hut" and writes, "There is no certainty about the interpretation of this type, though it is specifically associated with Constans. The warrior who leads the small bare-headed figure from a hut beneath a tree is no doubt the emperor; perhaps Constans' 'pacification' of the Franks in 342 involved the acceptance—enforcement in propaganda terms—of some settlement within the Empire—that in Toxandria, for example. The allusion might however be to some event in Britain during Constans' visit" (35).

> As for type B, the motif of a Roman leading a barbarian by the hand is not new, but the addition of the hut and the tree is. The figure is certainly a barbarian because on several specimens the traditional barbaric features such as beard and trousers are clearly visible. Therefore, the scene could be interpreted as the symbolic representation of one of the consequences of victory, frequently mentioned by later writers. Barbarians were often forced to settle within the boundaries of the empire in order to cultivate the soil. The "Panegyricus" of Constantius is very illuminating in this respect. That the coin type under consideration is related to those forced migrations, is shown by the hut and the tree. They are an abbreviation of a whole landscape and indicate the woods and the huts where the barbarians lived. The Roman warrior is leading the barbarian out of his home to his new place in the Roman empire. Perhaps, the whole group of these coins with the legend FEL TEMP REPARATIO could be connected with some monument erected for the eleventh centenary of Rome.[10]

Caló Levi's description here is generally accurate, although the "barbarian and hut" centenionalis does not depict the smaller figure with a beard. She may be confusing this figure with the bearded barbarians in the "fallen horseman" FEL TEMP coinage, or possibly mistaking the figure's raised hand (which sometimes holds an object) for a beard. On some, but not all, versions of this centenionalis the smaller figure does seem to wear leggings or trousers as indicated by a series of horizontal or diagonal marks; e.g., in the emissions of the fourth officina at Antioch; the fifth officina at Constantinople; the fourth officina at Heraclea, and the second officina at Nicomedia, to name a few.

Six years after Caló Levi's study, Konrad Kraft more pointedly rejected Mattingly's hypothesis and argued in very specific terms that the "barbarian and hut" reverse represents Constans' peaceful settlement of the Franks in Toxandria (present-day Belgium). Constantius II also minted the "barbarian and hut" type, but Kraft asserted that the "Typ Hütte" is to be principally associated with Constans because of the overwhelming number of "barbarian and hut" reverses struck for that emperor, especially by Eastern mints, even though Constans was Emperor in the West. Constans' pacification of the bellicose Franks in the 340s was indeed a major achievement; in his *Oratio 40*, the fourth century *rhetor* Libanius details how Constans checked their advances without bloodshed:

> 131. But even the waves of these *Fracti* [Franks] had to cease sometime and to halt their movement for certain. For an emperor appeared who turned their insatiable love of warfare into a desire for peace by no other means than by demonstrating that his own enthusiasm for battles was greater than theirs. Accordingly they no longer dared to join in a trial of combat, but fear sufficed to accomplish the results of the trial. They did not lift their right hands to discharge their spears but held them forth to request a treaty. 132. The proof is as follows. They received officers from us as overseers of their behaviour and, discarding their bestial frenzy, they welcomed human reason. They abandoned their arrogance and honoured the keeping of their oaths. In any case even if the obligation resulting from oaths had not been present they would have loved peace. Thus the inferior is generally brought under control by the superior.[11]

While Libanius' panegyric may tend to hyperbole, Kraft argued that Constans' relatively peaceful barbarian subjugation, in contrast to Eastern problems with the Persians, accounts for the comparatively gentle treatment of the smaller figure on the centenionalis reverse. As Mattingly noted, this figure seems to be led rather than dragged, unlike less fortunate barbarian counterparts on fourth-century coinage.

The humiliation of barbarians was a favorite Roman motif, as evidenced by the defeated Dacians on Trajan's Column and the Parthians on the Arch of Septimius Severus. Late Imperial coins and medallions routinely featured diminutive, bound captives in postures of supplication, and one widespread FEL TEMP REPARATIO reverse depicted a Roman soldier spearing a barbarian as his horse tumbles beneath him. Later reverse types of Valentinian I, Valens, Gratian, Valentinian II, Theodosius I, and Arcadius featured the Emperor carrying a Chi-Rho labarum in his left hand while dragging a bound captive by the hair with his right in a vigorous assertion of Imperial power and the *ecclesia militans*.[12] Violent numismatic propaganda celebrating Roman triumph over barbarians reflected a palpable anxiety over barbarian incursion in the fourth century. Slaughtered or captured barbarians, as well as Roman campgates—strongholds of Roman protection in the provinces—dominate the reverses of late Imperial bronze coinage. Indeed, one might argue that the depiction of barbarian slaughter grows more graphic as the empire deteriorates, at least in the West. In artistically constructing the defeat of barbarians, it is fair to say that much late Imperial coinage reflects a kind of denial, or perhaps

10 Caló Levi 47-8.

11 Samuel Lieu and Dominic Montserrat, *From Constantine to Julian: Pagan and Byzantine Views; a Source History* (New York, 1996) 195.

12 This is only one prominent example of the many violent depictions of captives on Roman coinage. For a more general discussion of triumphal imagery in the later empire, see works by Caló Levi, as well as Richard Brilliant's chapter 17: "Submission," in *Gesture and Rank in Roman Art: The Uses of Gestures to Denote Status in Roman Sculpture and Coinage* (New Haven, 1963), as well as Ellen Schwartz, "A New Source for the Byzantine Anastasis," *Marsyas* 16 (1972-1973): 29-34.

desire, among the heirs of Constantine and Valentinian. Yet the coinage squares well with general Imperial attitudes towards those who would not be assimilated. Constantine the Great was particularly concerned to demonstrate that he was not soft on the barbarian issue, publicizing the execution of Frankish Kings[13] and marking his *decennalia* with a triumph featuring the "ghastly spectacle of wild beasts tearing barbarian captives to shreds."[14] In "The Barbarian in Late Antiquity: Image, Reality, and Transformation," Peter Heather notes that posters celebrating Imperial victories over the barbarians were hung in arenas: "As the fate of the Sarmatians or ambushed Saxons makes clear, such pictorial *topoi* were far from empty images. A whole host of means were used to create, reinforce and fulfil the expectation, among the Roman population at large, that the imperial ship of state would cut a triumphant and bloody swathe through the waves of barbarians which broke against it."[15]

Thus, in its kinder, gentler depiction of Roman and barbarian, the "barbarian and hut" centenionalis seems to be a curious exception, and Konrad Kraft's argument that it signifies the Romanization of the Franks is thorough and convincing. Ultimately, however, the suggestion that the centenionalis reverse type alludes to the Flight from Troy does not preclude a concomitant reference to barbarian settlement. I maintain that the coin, Janus-like, simultaneously looks backward and forward.

II. LOOKING BACKWARD

Exploring the possible influence of Vergilian iconography upon the "barbarian and hut" centenionalis begins at a point long before the composition of Vergil's *Aeneid*. By Vergil's time the image of Aeneas carrying his father Anchises from a burning Troy was an ancient one, even as a numismatic motif. In his study of the mint at Ilium, Alfred R. Bellinger noted that "the device of Aeneas carrying Anchises appeared first on a sixth century [B.C.] tetradrachm of Aenea in Macedonia and is said to be 'often portrayed on archaic Greek monuments....'"[16] Closer to the time of Vergil, a silver denarius dated ca. 47 B.C. and struck at Julius Caesar's traveling military mint depicts the bust of Venus on its obverse, alluding to Caesar's claim that the Julian *gens* descended from that goddess via Ascanius, also called Iülus. On the reverse we see Aeneas striding left, holding the Palladium with his right hand while hoisting his aged father Anchises upon his left shoulder. A prominent CAESAR appears vertically in the right field.[17] The coin is designed as a piece of propaganda, circulated while Caesar was waging civil war in North Africa. The obverse and reverse images combine to offer a clear message: Caesar is the divinely-destined heir to Aeneas' legacy of piety, sacrifice, and rule. Some two decades later, Vergil would depict salient elements of the coin reverse as he detailed Aeneas' flight from a burning Troy. In *Aeneid* Book 2, Aeneas speaks to Anchises:

> ergo age, care pater, ceruici imponere nostrae;
> ipse subibo umeris nec me labor iste grauabit;
> quo res cumque cadent, unum et commune periclum,
> una salus ambobus erit. mihi paruus Iulus
> sit comes, et longe seruet uestigia coniunx.
> uos, famuli, quae dicam animis aduertite uestris.
> est urbe egressis tumulus templumque uetustum
> desertae Cereris, iuxtaque antiqua cupressus
> religione patrum multos seruata per annos;
> hanc ex diuerso sedem ueniemus in unam.
> tu, genitor, cape sacra manu patriosque penatis;
> me bello e tanto digressum et caede recenti
> attrectare nefas, donec me flumine uiuo
> abluero. (*Aen.* 2.707-20)

13 Peter Heather, "The Barbarian in Late Antiquity: Image, Reality, and Transformation," in Richard Miles, ed., *Constructing Identities in Late Antiquity* (London, 2002), 234-58, at 235.

14 Michael McCormick, *Eternal Victory: Triumphal Rulership in Late Antiquity, Byzantium and the Early Medieval West* (Cambridge, 1990) 37.

15 Heather 235.

16 Alfred R. Bellinger, *Troy: The Coins* (Princeton, 1961; reprinted New York, 1979) 41. Some of these coins are illustrated and briefly discussed by A. A. Boyce in "The Foundation and Birthday of Rome in Legend and History," *Archaeology* 7 (Spring 1954): 9-14. As a further testament to this motif's antiquity, Erich Gruen records that about seventy vase paintings from Etruria and statuettes from Veii dating ca. 6th c. B.C. depict Aeneas carrying Anchises, manifesting an early artistic interest in Aeneas on the Italian peninsula, if not yet a fully formed "foundation myth": *Culture and National Identity in Republican Rome* (Ithaca, 1995) 16-17.

17 Edward A. Sydenham, *The Coinage of the Roman Republic* (London, 1952) 168, #1013; Michael H. Crawford, *Roman Republican Coinage*, Vol. 1 (Cambridge, 1974), 471, #458.

(Come then, dear father, mount upon my neck;
I'll bear you on my shoulders. That is not
too much for me. Whatever waits for us,
we both shall share one danger, one salvation.
Let young Iülus come with me, and let
my wife Creusa follow at a distance.
And servants, listen well to what I say:
along the way, just past the city walls,
in an abandoned spot there is a mound,
an ancient shrine of Ceres; and nearby
an ancient cypress stands, one that our fathers'
devotion kept alive for many years.
From different directions, we shall meet
at this one point. My father, you will carry
the holy vessels and our homeland's gods.
Filthy with war, just come from slaughter, I
must never touch these sacred things until
I bathe myself within a running stream.)[18]

The Aeneas denarius circulated well into Augustus' reign, and it is tempting to imagine Vergil, with Julius Caesar's *denarii* jingling in his purse, composing these lines with this specific coin in mind. However, there are significant differences between the Caesar denarius and the passage above. The Palladium on the denarius, for example, is replaced by the Penates in Vergil's text, providing a spurious Trojan etiology for the Roman domestic gods. Also Ascanius, who does not appear on the coin, is given pride of place alongside Aeneas in the narrative. In the *Aeneid*, Anchises, Aeneas, and Ascanius—emblematic of Troy's past, present, and future—set out to claim the *imperium* promised to them and to their descendants.

Although the Aeneas denarius of Julius Caesar does not furnish a significant iconographical analogue to the later "barbarian and hut" image, it is the first in a long line of Roman coins to feature this foundation narrative, including an aureus issued by Octavian/Augustus while triumvir, and a "restoration" of the Julius Caesar denarius by Trajan.[19] Vergil's description of Aeneas's flight from Troy, with its emphasis on Ascanius in addition to Anchises, would offer a near-*ecphrasis* of a widespread Imperial motif which provides more plausible sources for the centenionalis reverse type. Paul Zanker comments extensively on the centrality of the Aeneas/Ascanius/Anchises group to the program of Augustan propaganda:

> In the Forum of Augustus, in the central niches of the two large exedrae, Aeneas and Romulus stood as counterparts of Mars and Venus . . . . The statues themselves do not survive, but statuettes, reliefs, and wall paintings give us a good idea of their appearance. Aeneas carries his aged father Anchises and leads his little son Ascanius by the hand . . . . He also rescues the precious household gods, or Penates, held by the old Anchises. These were worshipped, along with the Palladium, in the Temple of Vesta, as guarantors of Rome's safety. . . Within the context of the new official mythology, Aeneas is presented as a paradigm of *pietas* toward the gods and his own father in time of need.[20]

A well-known wall painting from Pompeii likely preserves the representation of the Forum statue group. Ascanius strides to the left of Aeneas, and both look anxiously to their right, presumably toward the burning Troy they are so desperate to escape.[21] Augustus promoted this visual symbol of *pietas* throughout the Roman world, as evidenced by its presence even on private items such as rings, lamps, and tombstone reliefs. But perhaps the greatest testament to the extent to which this image was impressed upon the consciousness of Imperial Romans is the parodic wall painting from Pompeii's more libertine sister-city Stabiae, in which Aeneas, Ascanius, and Anchises are represented as "apes with dogs' heads and huge phalloi" by an artist operating in a spirit more Ovidian than Vergilian.[22] Only a well known (and likely clichéd) image would be ripe for such a parody, and the wall painter could assume that everyone would get the joke.

Despite the bestial caricature, the Stabiae painting offers a closer analogue to the "barbarian and hut" reverse iconog-

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18 *Aeneid* translation from Allen Mandelbaum, *The Aeneid of Virgil: A Verse Translation* (New York, 1971).
19 See Richard Weigel, "The 'Commemorative' Coins of Antoninus Pius Reexamined," in Waldemar Heckel and Richard Sullivan, eds., *Ancient Coins of the Graeco-Roman World: The Nickle Numismatic Papers* (Waterloo, Ontario, 1984), 187-200, at 189. The aureus can be found in Sydenham 182, #1104, and Crawford 502, #494/3a. The Trajan restoration denarius featuring Aeneas is *RIC* II, 309, #801.
20 *The Power of Images in the Age of Augustus*, trans. Alan Shapiro (Ann Arbor, 1990) 201-202.
21 Zanker, fig. 156a on 202.
22 Zanker, fig. 162 on 209.

raphy than the more official Pompeii image, with the canine Aeneas turning his head toward the smaller dog (in Phrygian cap no less!) as he leads him toward the right—the same arrangement and movement as the figures on the centenionalis reverse. But by far the closest analogue to the reverse is a first-century altar relief found on the Byrsa Hill in Carthage.[23] Again, Aeneas is depicted striding right, holding Anchises and grasping Ascanius with his right hand. The agonistic nature of the image is intensified by Ascanius' billowing cloak. The tree which helps to frame the left side of the stone relief hangs over Anchises much in the way that the centenionalis tree follows the circular space of the coin. This tree may be the cypress tree (*antiqua cupressus*) mentioned by Vergil in *Aeneid* 2.714,[24] also relevant to this scene's emphasis upon *pietas* since Aeneas tells us that it was "kept alive for many years" by "our fathers' devotion." Such an identification is problematized by the fact that Vergil describes the Trojan refugees as moving *toward* this tree, not away from it, as on the altar relief. However, in an Antonine copy of a Hadrianic medallion, Aeneas is similarly depicted as carrying Anchises away from a tree which Michael Jenkins suggests is the "ancient cypress" mentioned in the *Aeneid*:

This passage of the *Aeneid* explains fully the upper zone of the design; the Temple of Ceres, shown with an altar before it, and the old cypress enclosed in its protective wall frame the figure of Aeneas carrying Anchises who arrive at the appointed place. The strong similarities between the scene depicted on the upper register of the medallion and the lines from Vergil suggest that the register is, in fact, an illustration of this passage of the *Aeneid*.[25]

Indeed, with Antonine coinage we find multiple reverse types which allow us to more confidently reinterpret the "barbarian and hut" centenionalis within a numismatic tradition of Vergilian iconography, especially for issues struck during Roman centenary observances in A.D. 147/48. Antoninus Pius prepared for the 900th anniversary of Rome's founding with a series of coins celebrating Rome's origins, and three of these coins feature Aeneas carrying Anchises and leading Ascanius.[26] Mattingly describes the reverse of one commemorative aureus (*BMC* #237) as follows: "Aeneas, in military dress with cloak, advancing r., carrying Anchises on his l. shoulder with this l. arm and with r. hand leading Ascanius, who advances r. with him: Anchises, veiled, draped, holds a *cista* in l. hand, Ascanius wears short tunic, cloak and Phrygian cap and holds *pedum* upright in r. hand." Two bronze coins from this series feature similar reverses. In these commemorative issues Aeneas holds neither Penates nor Palladium, though he does grasp the hand of his young son Ascanius. In addition to these regular commemorative issues, the Roman province of Ilium struck a similar-themed coinage, including a large, sestertius-sized (34 mm) bronze minted sometime during the reign of Marcus Aurelius.[27] The reverse of this coin is nearly identical with those of the Antoninus Pius coins, with the exception of the city name ΙΛΙΕΩΝ in the exergue. Ilium, of course, was patronized by Roman emperors and honored with these mythological reverse types due to its legendary associations with Troy and thus with the foundation of Rome itself. The Antonine commemorative and provincial coins testify to an "Aeneas leading Ascanius" numismatic motif prominent by the mid-second century.

In A.D. 248 Philip I ("The Arab") would similarly observe the 1000th anniversary of Rome's founding with the *Ludi Saeculares*. Unlike Antoninus Pius, however, he did not issue coins featuring Aeneas, opting instead to depict sacred temples and exotic animals used in the games, with reverse legends such as SAECVLARES AVGG and SAECVLVM NOVVM.[28] One may legitimately wonder, then, whether the Aeneas motif employed by the Antonines could have influenced coin issues some two centuries later in the age of Constans and Constantius II. The influence is plausible for several reasons. First, Michael Jenkins has demonstrated that numismatic motifs can recur even after long periods of disuse, offering the Aeneas, Anchises, and Ascanius iconography as a prime example:

> An "Aeneas, Anchises and Ascanius" medallion-type of Antoninus Pius appears to have been copied on a now worn medallion of Constantine I, which was similarly borrowed by contorniate-engravers during the "*First*" and "*Second Great Striking*"—a period of borrowing from the issuing of the original medallion to the latter contorniate-type of some 310 year[s]! … Such periods of survival strongly support the views of Toynbee and Vermeule for the existence of an "archive" or "reference collection" of proofs or dies within the Imperial Mint, an "archive" which it would appear, contorniate-engravers were able to access.[29]

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23 Fig. 8 in Aïcha Ben Abed Ben Khader and David Soren, eds., *Carthage: A Mosaic of Ancient Tunisia* (New York, 1987) 25.

24 2.966 in Mandelbaum.

25 Michael R. Jenkins, "The 'Aeneid' Medallion--a Narrative Interpretation," *Numismatic Chronicle* 148 (1988): 148-152, at 150-1.

26 See Weigel as well as Harold Mattingly, *Coins of the Roman Empire in the British Museum* [*BMC*], vol. IV in 2 parts: Antoninus Pius to Commodus (London, 1968), numbers 237, 1264, and 1292. See also *RIC* III, 37, #91; 109, #615; and 111, #627.

27 Bellinger T148. An early coin (19 B.C.-A.D. 14) from Ilium depicts Aeneas carrying Anchises, T115. Ascanius joins the group during the Flavian period and would appear throughout the provincial coinage of Ilium during the period of the Antonines: T129, T134, T140, T148, T154, T208, T210.

28 See Christian Körner, *Philippus Arabs, ein Soldatenkaiser in der Tradition des antoninisch-severischen Prinzipats* (New York, 2002) 114. On Philip's observation of the millennial anniversary of Rome, see Korner's chapter 11: "Die Tausendjarfeier."

29 Michael R. Jenkins, "Mythological Depictions on the Contorniates: An Insight into Ancient Die-artists at Work,"

And, presumably, die engravers as well. But even if this hypothesis of an Imperial archive is rejected, the ubiquity of the Aeneas/Ascanius/Anchises image argues for its long-term survival. Zanker observes that Augustan propaganda became part of the everyday fabric of Roman life: "In general the new mythological imagery was widely spread through Roman cities, and not only in the public sphere. It played an important part in private commissions as well and penetrated into the consciousness of a wide spectrum of the population."[30] Zanker singles out the Aeneas/Ascanius/Anchises group as a fundamental motif that became fixed in Roman consciousness. Such iconic images have cultural staying power, especially in a society as tradition-oriented as Rome, and Roman numismatic history is marked by the periodic exploitation of effective artistic motifs through "restoration" coinages such as those of Titus, Trajan, and Marcus Aurelius. Finally, provincial coinages kept the Aeneas/Ascanius/Anchises reverse in circulation well into the Severan era, as coins minted for Elagabalus and Julia Mamaea demonstrate.[31] Considering provincial issues, the gap between the Antonine coinage and the coinage of Constans and Constantius II is not as great as it may first appear.

Thus the "barbarian and hut" reverse type may be seen as a numismatic restoration of a common artistic motif. Just as Antoninus Pius issued Aeneas-themed coinage in preparation for Rome's 900th anniversary in A.D. 148, so too might Constans and Constantius II have instituted a reverse type alluding to Rome's foundation coinciding with Rome's 1100th anniversary. The Aeneas explanation offers solutions to a number of recurring questions best articulated by Mattingly himself in the 1930s: "The small figure—is he a barbarian or some one else? Is he being led by gentle constraint or roughly dragged? The hut—is it such indeed, or something quite different? And is the tree, behind him, a symbol of barbarian forests or not?"[32] The Vergilian reading obviously addresses the first two questions: the smaller figure resembles the boy Ascanius being led from a burning city by his father still in military attire after fending off the Greeks during the Fall of Troy. In some mint issues, such as Heraclea and Rome, the smaller figure holds an elongated object in his left hand.[33] If we interpret the smaller figure as a type of Ascanius, the object might be the die engraver's attempt to reproduce the *pedum* (hunting stick) that was a familiar attribute of Ascanius, as noted by Zanker in his commentary on the Pompeii wall painting of the Flight from Troy:

> [Aeneas], barely out of Troy, is depicted as a future Roman, wearing not only Roman armor, but, as ancestor of the Julian clan, even patrician footwear. By contrast, the little Ascanius is represented like a Phrygian shepherd, in long-sleeved garment and pointed cap, and curiously, he carries a stick of the sort used in hunting rabbit. This is evidently an allusion to the tradition that the Trojan youth were shepherds on Mount Ida….[34]

The leggings or trousers of the smaller figure on the centenionalis, thought by Caló Levi to be clear indicators of barbarian status, are worn by Ascanius in the Vatican Vergil, folios 17 and 22 recto (ca. A.D. 400).[35] Even the bizarre hairstyle of the smaller figure—also thought to be a designator of barbarian status—may have been inspired by Ascanius' Phrygian cap.[36] Mattingly's last two questions about the hut and tree are also plausibly answered by the Vergilian imag-

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Proceedings of the XIth International Numismatic Congress, vol. 2 (Brussels, 1992), 341-5, at 342. Jenkins follows Alföldi in determining this chronology: "Alföldi's relative chronology … suggest that contorniates were created in two major periods, the '*First Great Striking*' between the reigns of Constantius II and Theodosius I, the '*Second*' between c. 410 - 467/72" (341).

30 Zanker 209-10.

31 See, for example, Barclay V. Head, *Catalogue of the Greek Coins in the British Museum [BMC-Greek*], vol. XXV: Phrygia (London, 1906), #s 213-5.

32 Mattingly (1977) 13.

33 I owe this detail to a discussion by Bill Welch on his website, "Analysis of the Hut Coins of Constans and Constantius II." The object is quite clear on plate 21of *RIC* VIII, a cast of Heraclea #71 found in the Sydenham hoard. Kent comments, "[T]he small figure appears to hold a bow in r. hand" (435 note). This "bow" looks very much like the *pedum* held by Ascanius in the Vatican Vergil, as discussed below. It must be noted, however, that the centenionalis reverse most commonly depicts the smaller figure holding an open hand to his face without an object of any sort.

34 Zanker 202.

35 David. H. Wright, *The Vatican Vergil: A Masterpiece of Late Antique Art* (Berkeley, 1993) 27, 126. Properly speaking, the folio depicts Cupid in the guise of Ascanius, as Venus sends him as a kind of proxy wooer to inflame Dido with love for Aeneas; see *Aeneid* 1.657-94. The *pedum* in his hand looks very much like a bow, perhaps reminding readers of his dual nature as Cupid/Ascanius at this point in the narrative. On the coin, the series of horizontal marks sometimes visible on the smaller figure's legs may signify woolen stockings, similar to the leggings worn by a shepherd on the West Front of Chartres Cathedral (lower right portal, "Annunciation to the Shepherds"); see Titus Burckhardt, *Chartres and the Birth of the Cathedral,* trans. W. Stoddart (Bloomington, 1996) 68. I owe this latter observation to a suggestion by Patricia Lawrence.

36 Furthermore, on some mint issues (e.g., Alexandria, Antioch, Heraclea, Nicomedia) a star appears on the centenionalis reverse above the head of the smaller figure. It is tempting to relate this star to the one mentioned in *Aeneid* 2.692-694, which courses across the sky and confirms the omen of fire over Ascanius' head, prompting Anchises to recognize the will of Jupiter and depart a burning Troy. However, the star is most likely a "field mark" common on late imperial

ery. As on the Antonine medallion discussed above, the tree may allude to the "ancient cypress" mentioned in Book 2 of the *Aeneid*. The altar relief of Aeneas, Anchises, and Ascanius on the Byrsa Hill in Carthage, with its overhanging tree, offers an even closer artistic analogue to the mysterious tree on the centenionalis reverse. It is tempting to argue that the "hut" is a representation of the protective wall around the sacred tree as found on the *Aeneid* medallion, but the clear artistic affinities between the centenionalis hut and a similar rustic structure on a relief dated to A.D. 270 caution against pushing the Vergilian imagery too far. [37]

Indeed, this Vergilian reading of the "barbarian and hut" reverse type raises certain questions as it answers others. Perhaps the most prominent obstacle to a Vergilian reading of the centenionalis reverse is that the coin features two figures on the reverse, whereas the Aeneas group almost always includes the aged Anchises. Richard Weigel notes that it was Ascanius, not Anchises, who was likely to be omitted from the group in early numismatic representations of the Flight from Troy. Ascanius first appears in provincial coinage during the Flavian era and on regular Imperial issues during the reign of Antoninus Pius, suggesting, for Weigel, that Imperial die engravers were influenced by the *Aeneid*.[38] If the centenionalis reverse indeed alludes to the Flight from Troy, the erasure of Anchises is not easily explained. If we are to seek a thematic explanation for the absence of Anchises from the centenionalis reverse, we might consider Vergil's view that founding a new empire is largely an enterprise for the young. Anchises dies at Drepanum, in Sicily, and during his funereal games the war-weary Trojan women fire the ships to prevent further wandering. The aged seer Nautes then tells Aeneas to leave the old and infirm there to form a mock-Troy in "Acesta," and to take the young, strong, and courageous to Italy. That night the shade of Anchises appears to Aeneas and confirms Nautes' wise words. These events imply that, for Vergil, the aged do not have an active role to play in the process of ethnogenesis.[39] If the die engraver were adapting Vergilian iconography to comment upon fourth-century events, perhaps he shared a similar view, finding no place (or space) to represent Anchises.

Recent theoretical discussions about identification in classical art emphasizing cultural reception over strict identification may also be brought to bear on the Anchises question. In *Looking at Greek Vases* Mary Beard describes this reception-centered approach, one which values iconology as much as iconography: "First, our attention has to shift away from the artist-producer towards the viewer, towards those in Athenian society who looked at, made sense of and thought about (or thought *with*) the images on the pots."[40] Such an approach underlies Beard's argument that mythological scenes depicted on Athenian vases have simultaneous reference to contemporary life:

> It would be a crude oversimplification to try to determine in each case what precisely is represented, to try to invent a single, unproblematic title for each scene. The meanings of these images depend on the subtle interplay of both registers: myth and "real life." We are not just dealing with a figure who is either Hector or an Athenian hoplite; we are dealing with a figure who can be and is both.[41]

Simon Goldhill and Robin Osborne have called for similar methodological revisions to art history and criticism, stressing how "'identification' and 'recognition' are inevitably interwoven with a range of ideological presuppositions and interpretative issues."[42] Goldhill and Osborne discuss artists' invitations to "narrativise," to supply a story or many stories implied in a scene. They describe the Exekias vase painting of Ajax and Achilles playing dice, noting that the image can elicit a host of responses from the reader:

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coinage, perhaps relating to some unknown aspect of mint control.

37 As Kent observes in *RIC* VIII, the "hut" as a rustic symbol gains credence through comparison to a relief from A.D. 270 depicting a goatherd milking a goat beneath a wicker construction that closely resembles the centenionalis structure (35 note 8). For images, see Frederik van der Meer and Christine Mohrmann, *Atlas of the Early Christian World*, trans. and ed. Mary F. Hedlund and H. H. Rowley (London, 1958) 45, fig. 65; and Moses Hadas, *Imperial Rome* (New York, 1965) 149.

38 See Bellinger T129 and Weigel 189.

39 *Aeneid* 5.709-18 (Mandelbaum 5.934-47).

40 Mary Beard, "Adopting an approach II," in Tom Rasmussen and Nigel Spivey, eds., *Looking at Greek Vases* (Cambridge, 1991), 12-35, at 17.

41 Beard 21. Beard's comments on the social functions and polyvalence of Greek art are echoed by Roman art historian Tonio Hölscher: "Among the fundamental themes for social history raised by the communicative aspects of the history of images are the following: how a society may coin a means of visual communication, how this language then reacts upon the society as it uses and develops it, what the overall visual system is able to achieve as a result, which structures of meaning are implied in its syntax and repertoire of motifs. All these are of real importance for social and cultural history," *The Language of Images in Roman Art*, trans. Anthony Snodgrass and Annemarie Künzl-Snodgrass (Cambridge, 2004) 1-2.

42 Simon Goldhill and Robin Osborne, "Introduction: Programmatics and polemics," *Art and Text in Ancient Greek Culture* (Cambridge, 1994) 4.

> The fragmentary text in the image, which encourages the reader to narrativise the dice throw as part of an uncompleted game, stands as an emblem of the fragmentary texts invoked by the image, which encourage the reader to narrativise the image—the uncompleted game of reading. . . Naming, describing, narrating are overlapping and mutually implicative processes.[43]

It seems implausible that on the 1100th anniversary of Rome—an event with a history of Vergilian numismatic iconography—the centenionalis die engravers would unwittingly depict a scene so similar to the Flight from Troy, unaware of the iconography's strong resemblance to Aeneas leading Ascanius. And what would this gesture mean to a fourth-century Imperial viewer? The hermeneutic approach Beard, Goldhill, and Osborne describe above raises the possibility that even if Vergilian associations were not intended by the die engravers, these associations would likely be part of the cultural reception of the coin in circulation. So pervasive was the Flight from Troy motif that even an incomplete figuring of it would likely trigger Vergilian narratives in Roman minds.

Other obstacles to a Vergilian reading of the centenionalis reverse are less problematic. For example, the soldier on the centenionalis is always helmeted, whereas in the Flight from Troy motif Aeneas is almost always bareheaded. An exception is provided by an image from the Vatican Vergil, folio 22 recto, ca. A.D. 400.[44] Here a helmeted Aeneas turns to grasp the hand of a kneeling, ill-fated Creusa. Although the Vatican Vergil's Aeneas holds a shield, his dress, posture, and spear position are quite similar to those of the centenionalis soldier, further arguing for a connection between the iconography of Aeneas and the centenionalis soldier. Similarly, the image of Ascanius on folio 17 recto, with his outstretched right hand and *pedum* in left, offers a striking resemblance to the smaller figure on the centenionalis. The similarities may be due to a common exemplar now lost, or the codex may actually show the influence of the centenionalis.

A more philosophical objection to a Vergilian reading of the centenionalis reverse type can be found in Konrad Kraft's criticism of Mattingly's 1933 argument. Mattingly maintained that the reverse type was struck in commemoration of the 1100th anniversary of Rome, but Kraft asserted that celebrating the saecular anniversary would not be in keeping with the new Christian nature of the empire ("Der heidnische Charakter der Saecularfeier verträgt sich überdies nicht mit dem christlichen Kaisertum….")[45] However, more recent studies of Constantine and his age demonstrate that the Imperial family, while promoting Christianity, did value important Roman customs regardless of their pagan associations. Of Constantine himself Michael Grant writes:

> …Constantine understood that, despite the spread of Christianity, paganism was still the religion of the great majority of his subjects, including nearly all the members of the Senate and the dominant class at Rome, not to speak of the general public: so that he had to go carefully--paying ample tribute to the senators, for example on his coins and medallions. That is the keynote of his entire reign: he did push Christianity, but, recalling, perhaps, that the Christians had always operated with secrecy, he pushed it by careful, ambivalent stages and periphrases. These included references to the past, such as moves to see himself as a reborn Augustus. And the inscription on his Arch in Rome, designed either by Constantine himself, and his advisers, or by the Senate, offers very deliberate and definite echoes of the great pagan emperors of the past. Indeed, some of the reliefs on the Arch were actually *taken* from monuments of Trajan, Hadrian and Marcus Aurelius--so that the structure was called "Aesop's jay," because of its borrowed plumage.[46]

Specifically concerning the reign of Constans, Kent writes, "Constans' aggressive Christianity led to measures early in his reign against Jews, Pagans, and violators of morality. There is however no indication in his surviving legislation that this zeal continued after 342, and many distinguished pagans held office under him."[47]

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43 Goldhill and Osborne 6.

44 Wright 27.

45 Kraft 146.

46 Michael Grant, *Constantine the Great: The Man and His Times* (New York, 1994) 152. It should be noted, however, that other scholars such as Timothy D. Barnes argue for a Constantine far less tolerant of paganism. But even Barnes observes, "In many matters, Constantine showed a caution which has often seemed to imply a policy of religious toleration. He would not risk rebellion or civil disobedience, and in Italy and the West, where he had been emperor long before 324, he made no serious attempt to enforce the prohibition of sacrifice which Eusebius attests for the East. More generally, he could not disappoint the expectations of subsidy or support which loyal subjects, whatever their creed, entertained of their ruler, for to do so would flout the etiquette of centuries. Constantine subsidized the travels of a priest of the Eleusinian mysteries who visited the tombs of the kings in Egyptian Thebes, welcomed a pagan philosopher at court, and honored a priest of Apollo at Delphi for conspicuous devotion to the imperial house," *Constantine and Eusebius* (Cambridge, MA, 1981) 211.

47 *RIC* VIII, 9.

To argue that the appropriation of Vergilian motifs would be deemed unsuitable for coinage minted in a Christian empire is to ignore other clear mythological appeals to Rome's origins during the fourth century. After the dedication of Constantinople in May 330, Constantine consciously sought to fold Rome's pagan past into its Christian present. He and his sons issued coinage celebrating Rome and Constantinople as equally important cities, with the Roma reverse featuring the she-wolf suckling Romulus and Remus.[48] Later writers asserted that the base of the porphyry column at the center of Constantinople's forum not only contained artifacts from Moses and Noah, but the Palladium itself.[49] And David Wright's discussion of the patron and audience of the Vatican Vergil, with its conscious attempt to "maintain old traditions," should demonstrate that affection for Rome's founding narrative was never stronger than in the 4th century--a time when "Vergilian scholarship particularly flourished."[50] In short, the empire's conversion to Christianity was a lingering process, and Constantine himself was not willing to abandon fully its pagan past if it happened to serve a contemporary civic use. On the extent to which late antiquity sought such connections, Averil Cameron has commented:

> This is no romanticizing of the past, but rather its practical adaptation to the needs of the present. If the men and women of late antiquity did not romanticize the past, nor were they conscious of a sense of modernity. Rather, they wished devoutly to connect with a past which they still saw as part of their own experience and their own world. This could easily lead to incongruity in modern eyes; but it puzzles us far more than it did contemporaries to find, for example, fragments of classical masonry or sculpture built in to new constructions which we tend to find inferior. The past was very real to the men and women of late antiquity: as they saw it, it had not so much to be remade as to be reasserted.[51]

III. LOOKING FORWARD

Thus, with the "barbarian and hut" centenionalis we may be witnessing the kind of reassertion Cameron describes, no matter the potential incongruities. But Kraft's objections, as well as his compelling arguments concerning Constans' program of Romanizing the Franks, caution us against overdetermining the image on the centenionalis reverse. Perhaps an intentional ambiguity in the die engraver's art allows for both possibilities. In offering this Vergilian reading, I am not arguing that the larger and smaller figures *are* Aeneas and Ascanius; rather, I argue that the centenionalis reverse alludes to this familiar iconography without strictly imposing the identification, much in the same way that Mary Beard's Greek viewer could see in a single figure both Hector and an Athenian hoplite. The "barbarian and hut" centenionalis simultaneously celebrates the virtues of *Romanitas* for those border tribes willing to embrace it, just as Aeneas and Ascanius embraced their Roman destiny when leaving their homeland. This Romanization can be viewed as a late antique reflex of the very ethnogenesis celebrated in Vergil's *Aeneid*. Even the father of Rome itself, *pater Aeneas*, was not Roman but Trojan, and while much attention is paid to Aeneas' Trojan identity and Rome's Trojan origins, Vergil goes to great pains to establish the idea that *Romanitas* was not a racial prerogative but a socially constructed one. In *Aeneid* Book 12, as Aeneas fights Turnus and his hostile allies, Jupiter finally convinces Juno of the futility of it all. Aeneas is destined to found the Roman people, to whom Jupiter has given *imperium sine fine*, "empire without end." Juno agrees to set aside her fruitless enmity toward the Trojans on the condition that the Trojan name be obliterated, and that Trojan and Italian be assimilated into a new, unified people. Jupiter consents, detailing how the assimilation will occur:

> sermonem Ausonii patrium moresque tenebunt,
> utque est nomen erit; commixti corpore tantum
> subsident Teucri. morem ritusque sacrorum
> adiciam faciamque omnis uno ore Latinos.
> hinc genus Ausonio mixtum quod sanguine surget,
> supra homines, supra ire deos pietate uidebis…. (*Aen.*12.834-9)
>
> *(…For the Ausonians will keep*
> *their homeland's words and ways; their name will stay;*
> *the body of the Teucrians will merge*
> *with Latins, and their name will fall away.*
> *But I shall add their rituals and customs*
> *to the Ausonians', and make them all—*

48 See any number of CONSTANTINOPOLIS or VRBS ROMA issues in *RIC* VII; e.g., 138, #s 241-42.
49 See Christopher Kelly, "Empire Building," in G. W. Bowersock, Peter Brown, and Oleg Grabar, eds., *Interpreting Late Antiquity: Essays on the Postclassical World* (Cambridge, MA, 2001), 170-195, at 170-71.
50 Wright 101-2.
51 Averil Cameron, "Remaking the Past," in G. W. Bowersock, Peter Brown, and Oleg Grabar, eds., *Interpreting Late Antiquity: Essays on the Postclassical World* (Cambridge, MA, 2001), 1-20, at 1-2.

and with one language—Latins. You will see
a race arise from this that, mingled with
the blood of the Ausonians, will be
past men, even past gods, in piety….)[52]

Here Vergil provides an *aetion* for the Roman practice of assimilating conquered peoples into the empire. Vergil's fiction is a helpful metaphor for the truth, as Romans indeed established their hegemony in Italy following the Latin and Samnite wars in the fourth century B.C. through the judicious extension of Roman citizenship in varied degrees. It was a practice that Rome would exercise throughout its history, with the result that *Romanitas* would be theoretically open to the friends and allies of Rome. The artistic representation of Aeneas leading Ascanius represents both fleeing and founding, and in a single tableau collapses the protracted process by which Trojan and Italian become one. Such a model of ethnogenesis would not apply precisely to the fourth-century treatment of barbarians (e.g., Rome would not lose its name as Troy did), but the Vergilian model does posit an underlying principle for assimilating peoples such as the Franks, Alemanni, and Sarmatians into the empire, as long as they are willing to share in Rome's destiny.[53]

The images on the "barbarian and hut" reverse, then, are polyvalent: the hut and overhanging tree are, in the words of Caló Levi, "an abbreviation of a whole landscape and indicate the woods and the huts where the barbarians lived," as well as an allusion to the ancient cypress in *Aeneid* Book 2 and possibly to a protective wall. The leggings/trousers of the smaller figure, as well as his shepherd's crook or hunting stick, may denote the figure's pastoral/barbarian status, but they also place him in the iconographical tradition of Ascanius, as witnessed by the roughly contemporary Vatican Vergil. In short, the Aeneas/Ascanius interpretation and the barbarian/hut interpretation are not mutually exclusive. An attractive possibility is that Constans and his propagandists skillfully employed traditional Roman iconography in order to celebrate present triumphs and future possibilities—nothing could be more appropriate to the reverse legend FEL TEMP REPARATIO, a concept embodied by the soldier himself who looks backward while striding forward toward future glory. By placing the youthful barbarian in the traditional position of Ascanius on the centenionalis reverse, the sons of Constantine and their die engravers imply that, like Ascanius, barbarians too have a destiny vital to the interests of the empire.[54]

52 Mandelbaum 12.1107-1116.

53 The "barbarian and hut" centenionalis may not be the first coin to appropriate the Flight from Troy motif to commemorate a shift in population. Concerning a third-century coin from Otrus in Phrygia, William M. Ramsay comments, "A coin type representing Aeneas carrying Anchises and leading his little son Askanios by the hand may be interpreted as symbolizing an emigration from the Askanian shore. The type previously described implies an emigration beyond the sea; and we thus arrive at the conclusion that the mercenaries settled in Otrous came partly from Europe and partly from the Bithynian lake Askania." Of course, it is unlikely that Roman die-engravers of the fourth century could have been aware of these associations, but Ramsay's speculations, if correct, would establish a numismatic precedent for using this artistic motif to comment on a contemporary emigration. See William M. Ramsay, *The Cities And Bishoprics of Phrygia: Being an Essay of the Local History of Phrygia from the Earliest Times to the Turkish Conquest*, vol. 1, part 2 (Oxford, 1895) 688.

54 This essay has benefited from many helpful suggestions by Curtis Clay, Susan Ford Wiltshire, and Bill Welch, and from unflagging bibliographical assistance from Paul Sorrell.

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PLATES

A "barbarian and hut" centenionalis from Antioch, A.D. 348. Photo © Bill Welch.

Altar relief, Byrsa Hill, Carthage; 1st c. A.D.

Aeneas carrying Anchises and leading Ascanius; wall painting from Pompeii, 1st century A.D.

Aeneas/Ascanius/Anchises parody; wall painting, Stabiae, 1st century A.D.	
Antoninus Pius AE coin commemorating Rome's 900th centenary; A.D. 147	
Antonine copy of the 'Aeneid' medallion, mid-2nd c. A.D.	
Bronze coin of Marcus Aurelius minted at Ilium, ca. A.D. 161-180	

Cupid in the guise of Ascanius; detail from the Vatican Vergil folio 17 recto, ca. A.D. 400	
Aeneas & Creusa Flight from Troy; detail from the Vatican Vergil folio 22 recto, ca. A.D. 400	

"Use the Force": Porter's Five Forces Applied to the RAND Study of Strategy in the US Higher Education Industry

by M. Kenneth Holt, William R. Nance, Jr., & Darin W. White

Introduction

This paper provides a conceptual analysis of the applicability of one of Porter's (1980) five forces to the strategies in use in the US higher education industry as described by Brewer, Gates, and Goldman (2002)("the RAND study"). The paper begins with a brief background description of the US higher education industry. Next, the strategies found by the RAND study (Brewer, et al., 2002) among organizations competing in the US higher education industry are described. Following this, Porter's (1980) five forces model is briefly discussed, and a comparison is then provided between Porter's criteria for the bargaining power of buyers and the strategic options in higher education identified by the RAND study (Brewer, et al., 2002). The paper then concludes with a summary and recommendations for future research and discussion.

Industry Background

The higher education industry in the US is arguably the strongest in the world. US colleges and universities produce more graduates, produce more research, attract superior faculty and students from a worldwide pool, and provide for a higher rate of participation than any other system of postsecondary education (Brewer, et al., 2002). Information collected and published by the University of Texas (2002) indicates that there are currently over 1,600 accredited colleges and universities in the United States offering at least a bachelor's degree. If community and junior colleges are included, the number of accredited US institutions of postsecondary education rises to well over 3,000 (University of Texas, 2002).

Demand for postsecondary education in the US has, until recently, been impacted primarily by changes in the number of 18 to 24 year-olds in the population. These "traditional-aged" students have long been the primary target market of institutions of higher education. After World War II, changes in government policy (such as the GI Bill), rising economic prosperity, and the coming-of-age of "baby boom" children born between 1946 and 1964 (who number over 70 million) (US Census Bureau, 2001) all contributed to increased demand for higher education in the US. Both public and private institutions met the post-war increase in demand with rapid increases in capacity. Rising demand from the late 1950s through the mid-1970s produced a seller's market for higher education, and most institutions were successful following an "if we build it, they will come" approach to market strategy.

From the late 1970s into the 1980s, demand declined as the baby boom generation aged and US birthrates dropped (US Census Bureau, 2001). More recently, however, demand for postsecondary instruction has again increased, with nearly 15 million students enrolled in accredited senior colleges as of 2000 (University of Texas, 2002). This more recent increase in demand is generally attributed to two primary factors. First, the number of 18 to 24 year-olds in the US population (the "baby boomlet" children of baby boom parents, also numbering well over 70 million) is increasing and is not expected to peak until sometime after the year 2020 (US Census Bureau, 2001). Second, "nontraditional" students, primarily adults between 25 and 40 years of age, are entering or returning to school in increasing numbers (US Census Bureau, 2001). As of 2000, over 45 percent of all undergraduates enrolled at accredited institutions offering at least a bachelor's degree were adult nontraditional students (Union University, 2002). In short, demand for higher education in the US is increasing rapidly, and may well exceed the demand experienced in the industry from the 1960s through the mid-1970s.

Ironically, the US higher education industry may not be equipped to meet the needs and expectations of students and society in the rapidly-changing environment of the 21st century. Both industry insiders and public policy-makers have expressed concern over the ability of the industry to meet increased demand with an adequate supply of "seats" in colleges and universities (Kelderman, 2005). In addition, such environmental factors as the computer-telecommunications "revolution," tight federal, state, and local budgets, and an aging US population are challenging institutions of higher education even as the demand for the services they provide increases. Public perceptions of institutional inefficiency and "navel-gazing" have led to calls for an examination of industry performance by both public officials and private critics, who contend that students and other stakeholders are receiving poor value for their money (Garrett & Poole, 2006). Clearly, there is a need in higher education for the development of appropriate goals, plans for accomplishing these goals, and some means for assessing progress as these plans are implemented. In short, institutions of higher education need to develop strategies.

The first step toward strategy development, at least as it is most often viewed, is the development of an understanding of the industry environment within which specific organizations must perform. Porter's (1980) five forces model was

developed as a tool to aid strategists in the analysis of industries, and it is to the question of the usefulness of this tool as an analytic window into the US higher education industry that we now turn.

The RAND Study of Strategies in the US Higher Education Industry

In an innovative approach to conceptualization of strategy in the US higher education industry, The RAND Corporation found that four basic sources of revenue exist for colleges and universities (Brewer, et al., 2002). These sources are (1) tuition, (2) non-research-related government payments, (3) public and private funding for research, and (4) gifts. These four sources of revenue may be considered separate markets within which colleges and universities may compete. Brewer, et al. (2002) also found that US colleges and universities compete in these four markets by adopting one of three generic strategies. These generic strategies are termed prestige, reputation, and prestige-seeking (Brewer, et al., 2002).

Brewer, et al., (2002) define prestige institutions as those that compete for revenue by creating, developing, and maintaining a high-status image. The primary factors that create prestige are faculty excellence, highly selective admissions policies, research excellence, and successful, nationally-known sports teams (Brewer, et al., 2002). Moreover, prestige universities were found to generate significant revenue across all four markets (i.e., tuition, government payments, research funds, and gifts) (Brewer, et al., 2002).

Reputation institutions compete by meeting student or social demand for particular programs (Brewer, et al., 2002). Successful reputation schools are likely to generate significant revenue from only one source: tuition (Brewer, et al., 2002). In particular, Brewer, et al. (2002) found that reputation-based institutions do not typically obtain significant revenue from gifts from alumni or others, in marked contrast to prestige-based institutions, among which gifts constitute an important source of funds.

Representing the third generic approach to strategy in higher education according to the RAND study (Brewer, et al., 2002) are the prestige-seeking institutions. Schools that are prestige-seekers are, as the name implies, those that currently lack prestige but are "investing in a set of activities, some of which might propel them to a position" of prestige (Brewer, et al., 2002, p. 42). Since prestige-seeking schools are always reputation schools that are attempting to change their strategy from reputation-based to prestige-based, this paper will focus primarily upon the prestige and reputation strategic approaches.

Prestige schools and reputation schools attract students for very different reasons. Prestige schools attract students by promising two outcomes. First, students are promised access to an effective network that provides graduates with a "leg up" socially and professionally (e.g., the Harvard Business School alumni presence in senior management positions; the preponderance of West Point graduates among senior Army officers, etc.). Second, the high selectivity of these institutions (at both student and faculty levels) provides an improved contact group (i.e., peers and faculty contacts) which improves the social signal associated with graduation from a prestige school. This improved social signal provides graduates with an assumption of superiority relative to others with whom they may compete for desirable jobs, advancement opportunities, and so on (Brewer, et al., 2002).

Reputation schools, by contrast, generally promise marketable, "real world" knowledge and skills and focus on excellence in pedagogy (Brewer, et al., 2002). Reputation schools promise to provide these marketable skills through closer, more personalized student-faculty interaction, through frequent, on-going revision of courses and programs to more closely match the current state-of-the-art or identified market needs, and so on (Brewer, et al., 2002).

In essence, the primary value-added promised by prestige schools may be thought of as intrinsic to the school itself but extrinsic to the student-customer (network, status/social signaling). By contrast, the primary value-added promised by reputation schools may be viewed as extrinsic to the school but intrinsic to the student-customer (valued/marketable knowledge, practical skills, abilities, etc.).

This difference may account in part for disparities in alumni support between prestige and reputation schools. Prestige school alumni receive ongoing value from their school's continued high-status image. In contrast, reputation school alumni have "carried away" all or most of the value (valued or marketable knowledge, skills, etc.) they expect to receive on graduation day. Thus, prestige school graduates give to maintain the high-status image of their alma mater, the benefits of which continue to accrue to them. Reputation school graduates are much less interested in the current goings-on at their university since their opportunity to appropriate value from it has largely passed (Brewer, et al., 2002).

Porter's Five Forces

As stated above, the development of an understanding of the industry environment is often considered the first step toward the development of a successful strategy. A popular approach to industry analysis is Porter's (1980) five forces model. Porter (1980) proposes that industries may be analyzed across five dimensions (termed "forces;" Porter, 1980), which are: the threat of new entrants, the threat of substitution, the bargaining power of buyers, the bargaining power of suppliers, and the level of rivalry among industry incumbents. Porter (1980) suggests that interaction between these five forces accounts for industry structure and, therefore, heavily influences both the strategy pursued by an organization and the success of the strategy. In this paper, only the bargaining power of buyers and its relationship with the two primary strategic approaches identified by Brewer, et al., (2002) will be examined.

The Bargaining Power of Buyers

According to Porter (1980), buyers will attempt to force industry prices down or product quality up. There are several characteristics which must hold true in order for buyers to exert this pressure on an industry. Porter identifies the following factors that determine the buyer's power:

Buyer Concentration versus Industry Concentration.

Concentration is high when a relatively high fraction of market power (generally measured by industry revenue) is in the hands of one or a handful of individuals or organizations within a coherent "buying group" or buying industry. When buyer concentration is higher than that of the supplying industry, a bargaining advantage accrues to the buyers, and buyers will be able to exercise more control over the supplier's price and quality and, therefore, over the supplier's profit (Porter, 1980).

Recall that, according to the RAND study (Brewer, et al., 2002), colleges and universities compete for revenue from four primary sources, which may be viewed as buyers of the industry's output. These sources are (1) tuition, (2) non-research-related government payments, (3) public and private funding for research, and (4) gifts. Individual students make tuition payments. Individual students do not, as individuals, account for a significant fraction of total tuition payments each year. The tuition market faced by the US higher education industry is therefore highly fragmented, and student tuition "buyers" exist at a much lower level of concentration than that enjoyed by the higher education industry. Since buyer concentration is low relative to the industry in this case, students do not possess much bargaining power and have relatively little influence over industry prices and quality arising from concentration.

The US higher education industry also receives revenue in the form of non-research-related government payments. The bulk of this funding is provided by state governments, and accounted for between 30 and 40 percent of total revenue for public US colleges and universities in 1994 (Brewer, et al., 2002; SREB, 2005). In practice, institutions in the industry face a circumstance where there is only one provider (buyer) of non-research-related payments available – the government of the particular state within which the university or college is chartered. Whether the institution has adopted a prestige approach or a reputation approach, the high level of concentration of buyers relative to the industry gives state government "buyers" of non-research-related government payments a significant ability to impact both price and quality in the industry.

Research revenue likewise is derived from buyers who possess a higher level of concentration than that of the higher education industry. Roughly 6 percent of total industry revenue is provided by research funding annually (Brewer, et al., 2002). The RAND study notes that over 73 percent of total research funding is derived from the federal government, with states and private industry contributing only 9 and 8 percent of total research funds available, respectively (Brewer, et al., 2002). As previously mentioned, institutions pursuing a prestige-based strategy enjoy significantly greater success in attracting revenue for research. Because of the higher level of concentration of research "buyers" compared with the industry, however, buyers of research enjoy a heightened ability to impact pricing and quality among institutions in the industry.

Finally, competitors in the US higher education industry derive revenue from gifts from alumni and others. Revenue from gifts accounted for nearly 10 percent of total higher education industry revenue in 1994 (Brewer, et al., 2002). Most of this revenue came in the form of alumni giving. Gifts were roughly evenly divided between those intended to support current operations (so-called "unrestricted" gifts) and those made to support specific capital projects ("restricted" gifts). As would be expected, the primary beneficiaries of gifts are the competitors in the industry pursuing a prestige strategy. As noted above, prestige institutions offer a beneficial social signal effect to alumni (and others who are associated with the school, e.g., corporations, institutes, etc.) that makes maintenance of the school's prestige of continuing value and concern to givers. Reputation-based institutions offer little, if any, ongoing social signaling benefit to graduates, therefore these schools are less able to attract gift revenue from alumni and others.

Concentration generally favors the industry over gift "buyers," with individual givers typically unable to exert significant influence over industry pricing and quality. The exception, however, is in the case of large donations made for specific capital projects. Individuals and private organizations with the ability to provide large sums of money toward a specific project are relatively few, and therefore possess a level of concentration at least equal to that enjoyed by the industry. These "major benefactors" are often able to exert considerable influence over the nature, price, and quality of (at least) the specific project toward which their gifts are directed.

Buyer Volume. When a particular buyer purchases a significant fraction of total industry output, that buyer will enjoy a bargaining power advantage over the industry (Porter, 1980). In the case of the four revenue "markets" facing the US higher education industry, tuition continues to represent the highest fraction of total industry revenue, followed in order of magnitude by non-research-related government payments, revenue from gifts made by alumni and others, and revenue from research, (Brewer, et al., 2002). The level of bargaining power accruing to buyers from the tuition market would seem to be enhanced by the fact that over 50 percent of total industry revenue arises from tuition payments. In other words, students – who provide the tuition payments – should possess a measure of ability to influence pricing and

quality as a result of providing the lion's share of revenue. The power of students to bargain effectively with the industry for price and quality is, however, mitigated by their fragmentation, as noted in the discussion of concentration in the tuition "market," above.

The next largest fraction of industry revenue comes from non-research-related government payments (Brewer, et al., 2002). As previously mentioned, these payments represent over a third of industry revenue annually. This fraction of total industry revenue, while not in itself the largest fraction, is still large enough to provide state governments (again, the largest buyer group in this category) with significant influence over industry pricing and quality arising from their purchase volume.

Alumni and other givers provide approximately 10 percent of industry revenue annually (Brewer, et al., 2002). For the industry overall, this level of purchases, while not insignificant, does not provide much in the way of real bargaining power to givers versus the industry. Among the group of competitors in the industry that have adopted a prestige strategy, however, giving by alumni and others constitutes a higher fraction of total revenue than average, and greater bargaining power accrues to givers in that circumstance.

Finally, research funding provided largely by the federal government also represents a significant fraction of overall industry revenue (at roughly 6 percent; Brewer, et al., 2002). Moreover, the fraction of prestige school revenue derived from this market is significantly higher than the overall industry average since most research funding goes to the most prestigious institutions each year (Brewer, et al., 2002). Among those institutions able to attract above-average levels of research funding, therefore, the bargaining power of research buyers is enhanced due to the fraction of total revenue represented by research funding. For the industry as whole, however, research buyers possess little ability to impact industry pricing or quality as a result of volume of purchases.

Switching Costs. Switching costs are expenses incurred by buyers when they switch from one supplier to another. For the purposes of industry analysis, switching costs refer to the costs incurred when buyers switch from one industry's product to the product of a different industry to satisfy the same need or accomplish the same goal (Porter, 1980). The higher the switching costs, the less likely the buyer is to "switch" to the product of a different industry. For most students, there are no close substitutes for the product provided by the higher education industry. Therefore, switching is either not an option or would require such a radical redefinition of the needs and purposes the student is attempting to satisfy through higher education as to make switching extremely "expensive." Buyers (students) providing tuition do not receive increased bargaining power through low switching costs.

Buyers providing non-research-related government payments (largely state governments) are attempting to satisfy a need to improve the level of education among the citizens of their states. Improving the level of education among the citizenry results in improved economic circumstances for both graduates and nongraduates, improves the social and cultural environment of the state, and so on. For each of these needs, there are alternative approaches that a state might pursue by switching its resource allocations from higher education to the alternatives. For example, a state might improve the economic circumstances among its citizens by attracting industries that do not require a highly-educated workforce yet provide above average levels of compensation. A state might improve the social and cultural environment by switching resources away from colleges and universities to other social and cultural institutions (e.g., libraries, symphonies, theaters, etc.). Overall, state providers of non-research-related revenue to higher education seem to believe that switching significant resources from higher education to alternatives would be less efficient and effective (i.e., the switching costs would be high and the outcomes less attractive). Therefore, the industry has a bargaining power advantage over providers of non-research-related payments as a result of the cost of switching.

The federal government is, as mentioned previously, the primary buyer of research from the higher education industry. While research may be provided by non-university organizations (e.g., private laboratories, "think tanks," etc.) the government seems to have concluded that universities offer better value than these alternative sources of research. This is partly due to the image of independence and impartiality maintained by academic researchers, and partly due to the cost advantage that universities possess arising from their ability to use students as research assistants, thereby lowering the cost of labor for the university relative to private research organizations. It can be assumed, however, that the potential to award research contracts to non-university providers does give buyers an ability to impact pricing and quality as the higher education industry competes both internally and with outsiders for research contracts.

Finally, gift-givers face relatively low switching costs and also possess many options when determining where to allocate gift resources. Those institutions adopting a prestige strategy in the higher education industry increase the propensity of alumni gift "buyers" to make gifts by offering ongoing benefits accruing to the giver from the institution's continuing prestige. Reputation-based competitors in the industry offer no such ongoing benefits to alumni givers, and therefore are much less likely to enjoy significant gift support from alumni. In short, there are some switching costs faced by alumni of prestige institutions when deciding where to allocate gift resources, and few costs faced by alumni of reputation institutions should they switch from giving to the industry to other recipients.

Buyer Information. If a buyer possesses full information relative to the market demand, actual market prices, and actual supplier costs, the buyer will have a stronger bargaining position and can demand lower prices or higher quality

(Porter, 1980). In the higher education industry, buyers from all four revenue markets possess little information that can be used to enhance their bargaining position. Cost structures of public institutions are more available but can be used to little advantage by the buyer.

Ability to Backward Integrate. With the possible exception of buyers of research, backward integration (purchasing suppliers or entering a supplier's industry through an internal start-up) is not a viable option for buyers from the higher education industry. Research buyers (mainly the federal government) may, in fact, elect to create an internal research capability, and have done so in the past (e.g., Oak Ridge National Laboratories, the National Institutes of Health, etc.). However, the trend in federal research efforts seems to be away from internally created and managed efforts toward outsourced efforts, including those provided by the higher education industry.

Substitution. The propensity of buyers to substitute for the products of higher education varies by revenue market. For student tuition buyers, there are few viable substitutes for the product of the industry, therefore students do not possess the ability to impact industry prices or quality based upon a propensity to substitute the product of other industries for that of the higher education industry.

Buyers of research from the higher education industry (chiefly the federal government) may, as has been mentioned, purchase research from non-university organizations. However, the advantages held by the higher education industry in both image and cost (see "switching costs," above) reduce the research buyer's ability to impact pricing and quality based upon an ability to switch research spending from higher education to potential suppliers in other industries.

As also discussed above (see "switching costs,") givers have many options for substitution. Those institutions adopting a prestige strategy in the higher education industry offset the ability of alumni gift "buyers" to substitute giving to non-higher education recipients for industry giving by offering ongoing benefits accruing to the giver from the institution's prestige. Reputation-based competitors in the industry do not offer ongoing benefits to alumni givers, and therefore are much less likely to enjoy significant gift support from alumni.

Price Sensitivity of Buyers. Buyers may possess enough power to affect firm prices or quality, but they may or may not choose to use that power. The sensitivity of a particular buyer to the price of an industry's product determines, in part, whether buyer power will be used, and to what extent. Porter suggests the following factors that impact price sensitivity:

Price to Total Annual Purchases: The greater the percentage of the buyer's total annual budget a purchase represents the more price-sensitive the buyer will be (Porter, 1980). This concept applies primarily to student tuition buyers, and does not seem to be significant in the other three revenue markets (e.g., non-research-related government payments, research payments, and gifts). Based on data from the US Census Bureau (2004) and the CollegeBoard (2003), the percentage of real median household income consumed in tuition costs for public four year institutions was 10.84 percent and for private four year institutions 45.5 percent. As discussed in detail above, student tuition buyers possess little real bargaining power from the factors already covered. They are unlikely to be able to bargain more effectively over price or quality, despite their sensitivity to price, as a result.

Product Differences and Brand Identity: If a buyer finds a product well suited to his needs, the impact of price sensitivity on that buyer will be reduced. Again, prestige institutions use their "brand identities" to attract revenue from buyers in three of the four revenue markets that are largely unavailable to reputation institutions (Brewer, et al., 2002). Buyers of research, for example, need the enhanced credibility of a prestige institution and base their decisions to award research funding partly upon that concern. Gift-givers either need or want the benefits of prestige and make gifts more often to prestige-based competitors than to reputation-based competitors in the higher education industry.

In the market for tuition revenue, reputation institutions make significant efforts at differentiation by (1) creating programs of study that meet current market needs and/or by (2) creating programs that are unique either in actuality or in some other way (e.g., unique scheduling to accommodate a particular potential group of students, unique "delivery channels" such as on-site at an employer's place of business, etc.). Reputation schools that successfully differentiate are better able to attract and maintain flows of tuition revenue in this way.

Impact on Quality/Performance: If a particular product has a substantial favorable impact on the buyer's performance, the buyer will be less sensitive to the price of the product. Prestige schools tend to attract student tuition buyers who define performance as enhanced access to certain professional or career attainments (e.g., Ivy League schools for those determined to become CEO's, the military academies for those determined to become general or "flag" officers, etc.). Student tuition buyers who attend reputation schools, on the other hand, tend to define performance as immediate employability or in some other way associated with the specific programs of study available, or with the convenience provided through non-standard channels of delivery, etc.

Buyers of non-research-related payments (primarily state governments) tend to define performance in ways related to the beneficial impact the institution has upon the overall economy and "quality of life" in the state. Therefore, buyers in this market tend to provide more revenue to those institutions that attract larger numbers of students due to a perceived relationship between number of students served and the level of beneficial economic/cultural impact the institution is creating.

Buyers of research tend to define performance as both (1) the ability to successfully carry out a particular research project and (2) the credibility of the research results. Therefore, these buyers tend to favor highly prestigious competitors in the higher education industry over less prestigious or reputation-based competitors.

Finally, buyers in the giving market tend to define performance as the benefits that accrue to them personally from assisting a given institution. For this reason, givers who are either alumni of prestige institutions or who wish to access a given institution's prestige are more likely to provide gift revenue than alumni of reputation schools.

Conclusion and Recommendations for Research and Discussion

In conclusion, the factors identified as influencing the bargaining power of buyers in Porter's (1980) five forces model appear to align well with the generic strategic approaches described by Brewer and his colleagues (2002) and also help to explain their conclusions regarding differential success in accessing the four potential sources for industry revenue. In the market for tuition, buyers (students) appear to possess low bargaining power versus the industry due to the convergence of factors identified by Porter (1980).

In the market for non-research-related government payments, buyers (primarily state governments) appear to possess significant bargaining power with the industry due largely to concentration as well as volume of purchases. This bargaining power among buyers of non-research-related government payments, moreover, is not significantly mitigated by choosing one strategic focus over the other.

In the market for research, there appears to be a rough balance of bargaining power between research buyers (mainly the federal government) and industry competitors which have adopted a prestige strategy. This appears to be due to the impact of quality and differentiation on the buyer's own performance criteria. Reputation-based institutions, conversely, possess low bargaining power relative to the buyers of research.

Last, in the market for gifts from alumni and others, significant power accrues to gift-makers to reputation institutions due to low substitution costs and low costs of switching. Prestige institutions mitigate this power among gift buyers by offering ongoing benefits that arise from the prestige of the institution and the benefits that alumni and other givers receive by helping to maintain the institution's prestige. This decreases the propensity of buyers to substitute gifts to non-industry alternatives and also raises the cost of switching gift resources from the industry to other recipients.

The opportunity exists for both further discussion and research regarding the alignment of the RAND strategies (Brewer, et al., 2002) with Porter's (1980) five forces model. Research and discussion of the level of rivalry among industry competitors, the threat of new entrants (especially those in the emerging for-profit sector of the higher education industry), and the threat of substitution (for example, substituting "just-in-time" training and "corporate colleges" for the degrees and programs offered by the industry) abound.

Increasing awareness of strategic analysis in higher education will lead to more detailed consideration of the decision processes used by buyers. Specific research and discussion should address: who are the real buyers of higher educational services (parents, students, employers), what is the perceived "price" of education (stated tuition rate, scholarship/aid adjusted tuition), how much information do buyers possess about universities? Each addition to our collective knowledge will allow colleges and universities to more effectively serve our constituents.

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Once More From the Top: A Review of the Empirical Justifications for Data Aggregation

by Kevin Barksdale

In developing managerial paradigms for the 21st century, managers need to make decisions based on as much information as possible. It is incumbent on organizational researchers to pursue knowledge that will be useful for managing organizations. One way that organizational researchers can do this is through multiple organization, multiple level studies in which data collected at the individual (micro) level of analysis are aggregated to higher (macro) levels of analysis (e.g. the meso paradigm; House, Rousseau, & Thomas-Hunt, 1995). Research at the organizational level of analysis can lead to effective comparisons of organizations whereas group level analysis can lead to effective comparisons of groups. For example, Ostroff (1992) used aggregate measures of employee attitudes to predict school effectiveness. Similarly, George (1990) used aggregate measures of the affective tone of work groups to predict individual-level prosocial behavior and absenteeism.

Mowday and Sutton (1993) called for multi-level research to put organizations back into organizational behavior studies. Likewise, multi-level research is required to capture the work context in organizations (e.g., George, 1990), and help provide a paradigm for managerial actions and decisions. Scholars have responded to Mowday and Sutton's (1993) call with a plethora of multi-level and cross level studies. Excellent examples of multiple or cross-level theoretical relationships may be found in organizational research with respect to person-organization fit Caldwell, Herold,& Fedor, 2004), organizational justice climate and orientation (Liao & Rupp, 2005), work-family conflict (Judge, Ilies, & Scott, 2006) and workplace attitudes and group member relations (Choi, 2006). On the one hand, the conclusion may be drawn that multiple-level organizational research has become imbedded within our scholarly culture. Outstanding tools for examining cross-level effects are now available (e.g., Hierarchical Linear Modeling, Bryck & Raudenbush, 1992). However, what is lacking is a basic primer for making initial determinations of the appropriateness for aggregation of data from one level of analysis to another.

Given this emphasis on multi-level research and advances in empirical methods, there is a need for a recapitulation of conceptual and empirical requirements for assessing the appropriateness of data aggregation. Ostroff (1993) addressed the empirical issues associated with comparing correlations across levels of analysis. Similarly, George and James (1993) identified important empirical issues related to cross-level research. However, before examining cross-level effects, specific criteria in the data must be met. While the literature is replete with debates on this topic (e.g., Glick, 1985; Glick, 1988; James, Joyce & Slocum, 1988), much of it has focused on theoretical questions regarding organizational climate. Therefore, the present study focused on assisting in establishing the appropriateness of aggregating data collected at one level of analysis to another level of analysis, in the most general terms. The specific purposes of this study were to: (1) summarize the basic requirements for data aggregation; (2) review traditional methodology for evaluation of those requirements; (3) present both univariate and multivariate alternatives for testing the requirements of data aggregation; and (4) provide recommendations for a data analysis strategy.

Requirements of Multiple-Level Research

Theoretical requirements. The integration of micro- and macro- level research has become very important to the field of organization science and numerous authors have provided support for this integration (House, et al., 1995; Roberts, Hulin and Rousseau, 1978; Rousseau, 1985). Roberts et al., (1978) specifically argued that in order to examine aggregate data, theories which cross the levels of analysis in question must exist or be developed and empirical assumptions of aggregation must be addressed. Decisions must be made regarding the appropriate unit of theory (e.g., organization, department, group, or individual), as well as how variables may be operationalized at different levels of analysis (Blalock, 1982; Hannan, 1971; House, et al., 1995; Roberts, et al., 1978; Rousseau, 1985). Clarifying the appropriate unit of theory is not necessarily a simple task. The topic that will subsequently be used as an example is the concept of organizational climate (Glick, 1985; Glick, 1988; James et al., 1988).

Empirical requirements. Four empirical criteria for aggregation to higher levels of analysis (e.g., the organization) were set forth by Jones and James (1979): (1) low within-organization (aggregate) variance; (2) high across-organization (aggregate) variance; (3) homogeneity within the situation; and (4) meaningful relationships between the aggregate variables and other organizational, sub-unit, or individual level criteria.[1]

Conceptually, there are parallels between the evaluation of data for appropriateness of aggregation and the process of construct validity in psychological measurement (Glick, 1985; Glick, 1988; Seidler, 1974). In construct validity studies, we rely on multiple sets of evidence that lead to the conclusion that a measurement device does indeed represent the defined construct. We generally look at content analysis, item analysis and factor analysis results to assess the homogeneity of the items of interest. We empirically test the question: Do these items correlate highly with one another?

Only after homogeneity is established are items composing the construct combined. Likewise, in studies of aggregation we test for whether the items in question have been answered similarly at the level we wish to aggregate. The question we ask is: Do the subjects within each aggregate (department, group, or organization) respond to the items similarly (Criterion 1: interrater reliability)? We then ask: To what extent can the aggregated units in question be reliably differentiated from one another (Criterion 2: reliability of the means). In construct validity, after assessing homogeneity of our measure, we construct a nomological network around that variable, proposing and testing its relationship to other variables. In aggregation studies, we assess whether or not our newly constructed aggregate variables relate meaningfully to other hypothesized variables.

Do all four of these criteria need to be met? Since methodological limitations exist, it is likely that more than one should be used (Jones & James, 1979; Joyce & Slocum, 1984). At minimum, prior to evaluating the fourth criterion, the first two criteria (low within-aggregate and high between-aggregate variance) should be examined.

Empirical methods. The focus of this study is on the first two criteria noted by Jones and James (1979). Several authors have addressed these criteria in a variety of ways (James, 1982; James, Demaree & Wolfe, 1984; 1993; Jones & James, 1979; Lord & Novick, 1968; Shrout & Fleiss, 1979). The most common methods relate to analysis of variance (ANOVA) and the calculation of intra-class correlations (ICC). More recent methods employ variations of interrater agreement estimation methods (i.e.,r_{wg}; James, et al., 1984), and variations on ANOVA such as hierarchical linear modeling (HLM; Bryk & Raudenbush, 1993), and within- and between- analysis (WABA; Dansereau, Alutto, & Yammarino, 1984). WABA allows for an examination of within-aggregate variation and between-aggregate variation (WABA I) and the existence of covariance within- and between- aggregates (WABA II). HLM allows the researcher to examine both individual and higher level effects in hierarchical or nested fashion. Both HLM and WABA represent important empirical advances, however the primary contribution of these techniques is in the evaluation of cross-level and multiple-level effects. Basic ANOVA methodology will allow the investigator to evaluate the Jones and James (1979) criteria with respect to aggregating from one level of analysis to another theoretically driven level of analysis.

There are a number of ANOVA and ICC techniques applicable to the aggregation of data (Shrout & Fleiss, 1979). When the goal is to aggregate from the individual to the organizational level of analysis, the design is a random effects, one-way nested ANOVA design in which each of the K (K=1,...,K) organizations represent the classification and n_k individuals who provide information on the variable (X) are nested within the treatment (organization). If the researcher were interested in aggregating to the departmental level, the treatment would be the department and individuals would be nested within their respective department. The ANOVA provides a between-organization mean square (BMS) and a within organization mean square (WMS). The mean squares furnished by the ANOVA can then be used to calculate a variety of ICC coefficients to represent the extent of within- organization agreement and between- organization effects.

Two ICC coefficients are most relevant in this study. The first, often referred to as ICC(1) represents *interrater reliability* (italics added, James, 1982). The ICC(1) addresses Criterion 1 -- low within-aggregate variance, relative to between-aggregate variance and is calculated by the following formula:

$$ICC(1) = [BMS\text{-}WMS]/[BMS+(k\text{-}1)WMS] \qquad (Eq.1)$$

where (k) equals the number of raters. This method assumes homogeneity of variance, random selection of organizations, and an equal number of raters in each organization (Glick, 1985). Equation 1 assumes (k) to be equal over groups, however, if (k) is unequal, but not dramatically so, the ICC(1) may be estimated using the harmonic mean (see Jones & James, 1979 for a treatment of this issue).

ICC(1) estimates have some drawbacks that cannot be overcome. Because of the manner in which variance is partitioned, the residual term is equal to the inseparable effects of the rater, the rater by variable or target interaction, and random error. Thus, as James (1982) notes "without further information, we could not attribute a low ICC(1) to reliable and measurable differences among raters, to the experience of different organizational stimuli perhaps as a function of different positions in the organization, to interactions between reliable differences and positions, or to random variation due to such things as uncertainty and noise" (p.221-222).

A second criticism is the lack of a sufficient standard of what constitutes an ICC(1) value suggesting aggregation is appropriate. James (1982) reported that the range in many climate studies is from .00 to .50 with a median of .12 (with higher values representing greater homogeneity). Ostroff (1992) found ICC(1) values ranging from .10 to .26 in her study while George (1990) did not report ICC(1) values. Subsequently, Schneider, White and Paul (1998) made an argument for standards but no consistent agreement among scholars has evolved.

Likewise, the ICC(1) statistic can yield artificially low estimates of rater agreement (James et al., 1984). In particular, James et al., noted that it is affected by restriction of range. The ICC(1) statistic will be large (reflecting homogeneity) only when the BMS is substantially larger than WMS. It is "insensitive to degrees of agreement, that is, it treats agreement as an all or none phenomenon, with no room for partial or incomplete agreement" (Mitchell, 1979, p.377). (For an in-depth treatment of this criticism see James, et al., 1984).

Where restriction of range is present, it may be necessary to use a technique for assessing inter-rater agreement developed by James et al., (r_{wg}, 1984). The r_{wg} may be viewed in the following equation:

$$r_{wg}=1-(S^2_{xj}/\sigma^2_{eu}); \text{ (Eq. 2)}$$

where r_{wg} is the within-group (organization) interrater agreement for the subjects on a single item, S^2_{xj} is the observed variance on the variable of interest, and σ^2_{eu} is the expected variance on the variable of interest that would be expected if all judgments were due exclusively to random measurement error with no systematic bias. Expected variance on the variable of interest - σ^2_{eu} may be calculated by the equation:

$$\sigma^2_{eu}=(A^2-1)/12; \text{ (Eq. 3)}$$

where A = the number of alternatives in the response scale. James et al., (1984) have argued that r_{wg} estimates of .70 or higher are necessary to demonstrate within organization consistency. Thus, the r_{wg} coefficient addresses the first criterion relating to data aggregation, high within-aggregate agreement, or conversely, low within-aggregate variance, without taking into consideration between-aggregate variance. Similarly, James et al., (1984) provided an equation for the multi-item case:

$$r_{wg(j)}=J[1-(S^2_{xj}/\sigma^2_{eu})]/[J[1-(S^2_{xj}/\sigma^2_{eu})]+(S^2_{xj}/\sigma^2_{eu})]; \text{ (Eq. 4)}$$

where J=the number of items and S^2_{xj} is the mean of the observed variances for the J items and σ^2_{eu} is the same as above.

The r_{wg} has several requirements noted by James et al., (1984) and investigated by Schriesheim, Cogliser, and Neider (1995). Measures to which it is applied are expected to be of approximately equal interval, ordered, and discrete scale. Empirical evidence of the null distribution should be established (James et al., 1984, 1993; Schriesheim, et al., 1995). Particularly, skewness of the underlying distribution may affect the resulting magnitude of the r_{wg} coefficient. In addition, Schriesheim et al., found that the number of targets (or items) being rated affected the resulting coefficient. The r_{wg} must be computed on each construct of interest, for each organization or aggregate unit. It can then be averaged to attain an estimate of the average within-group (aggregate) interrater agreement for each construct.

A second ICC coefficient that can be calculated is the ICC(2). This may also be recognized as the ICC(1,k) (Glick, 1985) and will be referred to here as the *reliability of means* (italics added, James, 1982). The reliability of means estimate [ICC(2)] addresses criterion 2 -- high between- aggregate variance relative to within-aggregate variance and answers the question: Can organizations (aggregates) be reliably differentiated on the variable of interest? It may be defined as the reliability of the mean X scores for k organizations. It is obtained by applying the Spearman-Brown prophecy formula to the ICC(1) coefficient (James, 1982) or may be seen in the following formula:

$$\text{ICC(2)} = [\text{BMS-WMS/BMS}] \text{ (Eq. 5)}$$

This equation makes the same assumptions as Equation 1. Simply put, ICC(2) reflects how accurate the scores are in representing each organization's mean. Alternatively, it is the lower bound estimate of the mean rater reliability on the aggregate variable (Glick, 1985).

The ICC(2) faces criticisms similar to those of the ICC(1) with regard to its assumptions and appropriate size of estimates. James (1982) noted that if the F-value in the ANOVA is significant, the ICC(2) may also be interpreted as reflecting that K organizations can reliably be differentiated on the climate variable X. It has been noted elsewhere (Glick, 1985; Shrout & Fleiss, 1979) that statistical significance is an inadequate threshold for evaluating the ICC(2). Glick noted values of the ICC(2) ought to be at least above .60. The ICC(2) has a direct relationship to the number of people in the sample (James, 1982). Thus, ICC(2) can be large when the sample is large, even in the event that the ICC(1) is small. However, the relationship of the ICC(2) to the number of organizations is not altogether different from the relationship of the number of items in a scale and traditional internal consistency estimates (Glick, 1985). This scenario raises potential problems for the researcher when there is low agreement within-aggregate (a low interrater reliability estimate), but high between-aggregate variance (a high reliability of the means estimate). The best strategy in light of this scenario would be to examine the data for range restriction and utilize the r_{wg} suggested by James et al., (1984) to evaluate interrater reliability. Subsequently, the reliability of the means estimate should be calculated to evaluate the second criterion -- high between- organization variance.

Another criticism of the ANOVA technique for assessing the variance between- and within- organizations is that it is typically calculated on the summed scale of the construct in question. Thus, information associated with individual items is lost when the scale is created. In the organizational climate example, Schneider (1975) suggested that when the research is oriented toward understanding organizational climate, only items on which organizational members have

high agreement (low within-organization variance) should be retained. Analysis of only summed scale values might hide potentially problematic items. An alternative to using the traditional ANOVA method is to use multivariate analysis of variance (MANOVA). With MANOVA, each proposed item of a scale can be entered into the MANOVA model, still nested within organizations. The results provide an assessment of the variance of each item within- and between- organizations, as well as an omnibus F-test of the overall MANOVA model that controls for experimental error. A MANOVA will allow the researcher to see which items may be potentially less apt to aggregation, while controlling for multiple comparisons across items and organizations.

In summary, empirical criteria presented by Jones and James (1979) for evaluating the appropriateness of aggregation have been outlined and examined. The researcher should first examine the reliability of means at the item level with the MANOVA technique outlined in this study. Second, compute the ANOVA- based interrater reliability to evaluate Criterion 1. If restriction of range is present, the r_{wg} will allow the researcher further guidance in evaluating the first criterion. Finally, an evaluation of Criterion 2 may be carried out through the examination of reliability of means estimates. In order to further illuminate this strategy, an example from organizational climate research is provided below.

Aggregation example. Organizational climate refers to the discovery of how the organization becomes psychologically meaningful to the individual member (Payne & Pugh, 1976). Climate seems to function at a number of levels -- organization, division, department, group and individual (Jones & James, 1979; Schneider, 1975). Climate perceptions are formed at the individual level, where organizational climate is referred to as the psychological climate (James, 1982; Schneider, 1975). However, James (1982) argued that aggregate individual perceptions of climate, when appropriately assessed via empirical methods can represent powerful methods for analyzing organizational behavior. It is an individual perception that should be *widely shared* (italics added) among organizational members subjected to the same policies, policies and procedures and can be aggregated to other levels of analysis (e.g. department or group) (Schneider, 1975; Kopelman, Brief, & Guzzu, 1990). Thus, organizational climate represents a concept measured at the individual level via multiple dimensions that is widely shared and conceptualized to exist at higher levels of analysis (e.g., the organizational level).

Kopelman, et al., (1990) suggested five core dimensions of organizational climate seem to operate across organizations and have been commonly utilized in climate research: "(1) *goal emphasis* - the extent to which management makes known the types of outcomes and standards that employees are expected to accomplish; (2) *means emphasis* - the extent to which management makes known the methods and procedures that employees are expected to use in performing their jobs; (3) *reward orientation* - the extent to which various organizational rewards are perceived to be allocated on the basis of job performance; (4) *task support* - the extent to which employees perceive that they are being supplied with the materials, equipment, services and resources necessary to perform their jobs; (5) *socio-emotional support* - the extent to which employees perceive that their personal welfare is protected by a kind, considerate and generally humane management" (p. 296; italics added). In this study, task support was measured with a focus on the extent to which employees perceived they receive adequate training to complete their tasks.

Method

Sample

The database for this study includes 4,802 home office employees representing 92 life and health insurance organizations located within the United States and Canada.

Measures

Task Support. This dimension of climate was measured with 4 items (α=.89).
Goal Emphasis. This dimension of climate was measured with 4 items (α=.74).
Means Emphasis. This dimension of climate was measured with 4 items (α=.67).
Socio-Emotional Support. This dimension of climate was measured with 4 items (α=.87).
Reward Orientation. Rewards Emphasis was measured with 3 items (α=.78).

Items composing these scales are presented in the appendix. All items had a four point Likert- type response, where 1=strongly agree; 4=strongly disagree. Items were re-coded so that 4=strongly agree; 1=strongly disagree.

The method for computing ICC coefficients consisted of a two-step procedure. First, the items composing each of the five climate scales were subjected to a multivariate analysis of variance (MANOVA). Second, ANOVA was conducted on each of the five scales in the fashion described above. Thus, 5 MANOVA models and 5 ANOVA models were computed. The MANOVA models were computed on individual items in order to assess the item-level variation within and across organizations. The ANOVA models and r_{wg} coefficients were calculated on the summed scales. The ANOVA results were used to calculate ICC statistics. MANOVA provided an omnibus F-test (Wilk's Lambda) as well as F-tests of significance for individual items.

In this sample, the number of individuals in each organization ranged from 30 to 120. It was judged that this wide variation was such that substitution of the harmonic mean was inappropriate. Therefore, 30 individuals were randomly selected from each organization for the computation of the ICC coefficients. The r_{wg} coefficients were calculated using the entire sample.

Results

The MANOVA results in Table 1 suggest that items composing each scale reflect more variance across organizations than within each organization. The univariate statistics for each item were significant, as were the omnibus F-tests in the MANOVA. Thus, it was determined that all items included in the study could be aggregated to the organizational level of analysis.

Table 1 MANOVA results for testing assumptions of aggregation.

Scale	Wilk's Lambda	F-Value	Ndf/Ddf	PROB > F
Task emphasis	.699	2.245	637/27283	.0001
Goal emphasis	.793	2.733	364/16671	.0001
Reward orientation	.811	3.503	273/13254	.0001
Means emphasis	.845	2.09	364/17806	.0001
Socio-emotional support	.864	1.422	455/21759	.0001

The results for the ANOVA and interrater reliability estimates are presented in Table 2. The ICC(1) estimates were calculated using Equation 1 and the ICC(2) estimates were calculated using Equation 5. The task support climate dimension had the largest ICC(1) statistic (.225) and means emphasis had the smallest (.030). In all, three of five constructs reflected ICC (1) statistics that were relatively low, suggesting low interrater reliability. The average $r_{wg(j)}$ coefficient was calculated using Equation 4 and the results for each construct are also presented in Table 2. It should be noted that this formula assumed a uniform, rectangular null distribution underlying the data. Average $r_{wg(j)}$ estimates were greater than .75 with task support and means emphasis having the highest value. The individual $r_{wg(j)}$ coefficients ranged from .75 to .87. Thus, in contrast to the ICC(1) estimates, the $r_{wg(j)}$ estimates supported the first empirical criterion and suggested fairly high interrater reliability.

Table 2 ANOVA and within-group agreement results for testing assumptions of aggregation.

Scale	Range	BMS	WMS	ICC(1)	ICC(2)	$r_{wg(j)}$
Task support	2.26-3.20	1.90	.19	.225	.90	.76
Goal emphasis	2.54-3.32	.957	.216	.100	.77	.78
Reward orientation	2.12-3.36	1.48	.445	.080	.70	.76
Means emphasis	2.69-3.32	.378	.199	.030	.47	.78
Socio-emotional support	2.14-3.34	2.32	.379	.15	.84	.78

Note. All ANOVA results $p<.0001$.

The reliability of means estimates are also presented in Table 2. The F-value for each construct was significant, suggesting that the organizations could be reliably differentiated on the basis of these variables. In the case of every variable but one (means emphasis), the results suggested a reasonable degree of reliability at the organizational level (from .70 for reward orientation to .90 for task support).

Discussion

The results of the ICC(1) computations suggested that the overall interrater reliability was quite low. In other words, there was not substantial agreement on the climate constructs among individuals within a given organization. However, an alternative interpretation would be that individuals within a given organization do not agree completely with one another (e.g., James, 1982; James et al., 1984). Thus, the ICC(1) results failed to support Criterion 1 -- low within- aggregate variation. In contrast, the r_{wg} analysis suggested a good amount of within-aggregate agreement. In light of range restriction in the data, reliance on the r_{wg} results provides fairly strong support for the first criterion for aggregation. The individuals within each organization did not agree "completely" but they did agree substantially with each other.

The results of the ICC(2) computations suggested rather convincingly that with exception to means emphasis, reliability at the organizational level was relatively high. That is, the organizational means were stable. Thus, the second criterion, high between- organization variance was met. Drawing from these two sets of results, the conclusion would be that the first two of the criteria put forth by Jones and James (1979) were reasonably met in the present study. There is a moderate to high degree of relative perceptual agreement among raters within the organization, and organizations can be reliably differentiated on the basis of these variables.

In summary, these results provide justification for investigation of organizational level effects relating to data aggregated from the individual level of analysis. Once aggregation is found to be appropriate, the aggregate level variables will be assigned values (the organizational mean) for each variable in the study. The grand mean becomes the average of organizational means, and the standard deviation becomes the deviation of each organizational mean from the grand mean (Ostroff, 1993). After testing the first two criteria for data aggregation, and evaluation of the extent of homogeneity within the situation, the remaining aggregation questions relate to the fourth criterion - do the aggregated variables correlate meaningfully with other organizational level variables. Once again the parallel with construct validity is drawn by considering the nomological network of variables of interest.

A multivariate approach using MANOVA was proposed as one method for holistic evaluation of the items composing a construct or scale. The use of MANOVA provides an alternative methodology which allows the assessment of variance within- and between- organizations at the item level. This has the advantage of allowing the investigator to eliminate items that may not reflect high agreement at levels other than the level in which the data was collected. This focuses on the importance of investigating individual items prior to examining scale level aggregation (Glick, 1985; Schneider, 1975). While this could result in the need to delete items from an established measure, it may be necessary in order to successfully change levels of analysis with a given construct.

ANOVA and ICC methodologies were examined and comparisons were drawn between the ICC(1) and the r_{wg} (James et al., 1984). Several important conclusions may be drawn from this study. First, ANOVA based techniques represent an important evaluation of two out of the four criteria proposed by Jones and James (1979). The ICC(1) and the ICC(2) both provide unique and important information. It should be noted that the evaluation of Criterion 1 and Criterion 2 requires both the ICC(1) (or the r_{wg}) and the ICC(2) respectively (Shrout & Fleiss, 1979). Establishing interrater reliability only tells the researcher that there are grounds for aggregating within the chosen aggregate level. Technically, to stop at interrater reliability and begin with correlation at the aggregate level would be parallel to establishing construct validity prior to completing the reliability analysis. If we accept the criteria set forth by Jones and James (1979), reliability of the means must be evaluated and established prior to using statistical analyses across aggregates.

The r_{wg} (James et al., 1984) was presented as an alternative to the ICC(1) in the presence of range restriction. The main drawback to the r_{wg} is that it addresses only one of the four criteria proposed by Jones and James (1979) - within aggregate agreement. It does not address whether the aggregate units can be reliably differentiated from one another. Arguably, this is not of particular concern, since other criteria can be evaluated with subsequent analyses (e.g., ICC(2)).

The strategy presented is to first examine the reliability of means at the item level with the MANOVA technique outlined in this study. Second, compute the ANOVA- based interrater reliability and reliability of the means statistics. Problems regarding a determination of just how large an ICC(1) coefficient should be were raised. The researcher should evaluate previous literature in the specific area of interest, and evaluate the size of the ICC(1) within the context of previous findings. If the interrater reliability estimates are similar in size to previous research, and if restriction of range is not significant, then one can be fairly confident that the first criterion (low within-aggregate agreement) is met. If range restriction is present, the r_{wg} will allow the researcher further guidance in evaluating the first criterion. Finally, if the reliability of means estimates are fairly large, the researcher can move ahead with evaluation of the remaining two aggregation criteria. This strategy would be appropriate not only for organizational climate research but also for other multilevel studies (For a similar approach refer to Ostroff, 1992).

This study extended the research of Schriesheim, et al., (1995) in three important ways. First, the Schriesheim, et al. study contained a relatively small sample of 48 individuals with as few as 2 individuals per unit. This study evaluated ANOVA-based aggregation statistics with over 2700 observations (30 per organization) and r_{wg} estimates with 4800 observations. Second, this study illuminated circumstances in which ICC(1) and ICC(2) estimates conflict with one another regarding the question "should we aggregate this data?" Thus, the r_{wg} estimate was particularly useful in the presence of range restriction. Finally, while the Schriesheim et al. study examined the r_{wg} in comparison to WABA results, they did not present a comparison with the traditional techniques examined in this study.

The focus of this paper has been directed toward summarizing the most basic issues in data aggregation - assessing the appropriateness of aggregation from one level of analysis to another. The most commonly used empirical tools were evaluated. Other critical issues not addressed in this study refer to empirical evaluation and interpretation of cross-level effects. A number of authors address this topic (Bryk & Raudenbush, 1993; Dansereau, et al., 1984; George & James, 1993; Mossholder & Bedeian, 1983; Ostroff, 1993; Schriesheim, et al., 1995).

It is extremely important to note the restrictions of the ANOVA and ICC techniques used in this study. In this study the wide variation in the number of raters per organization poses a particular limitation, since there were wide variations in the number of subjects in each organization. In order to calculate the ICCs, a substantial number of subjects were deleted from the analysis, thus important information may have been lost. While the data set in this study was large enough to allow some leeway in deleting observations, in many cases this approach might prove to be extremely limiting. It should be noted that many statistical packages (e.g., SAS-GLM) provide linear modeling procedures that will adjust for the unbalanced research design, which will overcome this limitation provided the data meet the other required assumptions. Technical procedures for calculating the ICC statistics using the harmonic mean may be seen in Jones and James (1979) and Guilford (1954).

This study has moved away from the debates (Glick, 1985; Glick, 1988; James et al., 1988) regarding which reliability estimate is most appropriate in evaluating data for aggregation. In contrast, criteria from Jones and James (1979) were used to develop a comprehensive data analysis strategy. The importance of estimating reliability within-aggregates (Criterion 1) and reliability between-aggregates (Criterion 2) was emphasized. The example provided an excellent opportunity to observe the importance of a comprehensive approach to data analysis in multilevel studies.

Aggregation studies provide opportunities to develop substantively fruitful research questions. Theoretical and empirical criteria must be evaluated within the context of the particular research topic, but the general guidelines presented here serve to guide the research process. There is a wide array of empirical tools available to evaluate the assumptions of data aggregation. Each has important drawbacks to be certain. However, when following a thoroughly developed conceptual framework, they may be used in combination with each other to increase the potential for well conducted aggregate research.

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Appendix

Listing of items included for task support, goal emphasis, reward orientation, means emphasis, and socioemotional support.

Task support

I received sufficient training to do my job.
Education and training is an integral part of this company's culture.
I have had sufficient/adequate job-related training.
If I felt that I needed more job-related training, the company would provide it.

Goal emphasis

Company goals and objectives are clearly communicated to employees.
I understand how the work I do contributes to the company achieving its goals.
I am committed to the company's goals.
Employees of this company work toward a common goal.

Reward orientation

Generally I feel this company rewards employees who make an extra effort.
There is a strong link between how well I perform my job and the likelihood of my receiving a raise in pay/salary.
There is a strong link between how well I perform my job and the likelihood of my receiving high performance appraisal ratings.

Means emphasis

I understand this company's lines of authority.
I understand the boundaries of my job.
I know what is expected of me on the job.
I understand how my job performance is measured.

Socioemotional support

Generally I feel this company cares about its employees - not just about profits and losses.
Generally I feel this company values employees who have worked here a long time.
Generally I feel this company values employee loyalty.
Generally I feel this company treats employees as an investment -- key to its future success.

Who Am I?

by Kevin Barksdale

Who am I that I should not suffer? My Lord and King lived a perfect sinless life, yet he was the subject of rejection, ridicule, false imprisonment and execution. If my Lord was willing to suffer those things freely, who am I to not walk through those same trials and fires? Is there any suffering I can be subjected to that will equal that of the King? In my woes, He is made manifest. This occurs by my placing one foot in front of the other, walking through the fires and trials that are my life. Who am I to expect any less? If I am to serve my King, shall I not taste of the very same cup? Shall I escape the privilege of experiencing sacrifice on even the smallest scale of comparison that my King experienced? I would that my life be easy and my burden light. My King said to come to Him, and He will give rest. He said to take His yoke upon me. I willingly accept this burden for it is so much heavier and more painful than any burden I could place upon myself. What is suffering but a recognition that I am His? What is suffering but a reminder of His sacrifice? I prefer no less than an easy road, but what good would I be to Him?

Attacking the Obesity Epidemic: An Examination of the Potential Health Benefits of Nutrition Information Provision in Restaurants

by Kyle Huggins, Scot Burton, Elizabeth Howlett, & Jeremy Kees

*Note: This article was previously accepted in the September 2006 issue of the *American Journal of Public Health*.

Sixty-four percent of American adults are either overweight or obese and the obesity epidemic shows no signs of weakening.[1,2] While the precise number of deaths attributable to obesity is difficult to estimate, it is clearly one of the major causes of preventable death.[3,4,5] Not surprisingly, improving the healthfulness of the American diet has become a national health priority.[4,6] The increasing prevalence of obesity-related diseases has been blamed, in part, on the increased consumption of foods prepared outside-the-home. Restaurant expenditures have increased consistently in recent decades; consumers now spend more than $400 billion annually.[7]

Increased consumption of food prepared outside-the-home and the rising percentage of overweight Americans have made the failure to disclose the nutritional content of restaurant foods a significant public health issue. While the Nutrition Labeling and Education Act increased the availability of nutrition information on packaged foods, foods purchased for immediate consumption are exempt from nutrition disclosure requirements. Typically, fast food restaurants make nutrition information available to consumers through brochures available upon request or on their corporate web sites. Most dinner house restaurants disclose the nutrient content of their menu items only via the internet, if at all.

Laws governing the provision of nutrition information in restaurants are now under consideration by Congress. The Menu Education and Labeling Act would require chain restaurants with twenty or more outlets to provide key nutrient information. Legislation has also been proposed in several states (e.g., New York) that would require restaurants with ten or more national locations to disclose the calorie and nutrient content, such as fat and saturated fat levels, of their foods.[8] The FDA has initiated preliminary discussions about national standards for the provision of nutrition information in restaurants in response to these legislative initiatives.[9]

This research examines the potential public health benefits obtained by providing easily accessible nutrition information in restaurants. Study 1 examines the accuracy of consumers' expectations of the calorie, fat, saturated fat, and sodium levels of restaurant foods, and determines whether the difference between expected and objective levels vary depending on the calorie and nutrient levels of the items. Study 2 addresses how the provision of nutrition information on a menu affects consumers' attitudes and purchase intentions when objective calorie and nutrient levels are either much higher or about the same as consumers expect.

Study 1

Recent legal and regulatory initiatives regarding nutrition information disclosure in restaurants is largely driven by an interest in the negative health consequences associated with the over-consumption of calories and nutrients such as fat, saturated fat, and sodium. This raises an important question. What are the expectations of reasonable consumers regarding the nutrient levels of typical restaurant fare? Study 1 compares estimated calorie, fat, saturated fat, and sodium levels of foods typically served in dinner house restaurants with objective values determined by laboratory testing. We suggest that most consumers lack the expertise necessary to estimate calorie and nutrient levels accurately. Since nutrition information is difficult, if not impossible, to obtain in most dinner house restaurants, consumers are unlikely to realize that large restaurant portions of higher calorie and higher fat menu items (e.g., large bowl of fettuccini Alfredo) may exceed a full day's worth of fat and saturated fat. Therefore, consumers are expected to substantially underestimate calories and fat, saturated fat, and sodium levels. This is consistent with prior research showing that when presented large portion sizes of less healthful foods, professional nutritionists underestimated calorie levels by between 200 to 600 calories.[10] However, we anticipate consumers' estimates will be more accurate for the food items lower in calories and fat (e.g., grilled chicken breast).

H1: The difference between consumers' expectations and objective levels of calories and nutrients will be greater for items with higher levels of calories, fat, and sodium than for items with lower levels of calories, fat, and sodium.

H2: A greater percentage of consumers will underestimate calorie and nutrient levels for menu items with higher levels of calories, fat, and sodium than for items with lower levels.

Methods and Participants

For nine restaurant entrées, survey participants were given serving size information and brief item descriptions, similar to information that would appear on a menu. For each item, participants estimated calories, fat, saturated fat, and so-

dium levels. Measures of the objective (actual) calorie and nutrient levels for each of the nine items were obtained from independent laboratory testing performed previously for dinner house restaurant items.[11] Three items shown in Table 1 (e.g., grilled chicken breast) were lower in calories and fat (370 to 640 calories; 6 to 26g of fat) than other entrées. Five items (e.g., hamburger with fries) were much less favorable (930 to 1660 calories; 63 to 97g of fat). (While it can be argued that there are no "unhealthful" or "unfavorable" foods within the context of an entire diet, for the sake of brevity, we use the terms "less (more) favorable" to refer to menu items higher (lower) in calories, fat, and sodium.) The remaining item (cheese fries with ranch dressing) had *extremely* high calorie and nutrient levels (3010 calories; 217g of fat).

Study participants were recruited through a statewide mail research panel and by undergraduate students. Ninety-seven percent of respondents had dined at a restaurant in the past month; the mean dining-out frequency was fourteen. Almost all (97%) were high school graduates and 81% had at least some college. The median age of respondents was 39 and 60% were female. The total sample size was 193 respondents. Results of tests of hypotheses were consistent across demographic groups, the household research panel respondents, and sample of adult consumers.

Results

For each menu item, Table 1 presents consumers' estimated (expected) calorie and nutrient levels, the objective levels, the mean difference between estimated and objective levels, and the percentage of consumers who either overestimated or underestimated calorie and nutrient levels. As shown, less favorable items were judged to be higher in calories and fat than more favorable items. This indicates that consumers are at least somewhat aware of nutritional differences between foods.

To test H1, individual accuracy scores for calorie and nutrient levels were calculated by subtracting the objective levels from the consumer-estimated levels. These deviation scores were used as the dependent variables in a series of repeated-measures ANOVA's. Differences between consumers' estimates and objective values vary substantially across the more favorable, less favorable, and extremely unfavorable items.

For calories, results of the repeated measures analyses are highly significant ($F=2530$, $p< .001$). On average, participants underestimated the calorie levels of less favorable items by 642 calories; objective levels (1336 calories) were almost twice as high as consumers' estimates. The calorie content of cheese fries with ranch dressing (3010 calories) was underestimated by more than 2000 calories. Consumers slightly underestimated calories of the more favorable items. Follow-up contrasts on the difference scores between expected and the objective calorie measures show significant differences between the more ($M= -43$) and less ($M= -642$) favorable items, as well as between the less favorable items and the extremely unfavorable item (t values=37.4 and 54.8, respectively; p's$< .001$). Thus, as posited, the difference between consumers' calorie estimates and objective levels were far greater for items with less favorable nutritional content.

Similarly, consumers' expectations of nutrient levels (fat, saturated fat, and sodium) were less consistent with the objective levels for less favorable items than for more favorable items. Results from repeated-measures ANOVA's for each nutrient using the difference between consumers' estimates and objective values as the dependent variable resulted in significant findings for all three nutrients (F values exceed 700 for all tests, $p< .001$). For the less favorable items, consumers underestimated fat and saturated fat levels by 44g and 15g, respectively, amounts that exceed the recommended daily values by more than 60%. Estimated fat and saturated fat levels for the more favorable items were more consistent with objective levels (and even slightly *higher)*. Consumers underestimated sodium levels for the favorable items by 847mg, whereas they underestimated the amount of sodium in the less favorable and extremely unfavorable items by 1557mg and 4353mg, respectively. For all nutrients, follow-up contrasts showed significant differences between the more/less favorable and less favorable/extremely unfavorable groups.

To address differences in percentages of consumers underestimating calorie and nutrient levels, cross-tabulation analyses were performed. As shown in Table 1, 90%, 99%, and 73% of respondents underestimated calories for the less favorable, very unfavorable, and more favorable items, respectively (chi-square=102.2, $p< .001$). For fat, 90%, 97%, and 37% of respondents underestimated fat levels for the less favorable, very unfavorable, and more favorable items, respectively (chi-square=509.1, $p< .001$). The pattern of findings was similar for saturated fat (chi-square=433.6, $p< .001$). While most consumers underestimated sodium levels of all the items, differences were significant (chi-square=13.3, $p< .01$). These findings support H2.

Study 2

Given that consumers appear unaware of the high levels of calories, fat, and sodium found in many foods typically served in restaurants, the purpose of Study 2 was to examine the potential public health benefits associated with the provision of nutrition information in restaurants. Specifically, how the provision nutrition information influences consumers' attitudes and purchase intentions for restaurant menu items was examined. For each menu entrée, consumers were also asked to estimate how likely they were to gain weight and develop heart disease if that food item was included as a regular part of their diet. These risk perceptions were expected to be influenced by the provision of nutrition information.

Classic expectancy disconfirmation theory can be used to predict consumers' responses when accurate calorie and nu-

trient information are disclosed.[12,13] According to this theory, consumers form initial expectations about specific product attributes. If the actual information or subsequent experience does not meet expectations, then attribute dissatisfaction will occur which creates negative attitudes.[12] If actual product information exceeds expectations, positive attitudes result.

Study 1 showed that calories, fat, and sodium in less favorable restaurant menu items are much higher than consumers expect. However, the objective nutrient levels of more favorable items were relatively consistent or slightly better than what consumers expected. Therefore, for less favorable items, the provision of nutrition information should disconfirm consumers' nutrition-related expectations resulting in unfavorable attitudes and decreased purchase likelihoods. Consumers' perceptions regarding the likelihood of weight gain and heart disease risk should also be higher.[14] Expectancy disconfirmation theory thus suggests that the discrepancy between expected and objective nutrient levels should result in an interaction between the provision of nutrition information and the healthfulness of the menu item. Negative disconfirmation for less favorable items is expected to lead to stronger (more negative) effects on attitudes and purchase intentions and increase choice preference for more favorable items. In addition, these effects should generally be greater when both the number of calories and the nutrient levels are provided, as compared to when calorie information (a single attribute) is presented alone.

H3a: When objective nutrition information is less favorable than consumers' expect, nutrition information provision will have a greater negative influence on product attitudes and purchase intentions and a greater positive influence on perceived likelihood of weight gain and heart disease.

H3b: When objective nutrition information is less favorable than consumers' expect, the provision of *both* calorie and nutrient information will have the strongest influence.

H4: Provision of nutrition information on menus will decrease choice preference for items with objective nutrition information that is less favorable than consumers' expect and increase choice preference for items more consistent with expectations.

Methodology

Design. Study 2 is a 3 (nutrition information) X 2 (daily value information) X 4 (menu item) mixed experimental design. The nutrition information and daily value manipulations are between-subjects factors and menu item is a repeated-measure factor. Nutrient information conditions are: (1) calories, fat, saturated/trans fats, and sodium levels presented, (2) only calorie information presented, and (3) no nutrition information presented (status quo in most restaurants). (Note that most proposed legislation would require calorie plus nutrient information for restaurants using menus, but only calorie information for fast food restaurants with menu boards.) The daily value information disclosure is: (1) daily value recommendations for fat (65g), saturated fat (20g), and sodium (2400mg) based on a 2000 calorie diet, and (2) a control condition without daily values.[15,16] The nutrition information presented was based on laboratory tests of actual restaurant items. The provision of daily value information had no influence on the dependent measures and is therefore excluded from further discussion.

Four items included on the menu were deluxe hamburger with fries, chef salad, chicken breast with baked potato, and turkey sandwich. As shown in Table 1, for the first two items, objective levels of calories, fat, and saturated fat exceeded consumers' expectations. For the latter two, consumers' expectations were more consistent with objective levels. All information and manipulations were presented on a four-color mock restaurant menu stimulus. Respondents were instructed to answer questions regarding the menu items; nutrition was not mentioned.

Measures and Participants. For each menu item, overall attitude towards the product and purchase intention were assessed using seven-point scales (see Appendix). To assess consumers' risk perceptions (likelihood of weight gain and heart disease perceptions) nine-point, single item measures drawn from prior research were employed.[14,17] Items were recoded so that higher values indicated more favorable attitudes and higher perceived risk. A single measure of choice among the four items was used ("If you had to choose one of the products described on the mock menu, which one product would you select?").

Participants in a geographically dispersed area throughout a single south-central state responded to a mail survey. Participants were mailed packets that included one of the randomly assigned six menu stimuli, a survey including measures of interest, and a stamped self-return envelope. Completed surveys were returned by 241 respondents, a response rate of 50%. Almost all respondents were high school graduates (97%), 63% were female, and ages ranged from 23 to 85. For the six groups in the design, cell sizes ranged from 38 to 42 participants.

Results

To test predictions, a doubly multivariate analysis was performed (SPSS11.5GLM). Dependent variable means are shown in Table 2 and multivariate and univariate results are shown in Table 3. There are main effects of nutrition information provision and menu item type for the dependent variables as hypothesized and a multivariate interaction between information provision and menu item ($p < .01$). Univariate interactions are significant for each of the four dependent

variables. Plots of means relevant to interactions are shown in Figure 1. For the items inconsistent with nutrition expectations (hamburger and chef salad), purchase intention means follow the predicted pattern. For the hamburger platter, follow-up contrasts show that relative to the control (M= 4.44), there are significant decreases in purchase intentions for both the calories plus nutrients (M= 3.43, t= -2.93, p< .01) and calories only (M= 3.80, t= -1.89, p< .05, one-tailed test) conditions. The difference between the calorie only and calorie plus nutrients conditions is not significant.

For the chef salad, contrasts show that compared to the no information control condition (M= 4.92), there is not a significant decrease in purchase intentions from the addition of calorie information (M= 4.68). However, purchase intentions for the calories plus nutrient information condition (M= 3.97) is significantly lower than both the control (t= -3.18, p< .01) and the calorie only (t= -2.41, p< .02) conditions. This pattern is consistent with the nutritional composition of the chef salad; it contains a moderate number of calories, but substantially exceeds the levels of fat and saturated fat expected by consumers. H3a and H3b are supported.

Purchase intentions for the expectation-consistent items show no effect in one case and a positive effect in the other case, from the provision of nutrition information. Specifically, the purchase intentions means are flat for the chicken dinner (ranging between 5.55 and 5.59). For the turkey sandwich, relative to the control (M= 4.86), the addition of calories (M= 5.86, t= 3.68, p< .01) and calories plus nutrients (M= 5.48, t= 2.22, p< .05) results in stronger purchase intentions.

Plots for the perceived likelihood of gaining weight and developing heart disease are shown in the bottom of Figure 1. For both variables, univariate ANOVA's are significant for the chef salad (p< .01) and turkey sandwich (p< .05), but not significant for the hamburger platter or chicken dinner (p> .15). For the chef salad, the calories plus nutrients lead to higher perceived likelihoods of heart disease and weight gain, relative to the calories only condition (t's= 2.52 and 1.87, respectively, p< .05). For the turkey sandwich, calories alone decrease both perceived likelihoods (p< .05), but the full information does not differ relative to the control. (Presumably, the higher sodium levels revealed in the full information condition counterbalance the positive effects of a lower than anticipated calorie level.) The pattern of means is particularly interesting for heart disease. With no information, the means for all items except the hamburger platter are almost identical but the calorie and nutrient information widen perceived differences between these items, and the chef salad mean increases significantly (p< .01). These findings also support H3a and H3b.

Effect on Choice. Consumers' item choices were examined across the three levels of nutrition information. Results were significant (chi-square= 15.6, df = 6, p< .02). When calorie plus nutrient information was presented, the percentage of consumers choosing the turkey sandwich (which generally met or exceeded nutrition expectations) increased from 11% to 21%, and it decreased selection of items with higher levels of calories and fat than expected. The share of the chicken dinner (i.e., nutrient levels consistent with expectations) remained constant. In tests comparing the two items with higher calories and fat (i.e., items less consistent with expectations) to the two more favorable items, selection of the higher calorie, higher fat items decreased from 37% to 24% (p<.05) when calorie and nutrition information was provided. These findings support H4.

Discussion

Recent reports indicate that almost two-thirds of U.S. adults are either overweight or obese.[1] The increased prevalence of overweight and obesity has been blamed, in part, on greater consumption of foods prepared outside-the-home.[18] With 70 billion meals and snacks consumed from fast food or table service restaurants annually, it is clear that many consumers obtain much of their food outside of the home.[7] These simultaneous trends have lead to proposed legislation mandating the provision of nutrition information at both federal and state levels.

Study 1 results showed that for a number of items consumers vastly underestimated calories, fat, saturated fat, and sodium levels. On average, less favorable items were underestimated by more than 600 calories and between one-third to a full day's worth of the recommended values for fat and saturated fat. If diners consumed 600 more calories than they realized for just *one* restaurant meal per week, an extra 30,000 calories a year would be added to their diets. These unaccounted calories could cause a weight gain of approximately nine pounds annually, holding all other factors constant. Over several years' time, this degree of misestimation could cause significant weight gain. Given substantial differences between expected and objective values, these findings indicate inclusion of nutrition information on menus offers informational benefits to consumers.

Study 2 findings show that the addition of calorie and nutrient information for dinner house items influences attitudes, intentions and choices. Purchase intention and choice decrease for less healthful items that are worse than expected (hamburger platter and chef salad), while they remain constant or increase slightly for items more consistent with expectations. The largest changes occur for the chef salad which had the largest deviations from consumer expectations. In the absence of nutrition information, the turkey, chicken and chef salad items are indistinguishable in terms of the perceived likelihood of heart disease. However when calorie and nutrient information is provided, there is a larger difference in disease-risk perceptions.

Our findings have significant public health implications and provide support to the notion that new restaurant-oriented nutrition information initiatives may be warranted. However, circumstances unique to the restaurant industry such as customized orders and portion size differences will make provision of exact nutrition information for every single meal and every consumer difficult. Legislation would probably need to apply to items "as offered for sale," and nutrition disclosure would not include customized orders or daily specials. Because our results show that consumers substantially underestimate calorie levels for less healthful dinner house items and that preference for the less healthful items diminishes when nutrition information is disclosed, provision of nutrition information for chain restaurants' standard menu items would appear helpful. We also recognize that further research may identify additional nutrition formats that may be equally or more effective at conveying nutrition information and combining possible social marketing initiatives with future nutrition disclosure research seems warranted**.** In sum, these findings suggest that the provision of easily accessible nutrition information in restaurants may provide significant public health benefits by making it easier for consumers to make more healthful food choices.

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Table 1---Accuracy of Consumers' Estimates of Calories, Fat, Saturated Fat, and Sodium for Restaurant Items

	Calories				Fat			
Restaurant Menu Items	Mean Calorie Expectation Estimates	Objective Calorie Levels	Mean Difference Between Expectations and Objective Levels (% of Under/ Over Estimation)[a]	Percent of Consumers Under (Over) Estimating Calories[b]	Mean Fat Expectation Estimates (grams)	Objective Fat Levels (grams)	Mean Difference Between Expectations and Objective Levels (% of Under/ Over Estimation)	Percent of Consumers Under (Over) Estimating Fat
Less Favorable Items: [c,d]	**694**	**1336**	**-642(-93%)**	**90(10)**	**32**	**76**	**-44 (-137%)**	**90 (10)**
Fettuccini Alfredo	704	1500	-796(-113%)	90(10)	31	97	-66 (-213%)	96 (4)
Hamburger & Fries	777	1240	-463(-60%)	88(12)	37	67	-30 (-81%)	85 (15)
Chicken Fajitas	704	1660	-956(-136%)	96(4)	31	63	-32 (-103%)	82 (18)
Chef Salad	452	930	-478(-106%)	90(10)	21	71	-50 (-238%)	97 (3)
Patty Melt & Fries	834	1350	-516(-62%)	84(16)	41	81	-40 (-98%)	88 (12)
More Favorable Items:	**500**	**543**	**-43(-9%)**	**73(27)**	**23**	**15**	**+8 (35%)**	**37(63)**
Chicken Breast	479	640	-161(-34%)	78(22)	22	14	+8 (36%)	37(63)
Pot Roast	663	620	+43(6%)	65(35)	33	26	+7 (21%)	48(52)
Turkey Sandwich	358	370	-12(-3%)	75(25)	15	6	+9 (60%)	26(74)
Very Unfavorable Item:	**869**	**3010**	**-2141(-46%)**	**99(1)**	**40**	**217**	**-177 (-443%)**	**97(3)**
Cheese Fries	869	3010	-2141(-246%)	99(1)	40	217	-177 (-443%)	97(3)

[a] This is the difference between consumers' calories estimates and the objective levels determined by laboratory testing. The percentage (shown in parentheses) is the mean difference divided by consumers' calorie expectations (e.g., -642/694 = -93%).

[b] This is the percentage of participants who underestimated (overestimated) the calorie levels for each item.

[c] Numbers in bold are averages for each of the three categories; the recommended daily value is 65g for fat, based on a 2000 calorie diet.

[d] The items included brief descriptions, size of the item in ounces, and any side dishes, all drawn from Jacobson and Hurley.[11]

Table 1 (continued)

	Sodium				Saturated Fat			
Restaurant Menu Items	Mean Sodium Expectation Estimates (milligrams)	Objective Sodium Levels (milligrams)	Mean Difference Between Expectations and Objective Levels (% of Under/ Over Estimation)[e]	Percent of Consumers Under (Over) Estimating Sodium[f]	Mean Saturated Fat Expectation Estimates (grams)	Objective Saturated Fat Levels (grams)	Mean Difference Between Expectations and Objective Levels (% of Under/ Over Estimation)	Percent of Consumers Under (Over) Estimating Saturated Fat
Less Favorable Items:[g]	**457**	**2014**	**-1557(-341%)**	**93(7)**	**15**	**30**	**-15(-100%)**	**80(20)**
Fettuccini Alfredo	478	1030	-552(-115%)	88(12)	13	48	-35(-269%)	95(5)
Hamburger & Fries	523	1270	-747(-143%)	87(13)	17	29	-12(-71%)	77(23)
Chicken Fajitas	451	3660	-3209(-712%)	99(1)	14	19	-5(-36%)	67(33)
Chef Salad	328	2510	-2182(-665%)	99(1)	9	18	-9(-100%)	82(18)
Patty Melt	504	1600	-1096(-217%)	93(7)	20	37	-17(-85%)	80(20)
More Favorable Items:	**333**	**1180**	**-847(-254%)**	**92(8)**	**11**	**6**	**+5(45%)**	**30(70)**
Chicken Breast	321	820	-499(-155%)	88(12)	10	5	+5(50%)	27(73)
Pot Roast	425	1310	-885(-208%)	92(8)	15	11	+4(27%)	47(53)
Turkey Sandwich	254	1410	-1156(-455%)	96(4)	7	2	+5(71%)	17(83)
Very Unfavorable Item:	**537**	**4890**	**-4353(-811%)**	**99(1)**	**21**	**91**	**-70(-333%)**	**93(7)**
Cheese Fries	537	4890	-4353(-811%)	99(1)	21	91	-70(-333%)	93(7)

e This is the difference between consumers' sodium estimates and the objective levels determined by laboratory testing. The percentage (shown in parentheses) is the mean difference divided by consumers' expectations (e.g., -1557/457 = -341%).

f Percentage of participants who underestimated (overestimated) the actual sodium levels for each item.

g Numbers in bold are averages for each of the three categories; the recommended daily value is 2400mg for sodium and 20g for saturated fat, based on a 2000 calorie diet.

Table 2---Study 2: Means (Standard Deviations) for Purchase Intentions and Product Evaluation Dependent Variables for Nutrition Information Provision Conditions

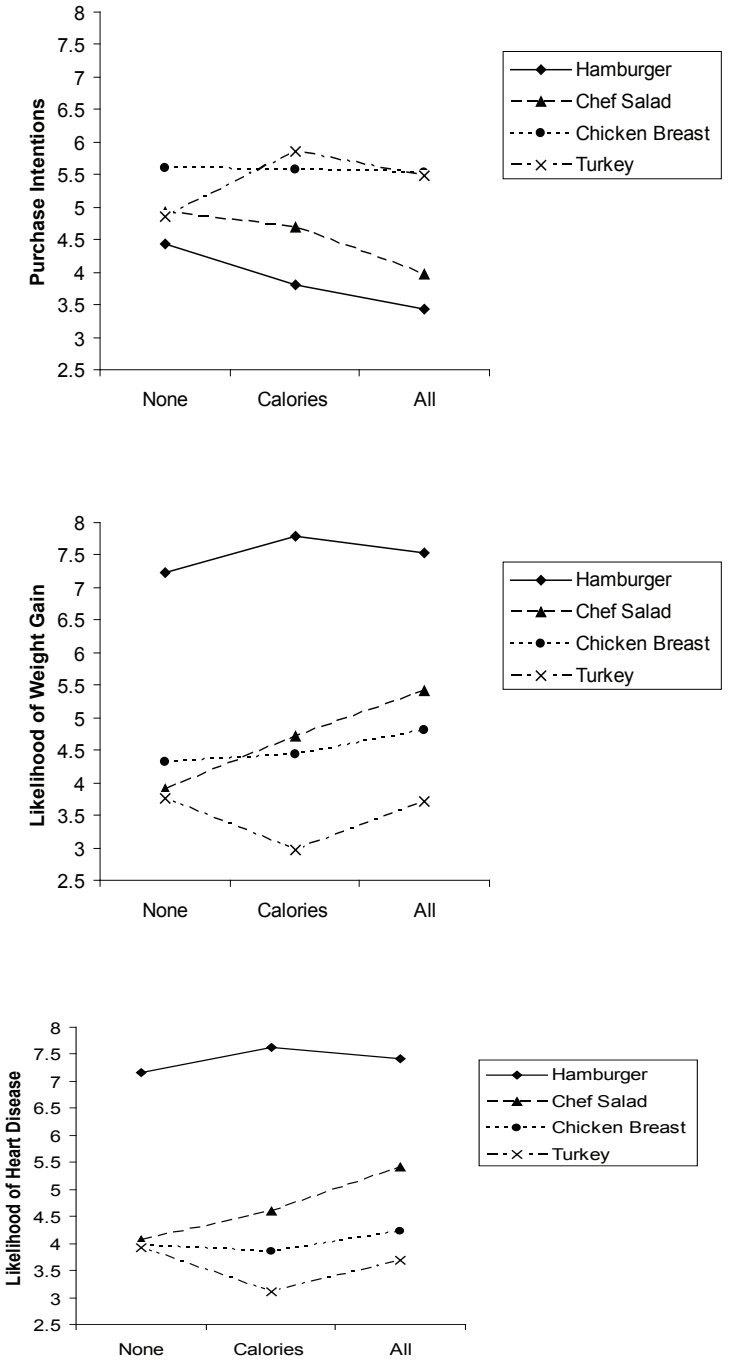
Dependent Measures for Nutrition Information Provision Conditions	Items Less Consistent with Nutrition Expectations		Items More Consistent with Nutrition Expectations	
	Chef Salad	Hamburger & French Fries	Grilled Chicken Breast & Baked Potato	Turkey Sandwich
Product Attitude				
No Nutrition Information	5.37 (1.8)	4.46 (1.8)	5.66 (1.4)	5.25 (1.6)
Calories Only	5.18 (1.6)	4.16 (1.9)	5.80 (1.3)	6.02 (1.4)
Calories & Nutrients	4.38 (1.9)	3.72 (2.0)	5.52 (1.5)	5.64 (1.5)
Purchase Intentions				
No Nutrition Information	4.92 (1.7)	4.44 (2.1)	5.59 (1.6)	4.86 (1.9)
Calories Only	4.68 (1.7)	3.80 (2.1)	5.58 (1.6)	5.86 (1.5)
Calories & Nutrients	3.97 (2.0)	3.43 (2.1)	5.55 (1.7)	5.48 (1.7)
Perceived Likelihood of Weight Gain				
No Nutrition Information	3.89 (2.0)	7.24 (1.9)	4.32 (1.9)	3.75 (2.0)
Calories Only	4.71 (2.3)	7.80 (1.8)	4.43 (1.8)	2.97 (1.7)
Calories & Nutrients	5.42 (2.3)	7.53 (1.8)	4.80 (1.7)	3.72 (1.8)
Perceived Likelihood of Heart Disease				
No Nutrition Information	4.05 (1.8)	7.17 (1.6)	3.97 (1.7)	3.92 (1.9)
Calories Only	4.59 (2.1)	7.62 (1.6)	3.86 (1.8)	3.10 (2.0)
Calories & Nutrients	5.42 (2.1)	7.41 (1.5)	4.23 (1.6)	3.70 (1.9)

Table 3--- Study 2: Effects on Purchase Intention and Product Evaluation Dependent Variables

	MANOVA Results		Univariate F Values			
Independent Variables	**Wilks' Lambda**	**F-Value**	**Product Attitude**	**Purchase Likelihood**	**Weight Gain Perceptions**	**Heart Disease Perceptions**
Nutrition Information (NI)	.93	1.9	4.2**	2.9	4.2**	3.5**
Daily Value Information (DVI)	.98	1.2	2.9	0.9	0.0	0.7
Item Type (IT)	.40	60.0***	56.6***	47.9***	218.4***	231.8***
NI x IT	.91	2.5***	4.0***	5.2***	4.8***	4.6***
NI x DVI	.94	1.8	2.2	1.4	0.4	0.1
DVI x IT	.98	1.1	1.4	2.4	0.3	1.2
NI x IT x DVI	.97	0.9	2.0	1.1	0.9	0.9

***p < .01
**p < .05

Figure 1---Study 2: Effects of Nutrition Information Provision Across Menu Items More and Less Consistent with Consumers' Nutrition Expectations [a]



[a] For the hamburger platter and chef salad, consumers' calorie and nutrient expectations (assessed in Study 1) generally were less consistent with objective levels than were the chicken breast dinner and turkey sandwich items.

Appendix: Items and Reliabilities for Multi-Item Measures used in Study 2

Attitude Towards the Product:

Based on the information shown on the menu, what is your overall attitude toward each of the four products below? (Endpoints used were: Favorable - Unfavorable; Good - Bad; and Positive-Negative.)[17]

Coefficient alpha reliability estimates for the (1) hamburger with French fries, (2) chef salad, (3) grilled chicken breast with baked potato, and (4) turkey sandwich are .97, .96, .98, and .97, respectively.

Purchase Intentions:

How likely would you be to purchase each of these items, given the information shown on the menu? (Endpoints used were: Very Likely - Not Likely.) Assuming you were interested in buying one of these four menu items, how probable is it that you would purchase the item, given the information shown on the menu? (Endpoints used were: Very Probable - Not Probable.) [17]

Coefficient alpha reliability estimates across the four menu product categories range between .91 and .93.

Consumers' Perceptions of the Likelihood of Weight Gain and Heart Disease:

If you ate this product regularly as part of your diet, do you think each menu item would increase or decrease the likelihood of (gaining weight / having heart disease)? (Endpoints used were: Would Decrease the Likelihood -Would Increase the Likelihood.) [14]

Nurse Anesthesia
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Chapter 7
Inhalation Anesthetics

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Historically, major advances have been made in the development of inhalation anesthetics (**Table 7-1**). In 1800 the anesthetic property of nitrous oxide (N_2O) was first recognized by Humphry Davy. He achieved pain relief from a toothache while inhaling N_2O and later described the experience as one of merriment and exhilaration. Humphry Davy also predicted that N_2O could be used to advantage during surgical operations.[1] It is surprising to note that his nineteenth-century prediction not only came to pass but also remains true today. The predominant reason for this is the pharmacokinetic profile that N_2O possesses.

TABLE 7-1 History of the Introduction of Inhalational Anesthetics

Anesthetic	Year(s) Introduced
N_2O	1840s
Ether	
Chloroform	
Cyclopropane	1930s
Fluroxene	1951
Halothane	1956
Methoxyflurane	1960
Enflurane	1973
Isoflurane	1981
Desflurane	1993
Sevoflurane	1995

The present-day use of N_2O can be credited to Edmund Andrews, a professor of surgery in Chicago. In 1868 he declared that a safer anesthetic could result from combining oxygen (O_2) with N_2O.[2] Before that time N_2O was administered through a mouthpiece with a nose clamp to prevent the rebreathing of air.

One of the earliest "complete" anesthetic agents used was diethyl ether (C_2H_5—O—C_2H_5). The first ether anesthetic was administered in Georgia in March 1842 when C.W. Long anesthetized a patient for a minor operation.[3] However, the recognition of numerous unfavorable characteristics (excessive secretions with inhalation induction, laryngospasm, excessive depths of anesthesia) promoted its disappearance from clinical practice as newer agents were subsequently developed.

In the 1930s research into potential anesthetic agents was based on the principle of a structure-activity relationship.[4] One of the earliest inhalation anesthetics developed in this manner was divinyl ether. Halothane was introduced into clinical practice in 1956 by Bryce-Smith and O'Brien in Oxford[5] and Johnstone in Manchester[6] and represented a significant advancement in inhalation anesthesia. Its sweet odor, nonflammability, and high potency offered clinical characteristics that were absent from the previous inhaled anesthetics. The search for newer and improved inhalation anesthetics persisted as concerns with hepatotoxicity and arrhythmogenicity of this alkane derivative began to be documented.

The two most recently released inhalation agents, sevoflurane (synthesized by Regan in the late 1960s) and desflurane (the 653rd compound of over 700 synthesized by Terrell and colleagues between 1959 and 1966), have become accepted by many anesthesia providers as viable anesthetics for a diverse surgical population based on their pharmacokinetic profile. What remains as a significant variable in determining the use of sevoflurane and desflurane among anesthesia providers is the cost (relative to isoflurane) versus clinical benefit to the patient. Some properties of an ideal anesthetic agent are listed in **Box 7-1**.

BOX 7-1 Properties of the Ideal Inhalation Anesthetic Agent*

- It should have a pleasant odor, be nonirritating to the respiratory tract, and result in pleasant and rapid induction of anesthesia.
- It should possess a low blood-gas solubility, which permits rapid induction of and rapid recovery from anesthesia.
- It should be chemically stable in storage and should not interact with the material of the anesthetic machine and circuits or with soda lime.
- It should be neither flammable nor explosive.
- It should be capable of producing unconsciousness with analgesia and preferably some degree of muscle relaxation.
- It should be sufficiently potent to allow the use of high inspired oxygen concentrations when necessary.
- It should not be metabolized in the body, should exert no systemic toxicity, and should not provoke allergic reactions.
- It should produce minimal and predictable depression of the cardiovascular and respiratory systems and should not interact with other drugs used commonly during anesthesia, e.g., pressor agents or catecholamines.
- It should be completely inert and eliminated completely and rapidly in an unchanged form via the lungs.
- It should be easy to administer using standard vaporizers.
- It should have a reasonable cost.
- It should not be epileptogenic or raise intracranial pressure.

**None of the inhalation anesthetic agents approaches the standards required of the ideal agent.*
Modified from Aitkenhead AR, Rowbotham DF, Smith G. Inhalation anaesthetic agents. In: Textbook of Anaesthesia. 4th ed. Edinburgh: Churchill Livingstone; 2001; and Bovill JG, Howie MB. Inhalational anaesthetics. In: Clinical Pharmacology for Anaesthetics. *London: Saunders; 1999.*

Relationship Of Chemical Structure And Agent Characteristics

An understanding of the chemical structure of inhalation agents provides insight into their physical properties such as flammability. However, the relationship between the pharmacologic characteristics (e.g., arrhythmogenic properties) and chemical structure of agents is not as predictable. This section reviews the structure-activity relationship of anesthetic vapors and their clinical relevance. Some selected physical and chemical properties are listed in **Table 7-2**.

TABLE 7-2 Select Properties of Volatile Anesthetics

Property	Halothane	Isoflurane	Desflurane	Sevoflurane	Nitrous oxide
MAC in O_2 30-60 yr at 37°C (EC_{50}; % atmosphere)	0.75	1.17	6.6	1.8	104
MAC in 60-70% N_2O (%)	0.29	0.56	2.38	0.66	
MAC > 65 yr (%)	0.64	1.0	5.17	1.45	
Blood-gas partition coefficient	2.5	1.46	0.42	0.65	0.46
Oil-gas partition coefficient	224	91	19	47	1.4
Specific gravity (g/ml)	1.87	1.50	1.47	1.50	NA
Boiling point (°C)	50	49	24	59	−88
Vapor pressure (mm Hg, 20° C)	243	238	669	157	Gas
Molecular weight (daltons)	197	184	168	200	44
Preservative	Thymol	None	None	None	None
Stability in CO_2 absorbers	Stable	Stable	Stable	No	Stable
Extent metabolized (%)	12-25	0.2	0.02	2-5	

EC_{50}, *effective concentration in 50% of the population;* MAC, *minimum alveolar concentration.*
Modified from Aitkenhead AR, Rowbotham DF, Smith G. Inhalation anaesthetic agents. In: Textbook of Anaesthesia. *4th ed. Edinburgh: Churchill Livingstone; 2001; and Lerman J. Pharmacokinetics of inhalation anesthetics. In Hemmings H, Hopkins P:* Foundation of Anesthesia Basic and Clinical Sciences. *London: Mosby; 2000.*

All commonly used inhalation agents are ethers (R—O—R) or aliphatic hydrocarbons (straight-chained or branched nonaromatic hydrocarbons) with no more than four carbon atoms (**Fig. 7-1**). The length of the anesthetic molecule is significant in that immobility (anesthetic effect) is attenuated or lost if carbon atom chain length exceeds a distance of four or five carbon atoms (5 angstroms [A]).[7] The molecular shape of the agents is spherical or cylindrical with a length less than 1.5 times the diameter.[8]

Of primary importance to the development of volatile agents was the discovery of the impact of halogenation of organic compounds. Halogenation of hydrocarbons and ethers (the addition of fluorine [F], chlorine [Cl], bromine [Br], or iodine [I]) influences anesthetic potency, arrhythmogenic properties, flammability, and chemical stability (e.g., oxidation during storage and reactions with bases).

Anesthetic potency has been shown to increase when a halogen with a lower atomic mass unit (amu) is replaced by a heavier halogen (e.g., Br at 80 amu substituted for F at 19 amu).[9-11] Nonetheless, a ceiling effect exists with halogenation of anesthetic compounds. For example, adding F atoms to ether results in a continuum in which the ether becomes more potent, then acts as a strong convulsant, and finally changes to an inert compound with full fluorination.[12]

In general, the potency of volatile agents has also been found to correlate with the physical property of lipid solubility. A decline in potency (meaning an *increase* in the minimum alveolar concentration [MAC] of volatile agents) is associated with a proportional decrease in oil/gas partition coefficient values. Exceptions to this principle exist and demonstrate that the correlation between potency and lipid solubility is not perfect.

With regard to arrhythmogenic properties, increasing the number of halogen atoms within a volatile agent favors the genesis of cardiac dysrhythmias.[12] Nevertheless, alkanes that contain five halogens (e.g., halothane) are more prone to induce arrhythmias than ethers with six halogen atoms (e.g., enflurane, isoflurane).[13] Ether molecules also contain oxygen, which reduces arrythmogenic effects.

Flammability is reduced and chemical stability enhanced by substituting hydrogen atoms with halogens. The epitome of this relationship is demonstrated with desflurane, a compound that contains fluorine as its only halogen and thus strongly resists biodegradation; desflurane is metabolized one tenth as much as isoflurane.[14, 15]

Metabolism

As stated previously, the chemical structure of each inhalation agent determines the extent to which each volatile agent is metabolized. In general increasing the number of fluorine atoms to an anesthetic molecule retards biodegradation (halothane has 3 and desflurane has 6). **Table 7-2** depicts the degree to which each of the modern fluorinated inhalation agents are biodegraded. The two ends of the spectrum are represented by halothane (15% to 25% metabolized)[16-21] and desflurane (0.02% metabolized).[14, 21] The latter anesthetic has been shown to resist biodegradation even after 7.35 MAC-hours; as determined by peak mean urinary excretion rate of trifluoroacetic acid (TFA). This metabolite (TFA) is recognized as being a sensitive marker of desflurane metabolism.[22]

The biodegradation of all currently used volatile anesthetics is predominantly by way of hepatic metabolism through oxidation (phase I).[23] Halothane is unique in that it can also be metabolized by an alternative reductive pathway.[24] Sevoflurane has been used in the United States since 1995. Its biotransformation and lack of nephrotoxicity[25] are reviewed later in this chapter.

Pharmacodynamics

Mechanisms of Action

The following properties of anesthetics must be taken into account when developing a theory that attempts to explain their mechanism of action:

1. Lipid solubility is directly proportional to potency (Meyer-Overton rule).[26, 27]
2. Reversal of anesthetic effect can be achieved with the application of pressure, with some exceptions (species variation).[28]
3. No common chemical structure for the variety of compounds capable of producing anesthesia.
4. The molecular and structural changes responsible for producing anesthesia must occur within seconds and be reversible.
5. A reduction in body temperature lowers anesthetic requirements.

In keeping with most of these prerequisites is the *unitary hypothesis*. This theory proposes that all inhalation anesthetics work via a *similar* (undefined) *mechanism of action* but not necessarily at the same site of action. One factor that supports this hypothesis is the Meyer-Overton correlation, which recognizes that the more lipid soluble the agent, the greater its potency (the lower its MAC value). This correlation suggests that anesthesia is produced by the volume of anesthetic molecules present (dissolved) at the site, not by the type of volatile agent present. The additive effect observed among different anesthetics also supports the unitary hypothesis by suggesting independent sites of action.[29]; nonetheless, disagreement remains regarding the validity of the unitary hypothesis.[30]

Research of the mechanism of action of volatile agents has caused some investigations to advocate for the redefining of the term *anesthesia*. A parsimonious view of inhalation anesthesia corresponds to compounds that produce amnesia and immobility in response to noxious stimuli. Amnesia in this context is defined as being unaware of one's environment or the inability to recall a previous episode of awareness. Any agent that produces both characteristics is termed a

full anesthetic, and drugs that cause amnesia alone are termed *nonimmobilizers and nonanesthetics*.[31] The other traditional characteristics of an anesthetic state (analgesia, skeletal muscle relaxation) are viewed as "side effects" that are not essential to what defines anesthesia.[32] For clarification, this does not mean these "side effects" are of no concern to the anesthesia provider. Quite the contrary, adequate modulation of a patient's sympathetic response to painful stimuli can determine the success or failure of some anesthetics.

Research has permitted the description of the mechanism of action of inhaled anesthetics relative to distinct anatomical regions of the body and molecular changes. The spinal cord is known to mediate immobility to a painful stimulus via several mechanism including 1) enhancing background K^+ currents in tandem pore domain weak inward rectifying K^+ channels (TWIK)[33, 34] and 2) reducing spontaneous action potential firing of spinal neurons via glycine receptors and γ-aminobutyric acid type A [GABAA]) receptors.[35] Investigators have also demonstrated nonimmobilizers with lipophilic characteristics (e.g., perfluoropentane) are able to produce amnesia but not immobility to noxious stimuli, which suggests two separate sites and mechanisms of anesthetic action for some drugs.[36] In contrast with other research, spinal and cerebral GABAA receptors (same receptor-clinical effect) were shown to contribute to volatile anesthetic's ability to produce immobility; therefore the anesthetic effect of immobility is modulated at the spinal cord and supraspinal level.[37] In summary, research has validated the concept of a distinct anatomical division for the mechanism of action of volatile agents as being oversimplistic (and inaccurate); one example being the isolation of TWIK (a member of the tandem pore domain K channel family) in both the spinal cord and brain.[33] Clearly supraspinal areas of the nervous system are recognized to mediate amnesia and immobility.[33, 37-39]

Other specific anatomic sites where volatile anesthetics produce an effect include the reticular formation within the brainstem,[40] cerebral cortex,[41] and hippocampus.[42] Evidence of changes in cortical activity by volatile agents includes the alteration in electroencephalogram (EEG) activity. All inhalation agents cause a dose-dependent change in the EEG - an initial increase in voltage (and decrease in frequency), then a peak, followed by a decline.[43, 44] Deeper levels of anesthesia produce burst suppression and eventually a flat EEG.[45] Nonspecific generalized EEG changes may also persist for several days postoperatively.[46]

Increased or decreased neuronal excitability and enhanced or depressed inhibitory postsynaptic currents can occur, depending on which anesthetic agent or specific area within the CNS is manipulated. In addition to supraspinal effects, modulation of afferent and efferent impulses within the spinal cord has also occurred with volatile anesthetics.[47, 48]

On a molecular level, researchers have found that the most likely site of action for volatile anesthetics involves interactions with membrane proteins in specific receptors (stereoselective) and not perturbation of lipid bilayers.[49-51] The primary receptor within the CNS that is believed to modulate anesthetic effects is the GABA receptor, specifically the subtype A.[38, 39, 52] This receptor is located abundantly in the CNS and is a ligand-gated chloride (Cl-) ion channel.[53] Agonism of this receptor by full anesthetics (volatile agents) results in enhanced Cl- conductance,[54] which leads to *inhibitory* actions on local neurons.[53] Ultimately, what is expressed is an extension of the amount of time the Cl- channel remains open.[68] In contrast to full anesthetics, nonimmobilizers do not enhance the effect of GABA on these receptors. Neuronal nicotinic acetylcholine receptors (nAChRs) have also been shown to be highly sensitive to inhalational anesthetics and are believed to significantly influence several stages of anesthesia.[55]

An investigation by Kaech and colleagues revealed a new anesthetic site of action within the CNS; chloroform, diethylether, methoxyflurane, halothane, enflurane, and isoflurane were each shown (in clinically relevant concentrations) to block the morphologic plasticity of dendritic spines.[56] Prior research has demonstrated that dendritic spines can change shape in seconds.[57] This phenomenon occurs secondary to motile actin, which is abundant in the spines.[58] These volatile agents were found to strongly inhibit actin motility, which blocked changes in dendritic spine shape (**Fig. 7-2**); the inhibition was fully reversed after removal of the agents. The dendritic spines serve as excitatory postsynaptic contact sites.[59] They are extremely abundant in the cerebral cortex (greater than 1013) and are also located in large numbers in the cerebellum, basal ganglia, and olfactory bulb.[60] The details of how these rapid morphologic changes in dendritic spines contribute to an anesthetic state are unclear and merit further research.

The CNS effects of amnesia and loss of consciousness likely are produced separately from the immobility conceptualized in the theory of MAC.[61] The concept of MAC refers to the concentration required to prevent movement in response to a surgical situation. This is the result of an effect at the spinal cord level via glycine, 5-hydroxytriptamine$_{2A}$, sodium, and *N*-methyl-D-asparate receptor action. Potassium, α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic (AMPA) and kainate, GABA, opioid, α_2-, $5HT_3$, and acetylcholine receptors are likely not involved in producing immobility. They may be involved in varying degrees in the amnestic and anesthetic effects in the CNS.

Minimum Alveolar Concentration

A useful means of comparing the potencies of inhalation agents is to use the concept of MAC, defined as the minimum alveolar concentration at equilibrium (expressed as a percentage of 1 atmosphere) in which 50% of subjects will not respond to a painful stimuli (i.e., initial surgical skin incision).[62] The response is defined as gross, *purposeful* movement of the head or extremities. The MAC values for the modern inhalation agents are listed in **Table 7-3**.[63-67]

TABLE 7-3 Potencies of Volatile Anesthetics in Humans with and without N_2O Expressed in MAC and MAPP Values*

Anesthetic	†MAC (MAPP)	In 60-70% N_2O MAC (MAPP)
Nitrous oxide	104 (798)	—
Desflurane	6.6 (50.16)	2.38 (18.08)
Sevoflurane	1.8 (13.68)	0.66 (5.01)
Isoflurane	1.17 (8.89)	0.56 (4.25)
Halothane	0.75 (5.7)	0.29 (2.20)

FiO_2, *Fraction of inspired oxygen;* MAC, *minimum alveolar concentration;* MAPP, *minimum alveolar partial pressure;* N_2O, *nitrous oxide.*
**MAC is expressed as volume percent of end-tidal gas at standard pressure. MAPP is calculated as MAC value times 760 mm Hg ÷ 100 (expressed in mm Hg).*
†Age 30 to 60 years.

The MAC of volatile agents can be affected by numerous factors, surprisingly even hair color.[68, 69] With increasing age the MAC of all inhaled anesthetics is reduced; in humans mean age 18 to 30 years the MAC of desflurane is 7.25% in contrast to being 6% in humans 30 to 55 years of age.67 Infants represent an exception to the MAC-age concept in that their anesthetic requirements exceed those of neonates. Box 7-2 lists variables shown to reduce and increase MAC.

BOX 7-2 Relationship of Physiologic and Pharmacologic Factors to the MAC of Inhaled Anesthetics

Factors That Reduce MAC
Increase in age
Hypothermia
Administration of depressant medications (e.g., opioids, opioid agonist-antagonist analgesics, benzodiazepines, barbiturates, chlorpromazine, hydroxyzine)
α_2 Agonists
Acute ethanol consumption
Metabolic acidosis
Hypoxemia
Anemia (< 4.3 mL O_2/dL blood)
Hypotension (MAP < 50 mmHg)
Hyponatremia
Pregnancy
N_2O, ketamine, verapamil, lidocaine, clonidine, alpha-methyl dopa, reserpine, chronic dextroamphetamine use, lithium, levodopa
Factors That Increase MAC
Decrease in age
Hyperthermia
Hyperthyroidism
Hypernatremia
Chronic alcohol consumption
Acute administration of dextroamphetamine
Monoamine oxidase inhibitors
Cocaine, levodopa
Factors with No Effect on MAC
Duration of anesthesia
Gender
Redheaded females
Hypocarbia and hypercarbia
Metabolic alkalosis
Hypertension
Administration of propranolol, isoproterenol, promethazine, naloxone, aminophylline, and neuromuscular blocking agents.
MAC, Minimum alveolar concentration; N2O, nitrous oxide.

Two other areas related to MAC are MAC-awake and MAC-BAR (block adrenergic response). *MAC-awake* is defined as the minimum alveolar concentration at which 50% of subjects will respond to the command "open your eyes."[70] It has also been described as the anesthetic concentration that is between the end-tidal values that allow and prevent response to a command.[70] This end-tidal concentration is usually associated with a loss of recall and encompasses approximately one third of MAC values. MAC-awake can also be used in combination with MAC values to evaluate the potency of

each agent with regard to amnestic properties. This is done by dividing MAC-awake by MAC (MAC-awake:MAC ratio). This parameter indicates that agents with ratios between 0.3 and 0.4 (e.g., desflurane, sevoflurane, isoflurane) are considered potent anesthetics. In contrast, N2O, which has a ratio of 0.64, is considered a weak amnestic agent.

The MAC-BAR parameter represents the MAC necessary to block the adrenergic response (e.g., changes in plasma norepinephrine concentration, heart rate [HR], rate-pressure product, and mean arterial pressure) to skin incision. It can be expressed as a MAC-BAR_{50} or MAC-BAR_{95}. The former is similar to AD_{95} values which represent the anesthetic dose that inhibits somatic evidence of light anesthesia in 95% of subjects in response to skin incision. Established MAC-BAR_{50} values for volatile agents include (in 60% N_2O) 1.45 MAC (0.75% ´ 1.5 = 1.125%) for halothane,[71] and 1.3 MAC for both isoflurane and desflurane.[72] The MAC-BAR_{50} for sevoflurane in 66% N_2O is 2.2.[73] The MAC-BAR_{95} of halothane is 2.1 and 2.6 for enflurane.[71] It should be emphasized that MAC-BAR values exceed the requirements for ablation of skeletal muscle movement with surgical stimulation; therefore, blocking an adrenergic response requires a greater depth of anesthesia than preventing skeletal muscle movement.[74] From a clinical standpoint, patients usually require anesthetic concentrations that exceed MAC by 20% to 30% (1.2 to 1.3 times MAC). At this alveolar concentration somatic evidence of light anesthesia will commonly be abated and fewer patients will respond adrenergically to the stresses of surgery.[74]

The concept of MAC has limitations when applied clinically to determine adequacy of anesthesia. It should be viewed as a general guide to the overall depth of anesthesia. One variable that restricts its application is the frequency at which surgical patients receive muscle relaxants, which attenuates the recognition of skeletal muscle movement in response to light planes of anesthesia. This results in the dependence of anesthesia providers on other traditional signs of anesthetic depth, such as changes in HR, blood pressure, pupillary size, and sweating. Unfortunately, a light plane of anesthesia can exist even with a decreased blood pressure and a normal heart rate (e.g., patients with limited cardiac reserve). Pupillary changes can also be affected by opioids (miosis) and volatile agents (mydriasis) over time, even in the absence of surgical stimuli.[75] Also, the usefulness of a traditional clinical end-point as a guide to depth of anesthesia can change over time. For example, one investigator found that decreases in blood pressure served as an estimate of anesthetic depth during the first hour of an anesthetic, but after 5 hours they were unreliable--further declines in blood pressure did not occur even with increasing concentrations of halothane.[76] The challenge to the anesthesia provider is to estimate anesthetic depth based on a collation of variables (heart rate, blood pressure, synergistic and additive effects of anesthetic adjuvants, volume status, physiologic reserve, MAC, MAC-BAR, and MAC intubation values). The last variable (MAC intubation) is similar to MAC-BAR in that its values exceed the anesthetic requirements for surgical skin incision. Clearly, different stimuli require different end-tidal concentrations (brain anesthetic partial pressures) of volatile anesthetics.[77]

Influence of Inhalation Agents on Organs and Systems

Central Nervous System

The volatile agents can adversely affect the care provided to patients with CNS pathology. Such effects include areas related to intracranial compliance, autoregulation of cerebral blood flow (CBF; e.g., cerebrovascular reactivity to carbon dioxide [CO_2]), cerebral metabolic rate, cerebrospinal fluid pressure (CSFP), and neurologic assessment.

Cerebral Metabolic Rate and Cerebral Blood Flow

In general volatile agents decrease cerebral metabolic rate of O_2 consumption ($CMRO_2$) in a dose-dependent manner whereas their effect on cerebral blood flow is variable; the latter has been reported by various researchers to be unchanged [78] increased (dose-dependent and time-dependent manner),[79, 80] or decreased.[81] When vascular resistance is decreased, CBF, cerebral blood volume (CBV), and CSFP increase. The order of potency for increasing CBF varies; it is affected by the dose of volatile anesthetic,[82] the administration of other drugs (e.g., propofol, N_2O),[83] the rate of change in end-tidal concentration of agent,[79] and the animal model used.84 In other cases, differences in research findings lack a plausible explanation. A distinct picture of a homogeneous versus heterogeneous change in CBF, $CMRO_2$, and other anesthetic effects of volatile agents has been noted[85] For example, halothane has been shown to globally increases CBF, whereas isoflurane's sphere of influence predominates in the subcortical regions and hindbrain structures[86] (**Figure 7-3**).

Uncoupling of Cerebral Blood Flow and Metabolism

When decreases in $CMRO_2$ are accompanied by increases in CBF, uncoupling is said to occur. As noted above, volatile anesthetics are capable of producing this effect. This paradoxic response (decreased $CMRO_2$ occurring in conjunction with increased CBF) seems not to occur with 1.0 MAC or less of halothane and isoflurane;[87] the magnitude of change is variable and dose dependent, meaning some flow-metabolism coupling mechanism is preserved.[88-90]

Nitrous oxide reduces cerebrovascular tone significantly. This effect is unmasked and enhanced when N_2O is combined with a volatile anesthetic (decreased autoregulation)[91] The mechanism for increased CBF may be related to a sympathoadrenal-stimulating effect of N_2O.[92] The changes produced by N_2O in the $CMRO_2$ are the reverse of what

takes place with volatile agents (i.e., increased $CMRO_2$),[92] although other investigators have reported no effect.[93] Nevertheless, a general impression is that N_2O probably increases $CMRO_2$ and CBF. The combination of elevated CBF and $CMRO_2$ still results in an uncoupling between flow and metabolism, because in goats the increase in $CMRO_2$ exceeds, albeit slightly, the elevation in CBF.[94] In summary, N_2O use in neurosurgical procedures is acceptable as long as the anesthesia provider recognizes that its vasodilatory effects might adversely affect surgical outcome in patients with reduced intracranial compliance. Hyperventilation helps attenuate the increase in CBF that accompanies the use of N_2O.[95]

Cerebral Vasculature Responsiveness to CO_2

The normal physiologic response of the cerebral vasculature to CO_2 is to vasoconstrict in the presence of hypocapnia and vasodilate with hypercarbia. This reflex is effective in the acute setting when used during neurosurgical procedures to counteract drug-induced vasodilation and to reduce brain bulk within a closed compartment (cranial vault).[96] The usual goal for patients in which a reduction in intracranial volume is desired is a $PaCO_2$ of 30 to 35 mmHg with a duration of effectiveness being perhaps no more than 4 to 6 hours.[97]

Differences exist among the volatile agents in their ability to interfere with the cerebral vasculature's responsiveness to CO_2. Variables that affect the reported differences include the type of surgical procedure the patient is undergoing, associated pathophysiology, and the presence of any co-existing disease(s). For example, patients with hypertension given 1 MAC isoflurane with 67% N_2O have better control of CBF via manipulation of arterial CO_2 than those receiving 1 MAC sevoflurane with 67% N_2O.[98] Similar results have been reported by other investigators.[99] In contrast, CO_2 reactivity in insulin-dependent patients is equally impaired by 1 MAC isoflurane and 1 MAC sevoflurane- each given with 67% nitrous oxide[100]. Others have suggested that sevoflurane is less vasoactive than halothane, isoflurane, and desflurane; and recommend it as a good alternative to propofol in patients with normal intracranial pressure.[101] It has also been reported to better preserve dynamic cerebral autoregulation than isoflurane when both are given at 1.5 MAC in combination with 100% O_2.[102] Desflurane administered to patients undergoing craniotomy for tumor resection with an air-O_2 mixture at 1.0 to 1.5 MAC has been shown to act similarly to isoflurane and maintain cerebrovascular reactivity to CO_2 and cerebrospinal fluid pressure .[103-105] These research findings suggest that increases in CBF produced by isoflurane,[104] desflurane,[104] and sevoflurane[106] can be effectively prevented by hyperventilation and using concentrations less than 1.0 to 1.5 MAC.

Electroencephalogram and Evoked Potentials

The volatile agents produce a dose-related suppression of EEG activity (initial increase [later a decline] in amplitude and decreased frequency) and at high concentrations produce electrical quiescence.[107] At deeper levels of anesthesia the EEG may temporarily stop recording; at such time burst suppression is said to have occurred. The effect of anesthetic agents on evoked potential is given in **Box 26-4**.

For those procedures requiring monitoring of the integrity of the spinal cord or mapping of cortical regions of the brain, the anesthetist should be aware that inhalation agents can skew cortical somatosenory, motor, brain-stem auditory, and visual evoked potentials. Isoflurane, desflurane, sevoflurane, and N_2O produce a dose-dependent reduction in these evoked potentials with visual evoked potentials being most sensitive and brainstem evoked potentials the most resistant.[97, 107, 108] Two evoked potential variables commonly assessed are latency and amplitude. An increase in latency or decrease in amplitude of evoked potentials can reflect ischemia or be secondary to the volatile agent. Latency is the time between the initiation of a peripheral stimulus (e.g., electrical stimulation of the median nerve at the wrist) and onset of the evoked potential (e.g., cortical) recorded by scalp electrodes.

Isoflurane has been shown to interfere with the recording of cortical somatosensory evoked potentials (cSSEP) at light planes of anesthesia (0.5 MAC with 60% N_2O)[109] and desflurane and sevoflurane at 1.5 MAC (without N_2O).[97] Of these three agents, isoflurane produces the greatest reduction in cSSEP amplitude while no difference exists among the volatile anesthetics' effect on latency.[110] The addition of N_2O to isoflurane, desflurane, and sevoflurane can also produce a significant reduction in the amplitude of cSSEPs.[111, 112] It may be prudent to avoid the use of this agent in patients who have baseline low amplitude evoked potentials.

Sevoflurane,[113, 114] unlike desflurane [115] and isoflurane,[43] can predispose pediatric and adult patients to epileptic activity, even though sevoflurane[116-119] can suppress drug-induced convulsive activity in a manner similar to desflurane[120] and isoflurane.[118] Sevoflurane combined with N_2O has produced epileptiform EEG activity during inhalation induction with adults in a single-breath technique.[121] A hyperdynamic response can accompany the EEG changes if concurrent hyperventilation occurs.[121] The incidence of epileptiform EEG changes has been shown to nearly double in the presence of hypocapnia (100% versus 47%).[121] Similar results have been observed in children aged 2 to 12 years.[113] In contrast, intravenous induction with thiopental followed by anesthetic maintenance with 2% end-tidal sevoflurane in air does not produce seizure-like changes in the EEG in children.[114] Epileptiform activity has also been reported to occur during the emergence from sevoflurane.[122]

Emergence and Neurologic Assessment

Although the objective of a smooth and rapid emergence from a general anesthetic is desirable for all surgical patients, it is especially meaningful for neurosurgical candidates. Delayed emergence in this specialty of anesthesia can have devastating consequences. A slow return of consciousness makes it difficult to perform the initial postoperative neurologic examination. It can also add to unnecessary therapeutic or diagnostic intervention and can predispose the patient to respiratory complications.[123]

Because of this, the bias of some anesthesia providers is to administer total intravenous anesthetic (TIVA) techniques such as propofol with remifentanil for neurosurgical procedures involving supratentorial tumors. Some investigators report a more rapid awakening (after approximately 2 hours of anesthesia) from TIVA in nonneurosurgical patients compared to sevoflurane and desflurane combined with N_2O[124]. Recovery profiles for sevoflurane and desflurane indicate they are superior to isoflurane.[125, 126] In side-by-side comparisons of desflurane and sevoflurane, desflurane permits for a more rapid awakening than sevoflurane in volunteers after 8 hours of exposure.[127] In contrast, sevoflurane allows for acute changes in vaporizer settings without evoking neurocirculatory excitation (significant increases in sympathetic nerve activity, norepinephrine concentrations, heart rate, and mean arterial blood pressure); of particular interest was the finding that desflurane's sympathomimetic response occurred in response to a controlled adjustment in vaporizer settings (i.e., changing from 6% to 9%)--that is, in the absence of overpressurization.[128] Sevoflurane may be preferred over desflurane if concentrations equal to or in excess of 1 MAC are used during neurological surgery.[79] One study also found no difference in early postoperative recovery and cognitive function between a balanced sevoflurane-fentanyl technique versus propofol-remifentanil (TIVA) management in patients undergoing supratentorial intracranial surgery.[129] Further research is necessary to clarify whether the use of one volatile agent over another or TIVA technique influences neurosurgery outcome. In addition, questions remain regarding the potential neuroprotective effect of currently used inhalational agents. Current research in rodents suggests a clinical benefit with the administration of isoflurane,[130] sevoflurane,[131, 132] and desflurane[133] following cerebral injury; although not all critiques of the literature support this premise.[134]

Cardiovascular System

All inhalation agents are capable of altering hemodynamics, the extent being related to various preoperative and intraoperative factors (e.g., American Society of Anesthesiologists physical status, coadministration of vasoactive drugs, opioids, barbiturates). This section reviews the influence of volatile agents on the cardiovascular system.

Systemic Hemodynamics

Halothane, isoflurane, desflurane, and sevoflurane all reduce mean arterial pressure (MAP) (**Fig. 7-4**) and cardiac output (CO) and cardiac index (CI) in a dose-dependent fashion.[128, 135-137] The mechanism by which each accomplishes this varies. For example, desflurane, sevoflurane, and isoflurane predominantly reduce MAP via a reduction in systemic vascular resistance (SVR), with the dose-response relationship being least with sevoflurane (**Fig. 7-5**).[128, 138] Halothane by comparison, causes less disruption in inherent vascular tone and therefore predominantly reduces MAP by direct myocardial depression versus a reduction in preload.[139] Nitrous oxide activates the sympathetic nervous system and increases SVR,[140] which can also lead to an increase in central venous pressure (CVP) and arterial pressure. This sympathetic nervous system response appears to be intact during co-administration of volatile agents.[135]

In general, N_2O used in combination with inhalation agents increases SVR and helps support arterial blood pressure.[141] In contrast, with opioids the addition of N_2O augments cardiac depression instead of supporting it[142] because N_2O also produces a direct negative inotropic effect. This property can be unmasked in patients with decreased left ventricular function secondary to coronary artery disease or valvular heart defects.[143] Desflurane supports CI better than halothane at both low and high MAC levels (i.e., 1.66 MAC)[144] (**Fig. 7-6**). With light levels of anesthesia, desflurane maintains the CI without an accompanied elevation in heart rate (HR). For deeper levels of anesthesia, the CI is probably supported by the associated rise in HR. Some investigators believe the favorable circulatory profile of desflurane, isoflurane, and sevoflurane results from their ability to attenuate the body's circulatory compensatory mechanisms in a dose-related manner.[128, 145] In summary, there is no appreciable difference in the ether anesthetics' ability to produce dose-dependent depression in arterial pressure and cardiac output. [135-137, 144]

Regarding the impact of the duration of anesthesia on hemodynamics, isoflurane, sevoflurane, and desflurane produce a similar response- that being as MAC-hours of anesthesia increase, CI and HR increase slightly.[135, 144] The CI effect may be secondary to a continued reduction in SVR and increase in HR following prolonged exposure to each of the agents. Protracted anesthesia (8 hours) in healthy volunteers anesthetized with desflurane and sevoflurane leads to an increase in pupil size and HR independent of surgery.[75] These changes are not associated with increases in plasma catecholamines, blood pressure, or CO_2 production; therefore mydriasis and tachycardia as signs of anesthetic depth could be misleading at times.

Although anesthetic changes produced at the cellular level have already been discussed, it is sensible to briefly review the cellular effects of inhaled anesthetics on the aforementioned areas of the cardiovascular system. In vitro and in vivo studies have revealed that isoflurane, sevoflurane, and desflurane reduce intracellular free Ca^{+2} concentrations in cardiac and vascular smooth muscle.[136, 137] The mechanism for this is believed to be a reduction in Ca^{+2} influx through the sarcolemma and a depression of depolarization-activated Ca^{+2} release from the sarcoplasmic reticulum.[136, 137, 146] The end result is a depression in the contractile state of the myocardium along with dilation of the peripheral vasculature. Other reported cellular effects of volatile agents include augmentation and attenuation of endothelium-derived relaxation factor, inhibition of acetylcholine-induced vascular relaxation,[147] and attenuation of Na^{+}-Ca^{2+} exchange that leads to a reduction in the quantity of intracellular Ca^{2+}.[148] Future research is needed to clarify the effect of volatile agents in patients with cardiovascular dysfunction (hypertension, diabetes, geriatric patients), in which vascular responses can be altered. In these populations (compared to patients with normal physiology) the mechanisms for regulating vascular tone at the cellular level are altered.

Heart Rate

Volatile agents and N_2O induce changes in HR relative to the concentration of the anesthetic being used. Alterations in HR are a result of several variables: antagonism of SA node automaticity,[149] modulation of baroreceptor reflex activity,[150] and sympathetic nervous system activation via activation of tacheopulmonary and systemic receptors.[151]

Halothane and sevoflurane produce only minor alterations in HR, even when used in excess of 1 MAC;[152] although a rapid and large increase in the inspired concentration (i.e., from 0.5 MAC to 2.9 MAC) of sevoflurane (and isoflurane) may produce an increase in plasma epinephrine concentrations.[153] Isoflurane and desflurane can cause an increase in HR;[154] and when more than 1 MAC of desflurane is used (even without overpressurization), the dose-response relationship becomes more prominent, particularly when compared with sevoflurane (Fig. 7-7).[128] Desflurane's steep dose-response to HR can potentially be problematic by diminishing the reliability of HR as a guide to anesthetic depth and by predisposing patient's at risk for coronary artery disease to myocardial ischemia secondary to an increase myocardial oxygen demand.

Research has shown pretreatment with fentanyl (1.5 µg/kg or 4.5 µg/kg) 5 min before an increase in end-tidal desflurane concentration from 4% to 8% modulates (not abolishes) an increase in HR by 61% and 70% respectively.155 In this same study increase in MAP was attenuated by 31% and 46%. Another group of investigators found 5 µg/kg of fentanyl followed by a continuous infusion of 2 µg/kg/hr initiated 12 minutes before induction significantly blunted the HR and MAP response to a rapid increase in end-tidal desflurane concentation (5.4% to 11%).156 The acute change in desflurane concentration occurred 20 minutes after intubation. Fentanyl's efficacy was also assessed two minutes after induction when desflurane was given in three incremental 1 minute steps (3.6%, 7.2%, 11%). Of interest was the finding that fentanyl was ineffective in diminishing the desflurane stimulatory effect during this induction period. Therefore the optimal use of fentanyl may be during steady-state periods of anesthesia when acute adjustments of desflurane are desired.

Esmolol (0.75 mg/kg) has been shown to attenuate HR response but not MAP and therefore may be less desirable than fentanyl.[155] Prior administration of intravenous lidocaine (1.5 mg/kg) has not been shown to be effective in modulating the sympathetic response associated with an acute change in desflurane end-tidal MAC value of 0.7 to 1.5.[157]

Coronary Blood Flow

The term *coronary steal* is defined as a reduction in perfusion of ischemic myocardium with simultaneous improvement of blood flow to nonischemic tissue. Simply stated, blood has been taken from the "poor" and given to the "rich" (a "reverse Robin Hood" syndrome). In addition, this phenomenon has been demonstrated to occur more easily with "coronary steal–prone anatomy" (i.e., multivessel disease models).158 Several articles have suggested that isoflurane and perhaps desflurane are capable of producing a coronary steal with clinically relevant concentrations,159 but other researchers have not found this to occur.160, 161 One investigator's results suggest that the use of 0.5% isoflurane in combination with 50% N2O might be protective to the myocardium (i.e., improve the tolerance to pacing-induced myocardial ischemia).162

An important qualifier to isoflurane's ability to maldistribute coronary blood flow is the presence of hypotension; when normotension is maintained, a steal phenomenon is abated.[163] Reduced blood flow to ischemic myocardium can also be reversed if normotension is reestablished with phenylephrine administration.[164] To summarize the effects of isoflurane, desflurane, and sevoflurane on the coronary circulation, it can be stated that each produces vasodilation, with sevoflurane doing so the least.[159, 165] In the presence of hypotension, a steal phenomenon can occur (as it can with inappropriate use of intravenous nitroglycerine or sodium nitroprusside), and this effect is reversible if normotension is reestablished. The magnitude of coronary vasodilation also is markedly less for isoflurane than that which occurs with dipyridamole[166] and the endogenous nucleoside, adenosine,[167] both of which produce coronary vasodilation even in the

presence of normotension. Any of these three volatile anesthetics can be used in patient's with a history of ischemic heart disease. If ECG monitoring demonstrates ST-segment or T-wave changes suggestive of myocardial ischemia (in the absence of abnormal hemodynamics) a change in primary anesthetic techniques may be warranted (e.g., substituting isoflurane for sevoflurane).[161]

As mentioned previously, volatile agents may produce a neuroprotective effect, similarly the heart appears to benefit from isoflurane, sevolfurane, and desflurane inhaled anesthetics via initiating the phenomenon of preconditioning.[168] Anesthetic preconditioning (APC) results in a cascade of intracellular events that help to protect the myocardium from ischemic and reperfusion insult- potentially limiting infarct size. The mechanism for this effect is multifactorial and includes such things as improving contractile function, preventing the down-regulation of major sarcoplasmic reticulum Ca^{+2} cycling proteins- thereby reducing calcium overload in the myocardial cells.[169] The latter effect has been shown to be independent of potassium-sensitive adenosine triphosphate (K_{ATP}) channels[169] and confers 30 to 40% of the cardioprotective effect produced by inhalational anesthetics.[170] On the molecular level sevoflurane has been found to produce in healthy male volunteers late preconditioning (24 to 48 hours after sevoflurane administration) as evidenced by altering gene expression in white blood cells (e.g., reduced proinflammatory L-selectin [CD62L] expression on granulocytes).[171] A potential application of APC, along with other cardioprotective substances such as insulin and adenosine, is administering preconditioning drugs during early coronary artery reperfusion as is currently done with antiplatelet and antithrombotic therapies.[172] Research has shown the administration of volatile agents during myocardial reperfusion activates a group of pro-survival kinases called the Reperfusion Injury Salvage Kinase (RISK) Pathway.[172] These pro-survival kinases produce potent cardioprotective effects.[172] The RISK pathway has also been found to be activated during ischemic preconditioning (a brief stimulus of myocardial ischemia/occlusion leading to cardioprotection).[172] Other factors that have been identified with preconditioning include protein kinase C activation of K_{ATP} channel opening, adenosine receptors (a_1 and a_2 subtypes), and inhibitory G proteins.[173-176] It has been advocated that sulfonylurea oral hyperglycemic drugs be discontinued 24 to 48 hours prior to elective surgery due to their ability to close K_{ATP} channels.[25, 177] Insulin is recommended as a replacement therapy during this time period to abate the negative impact of hyperglycemia on preconditioning.[177]

Dysrhythmias

The dysrhythmic potential of inhalation agents has long been recognized. All of the agents, with the exception of isoflurane and probably desflurane, are conducive to the development of bradycardias and disturbances in atrioventricular (AV) nodal conduction (excluding second- or third-degree AV block). The mechanism for this is their ability to depress slow-response (sinoatrial and atrioventricular nodal tissue) and fast-response (atrial or ventricular musculature, Purkinje fibers) action potentials. When fibers become ischemic or injured, the volatile agents (particularly halothane) are prone to produce reentrant excitation.[178, 179]

The ability of the volatile agents to reduce the quantity of catecholamines necessary to evoke dysrhythmias is commonly but inaccurately called "sensitization." It is more accurate to describe this phenomenon as an adverse drug interaction.[178] Researchers have determined the nasal and oral submucosal ED_{50} dosage of epinephrine for volatile agents to be 2.11 ± 0.15 mg/kg for halothane and 6.72 ± 0.66 mg/kg for isoflurane.[180] With these dosages, 50% of subjects developed three or more premature ventricular contractions or ventricular tachycardia during or immediately after a single injection of epinephrine (which required 3.5 to 11 minutes to complete). Variables that may influence epinephrine ED_{50} values are differences in systemic absorption, route of administration, existing plasma catecholamine levels, preexisting atrial or ventricular dysrhythmias, and the previous administration of induction agents (i.e., thiopental,[181, 182] ketamine,[183, 184] each of which increases the incidence of epinephrine-induced dysrhythmias). When these variables are taken into consideration it is not surprising that data regarding volatile agent "sensitization" are conflicting.[185] Regarding the two newest volatile agents, desflurane and sevoflurane, both appear to be similar to isoflurane in their epinephrine-arrhythmogenic potential.[186, 187]

In general, it is reasonable to anticipate the fewest difficulties with dysrhythmias in physical status I and II patients if the submucosal epinephrine dose remains 7.0 mg/kg or less with 1.0 to 1.3 MAC desflurane, [186] or 5.0 mg/kg or less with 1.0 to 1.3 MAC sevoflurane or isoflurane.[187] Additional protection can be achieved by combining 0.5% lidocaine with epinephrine, the net effect being an increase in the minimum threshold dose of epinephrine.[180]

One other point is worth mentioning in relation to rhythm disturbances and inhalation agents: patients who are given a general anesthetic (primary opioid supplemented with a volatile anesthetic) who are on amiodarone can have significant dysrhythmias intraoperatively or postoperatively (e.g., atropine-resistant bradycardia requiring isoproterenol infusions, atrioventricular sequential pacing). These significant rhythm disturbances can also result in death.[188] For clarification and emphasis it should be understood that amiodarone and its major metabolite are detectable in plasma for up to 9 months after discontinuation of therapy.[189]

Pulmonary Circulation

Pulmonary vascular resistance (PVR) is also affected by the volatile agents and N_2O. The effects of N_2O on PVR vary with age and preexisting levels of PVR. In adults with normal PVR the addition of N_2O results in a small increase in PVR,[190] presumably due to an increase in sympathetic nervous system tone.[140] If a subject has preexisting pulmonary hypertension, the addition of N_2O results in larger increases in PVR,[190] which may become clinically significant. Volatile agents (including 0.8 or 1.2 MAC desflurane) decrease pulmonary artery pressure;[135, 144] the opposite effect occurs when desflurane is administered at 1.6 MAC.[144]

The pulmonary vasculature also minimizes changes in alveolar-arterial oxygen tension gradient via hypoxic pulmonary vasoconstriction (HPV). This normal physiologic response to atelectasis or hypoxia is attenuated in vivo by halothane and isoflurane and markedly by N_2O.[191] All of the currently used volatile agents only marginally affect HPV.[192-194] Consistent with this finding, one group of researchers noted only minimal impairment in oxygenation (approximately 20% reduction in HPV at 1 MAC) in patients having one-lung ventilation performed during thoracotomy procedures.[232] Desflurane and sevoflurane delivered at 1 MAC without N_2O have also been shown to only slightly affect arterial oxygenation in patients placed in a lateral position while undergoing esophagogastrectomy.[193, 194]

Respiratory System

As seen with other systems of the body, the volatile agents exert a dose-response effect on the respiratory system, primarily tidal volume (TV). Responsiveness to CO_2 is depressed and the TV reduced as concentrations of the agents are increased. The compensatory mechanism for the diminished TV with halothane, isoflurane, sevoflurane, desflurane, and N_2O is an increase in respiratory rate (RR).[195-197] However, the increase in RR is not sufficient to prevent elevations in arterial CO_2 tension. Nevertheless, surgical stimulation is a variable that helps to overcome the respiratory depressant effects of volatile agents.[198]

Emergence from an anesthetic can be associated with hypercarbia if MV is not adequately supported, due to a volatile agent's capacity to depress the ventilatory response to $PaCO_2$ and PaO_2.[196, 199-201] Hypercarbia also represents an increase in the apneic threshold (higher $PaCO_2$ values are required for spontaneous ventilation to occur). Patients should be closely monitored during emergence from an anesthetic and following adequate reversal of muscle relaxants to avoid acidemia or hypercarbia. During this phase of the anesthetic, significant end-tidal values of residual volatile anesthetic may persist, particularly if there was recent administration of an opioid (synergistic effect). It is important to recognize that impairment of the hypoxic ventilatory response by volatile agents is not abated with central nervous system arousal or acute pain;[202] and even as little as 0.1 MAC of a volatile agent (excluding desflurane) can suppress ventilatory drive to hypoxia.[203] These research findings have implications for patients whose MVs are maintained via a hypoxic drive (e.g., emphysematous patients with depressed central chemoreceptors).

The smoothness of an inhalation induction is directly related to the ability of an inhalation agent to avoid provoking an irritant response. Halothane, N_2O, and sevoflurane are considered the standards by which other agents are measured due to the low incidence of breath holding, coughing, secretions, and laryngospasm encountered during inhalational induction.[204] In contrast, desflurane is considered a respiratory irritant when used for mask induction in concentrations greater than 6%;[204, 205] therefore it is generally not used to induce anesthesia in pediatric[206] and adult patients. One alternative method to incorporate desflurane in the pediatric population is to induce the child with sevoflurane, then change to desflurane for maintenance. Researchers have shown that reactive airway problems encountered during inhalational induction with desflurane are lost when this agent is used for anesthetic maintenance.[207] Lastly, the volatile agents have been shown to relax airway smooth muscle and produce bronchodilation. They have also been used in the treatment of refractory status asthmaticus.[208]

Kidneys

In general, autoregulation of the renal circulation remains intact during the administration of inhalation agents. Reductions in systolic blood pressure are accompanied by decreases in renal vascular resistance.[209] Nevertheless, compensatory reductions in renal vascular resistance can still lead to a decline in the glomerular filtration rate. This may contribute to the commonly observed intraoperative reduction in urinary output.

The potential for a volatile agent to produce renal damage is commonly assessed by the extent to which it elevates creatinine, blood urea nitrogen (BUN), and serum inorganic fluoride (F^-) concentrations.[210] With the older volatile agent methoxyflurane, a "toxic threshold" for peak serum concentration of F^- was established (50 mmol/L);[211] at this value vasopressin-resistant polyuric renal insufficiency occurs.[212]

Of the currently used inhalation agents, desflurane has been shown in both healthy and chronic renal disease patients213 to alter indices of renal integrity the least, including no change in the renal function tests of urinary retinol-binding protein and *N*-acetyl-b-glucosaminidase (NAG).214 The significance of this is that NAG is considered a

sensitive indicator of drug-induced proximal tubular necrosis,215, 216 and retinol-binding protein has been shown to be a specific marker for indicating the presence of tubular damage of any cause.217 Recent advancements in clinical markers for renal integrity have shown two new, perhaps better, biomarkers of tubular injury. Isoforms of glutathione-*S*-transferase (GST) include alpha GST, which is located exclusively in the proximal tubules, and pi GST, found only in the distal tubules.218 In humans the urinary levels of each of these enzymes have been shown to increase after acute tubular necrosis and renal infarction.219

In contrast to studies involving desflurane (and isoflurane),[220] research with sevoflurane has generated concerns with compromised renal function. However the current debate has settled on the degradation of sevolfurane by carbon dioxide absorbents. Most researchers now accept that serum inorganic fluoride (F^-) levels associated with sevolfurane administration do not represent a significant risk to patients; including those with compromised renal function.[221, 222] Millions of sevoflurane anesthetics worldwide have failed to demonstrate any significant untoward renal outcomes in the general surgical population. Nevertheless, current FDA guidelines recommend sevoflurane be used with caution in patients with renal insufficiency (creatinine >1.5 mg/dL). In morbidly obese patients researchers have found no appreciable difference in sevoflurane's biotransformation and subsequent fluoride levels compared to nonobese patients. .[223]

A concern still exists regarding sevoflurane's degradation within anesthesia circuits by barium hydroxide lime and soda lime.[224, 225]; with each having a chemical makeup of monovalent hydroxide bases (KOH and NaOH). These carbon dioxide absorbers breakdown all modern-day volatile agents.[226] The two by-products of sevoflurane's degradation that have been measured in a closed circuit are fluoromethyl-2,2-difluoro-1(trifluoromethyl)-vinyl ether (also known as compound A, an olefin) and fluoromethyl-2-methoxy-2,2-difluoro-1-(trifluoromethyl) ethyl ether (compound B).[227] The former is known to produce proximal corticomedullary tubular necrosis in rats.[228] Clinical studies involving low-flow (1-2 L/min) sevoflurane given over approximately 3 to 8 MAC hours (even in the presence of Baralyme[229]) in healthy patients[230] and in patients with stable renal insufficiency[229] were found to have no statistically significant changes in serum creatinine, blood urea nitrogen, urine protein, and glucose. It has also been reported that sevoflurane with desiccated barium hydroxide or soda lime can yield excessive temperatures that produce anesthesia machine fires and patient injuries;[231, 232] the potential explanation being the byproduct of hydrogen (3 moles) following the chemical reaction of sevoflurane with heated desiccated absorbent.[233]

In summary, it is widely recognized that the following variables do increase Compound A content: low fresh gas flows, high concentrations of sevoflurane, drying of soda lime or Baralyme®, and the use of Baralyme® as the CO_2 absorbant.[234, 235] One way to eliminate compound A is to replace soda lime or Baralyme® with Amsorb® (Armstrong Medical Ltd., Coleraine, Northern Ireland) or DragerSorb® Free. [236-238] These new CO_2 absorbants do not contain strong bases (sodium hydroxide [NaOH] or potassium hydroxide [KOH]) which are responsible for 1) the degradation of sevoflurane to compound A as well as 2) the production of carbon monoxide from the breakdown of desflurane and isoflurane.[239, 240] In the absence of Amsorb® or DragerSorb® Free carbon dioxide absorbents, current FDA dosing guidelines recommend sevoflurane exposure not exceed 2 MAC•hours at flow rates of 1 to < 2 L/min. Fresh gas flow rates <1 L/min are not recommended.

Liver

All of the volatile anesthetics have been shown to decrease total hepatic blood flow- with halothane producing the greatest reduction.[25, 241] By contrast, isoflurane, sevoflurane, and desflurane have been shown to increase or maintain hepatic artery blood flow thereby limiting any accompanying attenuation in portal vein blood flow.[242-244] Hepatocyte hypoxia is of clinical concern and its etiology can be multifactorial (e.g., volatile agents, surgical manipulation, enzyme induction). One significant outcome of liver hypoxia is increased reductive metabolism (which does not occur with the ether-based anesthetics) of halothane which has been linked to "halothane hepatitis." This phenomenon has been investigated for nearly 45 years since the appearance of case reports in the literature of hepatic damage following halothane's use.[245] A better understanding of the pathophysiology of this phenomenon has improved diagnostic capabilities for volatile-agent hepatitis.[246, 247]

Halothane-associated hepatitis is most common in the adult population (children are not immune to the response248) and is expressed as one of two clinical forms. The first is a mild hepatic reaction that occurs secondary to a direct hepatic effect or following reductive metabolism of halothane.249 It is associated with low morbidity and moderately increased concentrations of elevated serum glutathione-*S*-transferase (GST) levels246 or transient jaundice. It can occur shortly after the first exposure to a volatile agent, and the incidence may be as high as 20% to 50%.250

The second syndrome is characterized by fulminant hepatic failure with a high mortality rate. Multiple anesthetic exposures precede its onset, which has led researchers to theorize that an immune response evokes this syndrome (although not all research supports this theory).[251] Oxidative metabolism of halothane by hepatic cytochrome P-450 releases an unstable intermediate, trifluoroacetyl chloride (CF_3COCl). This substance binds to liver proteins to form

trifluoroacetylated-protein (TFA-protein) neoantigens.[250] Unfortunately, some patients form antibodies to TFA-protein neoantigens and on reexposure to halothane develop an immune response that is expressed as hepatic necrosis[250, 252-255] (**Fig. 7-8**). TFA-protein antibodies occur in up to 70% of patients with fulminant hepatic failure.[253, 254] These antibodies do not appear in patients with normal liver function, patients with hepatic injury due to other causes, or in subjects who have previously received halothane but have not developed fulminant hepatic failure.

The predominant P-450 isoform responsible for the oxidation of halothane is cytochrome P-450 2E1. This may help explain why morbidly obese patients are prone to halothane hepatitis; the enzymatic activity of P-450 2E1 increases in this patient population.[256] In addition, the fatty liver infiltration observed in obese patients is associated with a greater quantity of P-450 2E1. Other risk factors identified for development of halothane hepatitis include fatty liver infiltration, having multiple anesthetics, isoniazid and ethanol use.[257]

The overall incidence of the fulminant form of halothane hepatitis is reported to be 1:35,000 anesthetics.[258] In addition to the laboratory changes noted previously, the development of more specific serologic markers for detecting the presence of viral hepatitis C (including surrogate markers for recurrent hepatitis C [i.e., AST to platelet ratio index[259]]), D, and E has led to fewer false-positive diagnoses of halothane-associated hepatitis. [260-262]

Isoflurane and desflurane are similar to halothane in that each possesses a common metabolic pathway via cytochrome P-450 that eventually yields TFA-protein molecules.[247, 250] However, because of differences in the rate of biodegradation, these volatile agents are probably less likely to produce hepatic injury than halothane. For example, isoflurane is metabolized 100-fold less than halothane and as such it is estimated that fulminant hepatic failure caused by isoflurane may occur in 1:3,500,000 anesthetics.[247] Several case reports and clinical studies suggest that a potential immunologic mechanism (including cross-sensitization) may exist for the development of "isoflurane hepatitis,"[263] "sevoflurane hepatitis,"[264] and "desflurane hepatitis."[265] In one report following isoflurane anesthesia the patient developed fulminant hepatic failure that led to death.[266]

Although desflurane is metabolized the least of all volatile anesthetics, it has also been associated with hepatotoxicity.[265] In one case report, a 65-year-old woman without a history of liver disease developed desflurane hepatitis 12 days postoperatively. The patient had a rash, nausea, polyarthralgias, marked elevations in liver transaminases, and jaundice. Serologic markers for hepatitis A, B, and C were negative. It was significant that the patient had undergone two prior halothane anesthetics lasting approximately 45 minutes each (death from a halothane anesthetic given 28 years after primary exposure has been documented[267]). The patient was discharged from the hospital 27 days after surgery, with continued improvement in liver function. This patient's exposure to halothane decades earlier combined with the ether-based anesthetic produced hepatic damage, probably secondary to "immunologic memory" and possible cross-sensitization.[265]

Sevoflurane is unique among the volatile anesthetics in that it is the only one that appears not to be biodegraded to TFA-protein molecules.[268] This step is a prerequisite to the formation of TFA-protein antibodies, so it is unlikely that sevoflurane will produce fulminant hepatic failure via an immunoallergic mechanism.[269] Nonetheless, there have been several case reports of hepatic injury associated with sevoflurane use,[264, 270, 271] including one that involved a child.[272]

In spite of the case reports listed above, it is extremely rare for isoflurane, sevoflurane, and desflurane to produce clinically significant liver damage. Their molecular structure (increased fluorination) resists hepatic degradation and their pharmacodynamic profile is associated with no changes or slight reductions in hepatic blood flow.[273-276]

In vitro research suggests that N_2O is metabolized minimally (0.004%) by intestinal microflora, yielding molecular nitrogen (N_2).[277] The limited metabolism does not necessarily mean that N_2O is an inert substance within the body. On the contrary, studies have demonstrated that chronic exposure to N_2O can lead to inactivation of the vitamin B_{12} component of methionine synthetase,[278] which can disrupt deoxyribonucleic acid synthesis.[279] Nevertheless, for routine surgical cases this is generally not an issue. Caution should be exercised with patients who are pregnant, patients who receive a general anesthetic more than once a week, or patients who are debilitated and have problems with wound healing.[279, 280]

In summary, the ether-based volatile agents have an extremely low risk for evoking hepatic injury. The discontinuation of halothane anesthesia in adults and pediatrics is warranted particularly given the availability of sevoflurane for inhalational induction in children. Future research will help to further clarify the incidence and cellular mechanism by which isoflurane, sevoflurane, and desflurane evoke hepatic pathophysiological processes. Nonetheless, vigilance by anesthesia providers is still required with the knowledge that cross-sensitization and immunological memory are factors to be considered in any patient who has received a prior halothane anesthetic- even decades before.

Neuromuscular System

All volatile agents produce a dose-dependent relaxation of skeletal muscle, as well as potentiation of the effects of depolarizing and nondepolarizing muscle relaxants.[281] The mechanism by which this occurs is multifactorial, involving

reduced neural activity within the CNS and a presynaptic or postsynaptic effect at the neuromuscular junction.[47, 282] Of the synaptic changes produced, the volatile agents predominantly affect the postjunctional membrane.[283]

With the exception of halothane, it is variable as to which volatile agent potentiates neuromuscular blocking agents the most.[284] Studies incorporating a broader methodology indicate that the greatest degree of potentiation of neuromuscular blockade occurs with sevoflurane, then isoflurane, and finally halothane.[285, 286] Desflurane has been found by some investigators to potentiate the effects of neuromuscular blockers to the same extent as isoflurane[287] and sevoflurane.[288] Similarly, other studies have shown that sevoflurane and isoflurane equally augment[288] and prolong[284] neuromuscular blockade produced by nondepolarizing muscle relaxants. In contrast, one investigation found that desflurane and sevoflurane enhanced the intensity of neuromuscular blockade with rocuronium, while isoflurane's effect was no different than that observed with a total intravenous anesthetic (TIVA).[281]

The discrepancies reported with interactions between volatile agents and muscle relaxants may be the result of differences in research methodology (e.g., type of muscle relaxant used in the study). For example, recovery of neuromuscular blockade after the use of cisatracurium and rocuronium is prolonged with sevoflurane but not isoflurane.[286, 288] In contrast, the recovery profile for both volatile agents is the same after the use of vecuronium.[284]

Isoflurane[289] and N_2O[290] have been shown to potentiate the effects of succinlycholine. The former can accelerate the transition from a phase I to phase II block during an infusion of succinylcholine.[289] In general, nondepolarizing muscle relaxant dosages are decreased by approximately 25%[281, 291] (sometimes as much as 50%)[286] of that required with TIVA when they are used in combination with a volatile agent. Of interest are two studies that found no difference in potentiation of nondepolarizing muscle relaxants and neuromuscular recovery profiles between an isoflurane/N_2O and TIVA technique. [286, 288]

The volatile agents have also been shown to produce a time-dependent potentiation of (beginning in 5 to 10 minutes)[292] and delayed recovery from nondepolarizing muscle relaxants. For example, after 30 minutes of exposure to sevoflurane, recovery from vecuronium to 25% of baseline neuromuscular function is prolonged by 89%, and after 60 minutes, recovery exceeds 100%.[293] The inhalation agents have also been implicated in impairing reversal of nondepolarizing neuromuscular block.[294, 295] For the reasons listed above, anesthetists should carefully titrate muscle relaxants used in combination with inhalation anesthetics. Also, in select cases, a volatile anesthetic alone may produce adequate skeletal muscle relaxation without concurrent use of muscle relaxants.[296, 297] Some advantages and disadvantages are given in **Box 7-3**.

TABLE 7-5 Effects of the Inhalation Anesthetics

	Halothane	Isoflurane	Desflurane	Sevoflurane
Alveolar equilibration	Slow	Moderate	Fast	Fast
Recovery	Slow	Moderate	Very fast	Fast
Liver				
Hepatotoxicity	Yes	No	No	No
Metabolism (%)	12-25	0.2	0.02	3-5
Musculoskeletal relaxation	Moderate	Significant	Significant	Significant
Cardiovascular System				
Heart rate	Reduced	Increased	Increased	Stable
Cardiac output	Reduced	Slightly reduced	Stable	Slightly reduced
SVR	Stable	Reduced	Reduced	Reduced
MAP	Reduced	Reduced	Reduced	Reduced
Coronary vasodilation	Minimal	Marked	Minimal	Moderate
Sensitization of myocardium	Yes	No	No	No
Respiratory System				
Respiratory irritation	No	Significant	Significant	No
Respiratory depression	Yes	Yes	Marked	Yes
Central Nervous System				
Seizure activity on EEG	No	No	No	No
Renal System				
Renal toxic metabolites	No	No	No	No

EEG, Electroencephalogram; SVR, systemic vascular resistance; MAP, mean arterial pressure.
Modified from Mushambi MC, Smith G. Inhalation anaesthetic agents. In: Aitkenhead AR, Rowbotham DF, Smith G, eds. Textbook of Anaesthesia. *4th ed. Edinburgh: Churchill Livingstone; 2001:152-168.*

BOX 7-3 Clinical Advantages and Disadvantages of Selected Inhalation Anesthetics

Anesthetic	Advantages	Disadvantages
Nitrous oxide	Analgesia Rapid uptake and elimination Little cardiac or respiratory depression Nonpungent Allows less potent anesthetic to be administered	Expansion of closed air spaces Requires high concentrations Diffusion hypoxia Suppression of methionine synthetase that affects vitamin B_{12} utilization Teratogenic?
Halothane	Inexpensive Effective in low concentrations Excellent bronchodilator	Slow uptake and elimination Susceptible to biotransformation Idiosyncratic hepatic necrosis Catecholamine-induced ventricular ectopy Use is rapidly declining Impairs pulmonary macrophage activity and bronchial ciliary mucous transport Trigger for malignant hyperpyrexia
Isoflurane	Moderate muscle relaxation Decreases cerebral metabolic rate Minimal biotransformation No significant systemic toxicity Maintains cardiac output because of vasodilation Inexpensive	Pungent odor Airway irritant Fewer negative inotropic effects than halothane Trigger for malignant hyperpyrexia
Desflurane	Rapid uptake and elimination Stable molecules Minimal biotransformation No significant systemic toxicity	Airway irritant Low boiling point Sympathetic stimulation Expensive Low boiling point and high saturation vapor pressure Needs special, electrically heated vaporizer Rapid increases in inspired concentration can lead to reflex tachycardia and hypertension Trigger for malignant hyperthermia
Sevoflurane	Rapid uptake and elimination Nonpungent Excellent for inhalation induction Cardiovascular effects broadly comparable to those of isoflurane	Susceptible to biotransformation Reacts with soda lime and baralyme Increases serum fluoride concentration Expensive 3%-5% metabolized, but current evidence is that it causes neither hepatic nor renal toxicity

Malignant Hyperthermia

All of the volatile agents are capable of triggering malignant hyperthermia, including desflurane[298] and sevoflurane.[299] These agents should not be used in malignant hyperthermia–susceptible patients, but if a reaction occurs it can generally be successfully treated with intravenous dantrolene; the recommended dose being 2.5 mg/kg repeated every 5 minutes up to 10 mg/kg (although a dose of 29 mg/kg has been used).[300] Of interest is the observation that a delayed response (e.g. 6 hrs) to malignant hyperthermia provoked by inhalation agents has been reported to occur with 1) the use of nondepolarizing muscle relaxants and 2) with desflurane if it is administered in the absence of succinylcholine.[301]

N_2O is considered at most a weak trigger of malignant hyperthermia in susceptible patients.[302-304] Overall, the clinical use of N_2O, in combination with many other agents (e.g., barbiturates, propofol, ketamine, etomidate, opiates, amide and ester anesthetics), is considered acceptable in patients susceptible to malignant hyperthermia.[300, 305]

SUMMARY

Inhalation agents remain the most common class of drugs used to maintain a general anesthetic. The pharmacokinetic and pharmacodynamic profile of desflurane and sevoflurane facilitate meeting the anesthetic goals of an ever increas-

ing same-day surgery population. Sevoflurane use continues to expand and is viewed by many anesthesia providers as a beneficial substitute/replacement for halothane- particularly given the potential for hepatic injury and prolonged immunological memory. The ease of administration of all ether-based volatile anesthetics with or without N_2O lends itself to common use among a diverse surgical population. Continued research will help guide anesthetists in the selection and application of a variety inhalational anesthetic techniques.

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Chapter 16
Clinical Monitoring I - Cardiovascular System

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Monitoring of anatomic and physiologic variables during an anesthetic procedure enables anesthetists to enhance patient safety and meet established standards of care.[1] Many different monitors are commonly used to assist in the delivery of an anesthetic, and it is the responsibility of the anesthetist to assimilate data provided by monitors to make appropriate clinical judgments. Consequently, the application of critical thinking skills, thorough physical assessment, vigilance, and the appropriate selection and application of monitors are key requirements in the process of anesthesia monitoring.

Basic monitoring techniques include inspection, auscultation, and palpation. They provide essential subjective and objective data not available from technologic monitors and can alert the anesthetist to impending dangers in select patients. *Inspection* of the patient can provide information regarding the adequacy of oxygen delivery and carbon dioxide elimination, fluid requirements, and positioning and alignment of body structures. *Auscultation* is used to verify correct placement of airway devices such as the endotracheal tube and laryngeal mask airway, to assess arterial blood pressure, and to continually monitor heart sounds and air exchange through the pulmonary system. *Palpation* can aid the anesthetist in assessing the quality of the pulse and degree of skeletal muscle relaxation, as well as locating major vascular structures when placing central venous lines or performing anesthesia regional techniques.

Critical thinking skills are cardinal prerequisites for successful monitoring of a patient's anesthetic. In addition, it is well known that errors in anesthesia care are minimized when anesthetists remain alert and vigilant. Not surprising, it is easy for anesthesia providers to experience occasional periods of inattentiveness because of the large number of anesthetics that proceed without incident. This is partially the result of improvements that have been made in monitoring modalities and the development of drugs with more favorable pharmacokinetic and pharmacodynamic profiles. In addition, the large physiological reserve most healthy patients' possess helps to attenuate any errors made in monitoring secondary to an acute and transient physiological insult. This chapter reviews the more commonly used noninvasive and invasive monitors in anesthesia practice.

Pulmonary Artery Catheterization

One of the most significant advances made in critical care medicine was the introduction of the pulmonary artery catheter (PAC) by Swan and Ganz in 1970.[2] Their development of the flow-directed right-sided heart catheter allowed for direct bedside assessment of pulmonary artery (PA) pressures, indirect assessment of left ventricular (LV) filling pressures and right-sided cardiac outputs (CO), and calculation of pulmonary and systemic vascular resistances (SVRs), along with various cardio-pulmonary indices. This section of the chapter reviews the interpretation of hemodynamic data obtained from a PAC, variables that can skew the data, and an extension of its use beyond the recording of vascular pressures to include mixed venous oxygen saturation $(S\overline{V}O_2)$, vascular resistance, and CO.

An important question related to the use of the PAC is: "To what extent has morbidity and/or mortality been reduced when the PAC has been used to guide medical and nursing care?" Practice guidelines for PAC use have been recommended and established by various professional societies through the critique of the literature.[3-5] Such recommendations reveal that the indications and potential benefit (or harm) of PAC use remains controversial.[6-12] Factors that may contribute to the discrepancies in research findings include differences in patient populations and limitations in research methodology, such as retrospective analysis, lack of randomization, and double-blind techniques, and variations in desired hemodynamic clinical end-points.[13-15] Another explanation for conflicting study results deals with competency levels in managing PAC data.[16, 17] This explanation was supported by a multicenter study conducted by Iberti and co-workers in 1990.[16] These investigators developed a questionnaire that covered four main topic areas (insertion techniques, cardiac physiology, interpretation of waveforms along with pressure-volume relationships, and application of PAC data in patient treatment) related to PAC use. Examinees from the departments of medicine, surgery, and anesthesiology scored an average of 67% (range 19% to 100%). It is surprising to note that the attendings from all departments scored a mean value of 69%. Statistically, examinees had the most difficulty in interpreting hemodynamic variables (e.g., 47% of 496 respondents were unable to correctly determine the PA occlusive pressure [PAOP] from a clear tracing) and applying PAC data for proper patient treatment. Anesthesia providers who specialize in cardiovascular anesthesia have also been shown to have difficulty in interpreting one of the cardinal waveforms derived from PAC; 39% of cardiovascular anesthesiologists could not correctly interpret a PAOP waveform.[18] Results from these two studies suggest that the understanding of PAC data among patient care providers is extremely variable, and misinterpretation of PAC data may result in increased morbidity and mortality. It is likely that similar deficiencies in the application and interpretation of PAC data exists for nurses, knowing failing scores were noted on competency tests used to assess other areas of critical care.[19] Similarly, the 1988 prospective blinded study by Shoemaker and co-workers[20] supports the contention that PAC use per se does not improve patient outcome, but the way the physiologic information is interpreted and applied in patient care does. Such research findings have caused several groups to develop guidelines for the indications of a PAC, along with competency requirements for interpretation of data.[5, 21]

Physiology And Morphology Of Hemodynamic Waveforms

Essential to accurate interpretation of hemodynamic data derived from central venous lines is a solid foundation in what constitutes "normal" distances, pressures, and waveform morphology for central venous pressure (CVP), right ventricular (RV), PA, and PAOP recordings. Table 16-1 illustrates the approximate distances for reaching the junction of the venae cavae and the right atrium (RA) from various distal anatomic sites. Table 16-2 lists the anticipated distances for reaching various cardiac and pulmonary structures from the right internal jugular vein. Advancement of a catheter 10 cm beyond these distances without the production of a characteristic waveform could indicate coiling of the central line. If this problem arises with a PAC, the balloon should be deflated and the catheter withdrawn. If any resistance is met during withdrawal, a chest radiograph should be taken to rule out knotting or entanglement with the chordae tendineae.

Table 16-1 Distance to the Junction of the Venae Cavae and Right Atrium from Various Distal Anatomic Sites

Location	Distance (cm)
Subclavian	10
Right internal jugular vein	15
Left internal jugular vein	20
Femoral vein	40
Right median basilic vein	40
Left median basilic	50

Table 16-2 Distance from the Right Internal Jugular Vein to Distal Cardiac and Pulmonary Structures

Location or Structure	Distance (cm)
Junction venae cava and right atrium	15
Right atrium	15-25
Right ventricle	25-35
Pulmonary artery	35-45
Pulmonary artery wedge position	40-50

Right Atrial Pressure Waveform

In addition to familiarity with proper distances, knowledge of normal intracardiac pressures, pulmonary pressures (Table 16-3), and waveform morphology facilitates accurate interpretation of PAC data and placement of central lines. For example, under normal circumstances, a CVP tracing will generate mean RA pressures in the range of 1 to 10 mm Hg. The fidelity of the transducing system determines if discernible *a*, *c*, and *v* waves will be displayed once the distal tip of a central line lies just above the junction of the venae cavae and the RA (Figure 16-1). The *a* wave is produced by contraction of the RA, the *c* wave by closure of the tricuspid valve, and the v wave by passive filling of the RA (which encompasses a portion of RV systole). The reason the *a* wave is commonly larger than the *c* wave is based on the position of the catheter relative to the physiologic event responsible for the pressure change. In essence, RA systole and the subsequent increase in atrial pressure is directly sensed by a catheter positioned just above (or inappropriately within) the RA, whereas RV systole (a more distal physiologic event relative to the position of a CVP catheter) indirectly increases RA pressure by closure of the tricuspid valve.

TABLE 16-3 Normal Intracardiac and Pulmonary Pressures

Location	Absolute Value (mm Hg)	Range (mm Hg)
MRAP	5	1-10
RV	25/5*	15-30/0-8
PA S/D	25/10*	15-30/5-15
MPAP	15	10-20
PAOP	10	5-15
MLAP	8	4-12
LVEDP	8	4-12

**Values are systolic pressure/diastolic pressure.*

LVEDP, Left ventricular end-diastolic pressure; MLAP, mean left atrial pressure; MPAP, mean pulmonary artery pressure; MRAP, mean right atrial pressure; PA, pulmonary artery; PAOP, pulmonary artery occlusive pressure; RV, right ventricle; S/D, systolic/diastolic.

Right Ventricular Pressure Waveform

Further advancement of a PAC (approximately 10 cm) produces dramatic changes in the morphology of the hemodynamic waveform. As shown in Figure 16-2, a brisk upstroke (isovolumetric contraction and rapid ejection [RV systole]) and steep downslope (reduced ejection and isovolumetric relaxation [RV systole and diastole]) are viewed on an oscilloscope when a PAC is advanced through the right intraventricular cavity. A PAC with the distal balloon inflated should remain in the RV for as short a time as possible to reduce the incidence of ventricular ectopy, or the development of a conduction defect such as bundle branch block. Because it is undesirable to leave the tip of a central line in the RV, pressures generated during RV systole and RV diastole are assessed indirectly via the CVP port of a PAC and distal tip of the PAC. The former is used to estimate RV end-diastolic pressure (EDP) and the latter RV systolic pressure via the PA systolic recording. Thus- RVEDP is used to estimate RVED volume (RVEDV), which approximates RV preload (and less accurately LV preload).

Pulmonary Artery Pressure Waveform

When a catheter enters the PA, the diastolic pressure is acutely increased with little change in systolic pressure. The upstroke of the PA tracing is produced by opening of the pulmonic valve, followed by RV ejection. The downstroke contains the dicrotic notch, which is produced by sudden closure of the pulmonic valve leaflets (the beginning of diastole).

Pulmonary Artery Occlusive Pressure Waveform

Final advancement of a PAC by 5 to 10 cm should produce a PAOP tracing. This waveform is similar to a CVP (the *a* wave is produced by left atrial [LA] systole, the *c* wave by closure of the mitral valve, and the *v* wave by filling of the LA, as well as upward displacement of the mitral valve during left ventricular [LV] systole), except that the pressure values are higher. In addition, it is less common to detect a *c* wave on a PAOP tracing, because retrograde transmission of LA pressure (produced by closure of the mitral valve) is significantly attenuated within the pulmonary circulation. The characteristic waveform morphologies of a PAOP tracing are illustrated in Figure 16-2.

Negative Waveforms

The descents that follow the *a*, *c*, and *v* waves of a CVP or PAOP tracing are labeled as *x*, x^1, and *y* (see Figure 16-1). The *x* descent corresponds to the start of atrial diastole (its terminal component [just before the upstroke of the *c wave* {or in its absence, the *v* wave}] with RVEDP and LVEDP), the x^1 descent is produced by downward pulling of the septum during ventricular systole, and the *y* descent corresponds to opening of the tricuspid valve.

Correlation of Pressure Waveforms and the Electrocardiogram

The interpretation of hemodynamic waveforms can be facilitated by correlating their morphology and timeline with the electrocardiogram (ECG). The *a* wave of a CVP tracing, which is produced by atrial contraction, will follow electrical activation (depolarization) of the atria and is displayed as the P wave on the ECG. The *c* and *v* waves occur after the beginning of ventricular depolarization (QRS complex), or the *v* wave may not appear until shortly after the T wave (Figures 16-3 and 16-4). When compared with the CVP tracing, the PAOP recording shows greater hysteresis between the waveforms of the ECG and the display of *a*, *c* and *v* waves- meaning there is a greater distance between ECG activity and the subsequent pressure waveform. Identification of abnormal waveforms is greatly facilitated by the use of the ECG; for example, without an ECG recording, large positive waveforms on a PAOP tracing can be diagnosed as either cannon *a* waves or large *v* waves.

Distortion of Pressure Waveforms

Dysrhythmias can produce significant alterations in hemodynamic waveforms. Atrial fibrillation, junctional rhythms, and premature ventricular contractions (PVCs) can alter the shape of *a* waves. With atrial fibrillation, no synchronized atrial contraction occurs. In the CVP or PAOP tracing, this can lead to the loss of *a* waves or the appearance of small fibrillatory *a* waves. Complete atrioventricular block and some forms of junctional dysrhythmias cause the atria to contract against a closed tricuspid valve, which can produce large cannon *a* waves (Figure 16-5). Ventricular pacing can be associated with both the presence of cannon *a* waves and loss of *a* waves. The former occurs if a patient does not have an atrioventricular sequential pacemaker; the latter when ventricular pacing is used in the setting of asystole (neither **atrial** or ventricular depolarization is occurring). Valvular defects can also produce dramatic changes in the CVP and PAOP tracings, causing an increase in the amplitude of the *v* wave secondary to regurgitation (e.g., with mitral regurgitation, a portion of the stroke volume is ejected retrograde into the pulmonary circuit owing to an incompetent mitral valve). Recognition of such abnormalities is critical for accurate recording of pressure measurements and proper place-

ment of central lines. Significant tricuspid regurgitation can cause a CVP recording to mimic an RV tracing, and mitral regurgitation can cause a PAOP recording to appear as a PA tracing. Specifically, large *v* waves become superimposed on *a* waves. For the indistinguishable PA and PAOP recording, analysis of an SVO_2 blood sample can assist in making a differential diagnosis. The saturation will be elevated (greater than 77%) if the catheter is in a wedged position, assuming the distal tip is not in a region of the lung that is atelectatic or has pneumonia; both of these factors would produce a false-negative result (normal or low $\overline{SVO}_2$). As a precautionary measure, a catheter suspected of being in a wedged position should not be flushed with the fluid contained in the pressurized transducing system. Although the overall incidence of PA rupture is low (0.064%),[22] flushing of a wedged catheter (as well as balloon overinflation) can result in vascular damage ranging from minor endobronchial hemorrhage to massive hemoptysis.

Significant tricuspid regurgitation and mitral regurgitation may also be associated with normal CVP and PAOP tracings.[23] These occur in patients with a low volume status and compliant atria. In addition, a poor correlation has been found between the size of the *v* wave and the degree of regurgitation.[23] Also of interest is the finding that large *v* waves can be observed in the absence of significant regurgitation. This phenomenon can occur whenever an acute increase in preload occurs, which dynamically reduces atrial and pulmonary vascular compliance.[23]

Whenever large *v* waves are detected on a CVP or PAOP tracing, estimates of preload should be measured just before the upstroke of the v wave (or *c* wave when present). This point on the pressure recording equates with the EDP, the moment just before ventricular systole that ultimately produces the large *v* waves; the literature demonstrates alternative preload measurement points can be considered as well.[24, 25] Box 16-1 indicates how various rhythm disturbances, pacing, and valvular defects can distort the CVP tracing.

BOX 16-1 Factors That Can Distort Central Venous Pressure and Pulmonary Artery Occlusive Pressure Tracings

Loss of a Waves or Only v Waves
- Atrial fibrillation
- Ventricular pacing in the setting of asystole

Giant a Waves—"Cannon" a Waves
- Junctional rhythms
- Complete AV block
- PVCs (simultaneous atrial and ventricular contraction)
- Ventricular pacing (asynchronous)
- Tricuspid or mitral stenosis
- Diastolic dysfunction
- Myocardial ischemia
- Ventricular hypertrophy

Large v Waves
- Tricuspid or mitral regurgitation
- Acute ↑ in intravascular volume

↑, *Increase; AV, atrioventricular; PVCs, premature ventricular contractions.*

Implications of Abnormal Hemodynamic Values

The CVP serves as an estimate of right ventricular preload (RVEDP). Table 16-4 lists the causes of an elevated CVP. A low CVP correlates with hypovolemia of any cause. As stated previously, RV pressures can be assessed indirectly from the CVP and PA pressure (PAP) recordings. Right ventricular values can be elevated secondary to pulmonary hypertension, ventricular septal defect, pulmonary stenosis, RV failure, constrictive pericarditis, or cardiac tamponade.

Like the RV waveform, the PA tracing occurs within the QT interval of the ECG. LVEDP can be estimated by measuring the pressure value that exists just before the upstroke of the PA waveform (Figure 16-2). See Table 16-4 for a list of causes of an increase in the PAP. A false high value can also be produced by a phenomenon called *catheter whip*, which is exaggerated oscillation of the PA tracing. This can occur with excessive catheter coiling if the tip of the PA catheter is near the pulmonic valve; it also occurs in patients with dilated pulmonary arteries. The latter may occur if pulmonary hypertension exists.

One of the most valuable hemodynamic parameters is the PAOP recording. Like the CVP, it indirectly assesses ventricular function and therefore has distinct limitations. To ensure that accurate pressure recordings are documented, the mean or diastolic pressure should always be determined at end-expiration (whether the patient is spontaneously breathing or receiving positive pressure ventilation). This is the time when pleural pressures are approximately equal to atmospheric pressures (except when positive end-expiratory pressure [PEEP] is being used). The rationale for this timing relates to the fact that vascular pressure recordings are calibrated relative to atmospheric pressure. As stated previously,

the correct area on the pressure recording to determine preload (e.g., LVEDP) is just before the upstroke of the *v* wave (or *c* wave if present). Causes of an elevated PAOP are listed in Table 16-4.

Table 16-4 Potential Causes of Elevated Central Venous Pressure, Pulmonary Artery Pressure, and Pulmonary Artery Occlusive Pressure

CVP	PAP	PAOP
• RV failure	• LV failure	• LV failure
• Tricuspid stenosis or regurgitation	• Mitral stenosis or regurgitation	• Mitral stenosis or regurgitation
• Cardiac tamponade	• L-to-R shunt	• Cardiac tamponade
• Constrictive pericarditis	• ASD or VSD	• Constrictive pericarditis
• Volume overload	• Volume overload	• Volume overload
• Pulmonary HTN	• Pulmonary HTN	• Ischemia
• LV failure (chronic)	• "Cathether whip"	

ASD, atrial septal defect; CVP, central venous pressure; HTN, hypertension; L, left; LV, left ventricular; PAOP, pulmonary artery occlusive pressure; PAP, pulmonary artery pressure; R, right; RV, right ventricular; VSD, ventricular septal defect.

Variables That Influence Hemodynamic Measurements

Essential for proper management of hemodynamic parameters is the recognition of how numerous variables can skew recorded pressure values. The foundation for understanding PAC data begins with the recognition that absolute numbers are generally not as important as trends. In addition, most of the data obtained from a PAC allows for only *indirect* assessment of cardiovascular function and pulmonary indices. For example, PA diastolic pressure (PADP) approximates PAOP, which approximates LA pressure, which approximates LVEDP, which provides an estimate of left ventricular end-diastolic volume (LVEDV). Table 16-5 lists clinical factors that can skew these pressure and volume relationships. Obviously, reliance on indirect pressure measurements mandates that the anesthetist understand how to interpret these data in light of such limitations. It should be assumed that for most patients who require a PAC or CVP that several, if not numerous, pathophysiologic states exist (e.g., cardiovascular disease, pulmonary dysfunction) that will skew the pressure-to-pressure and pressure-to-volume relationships.

Of the variables listed in Table 16-5, several require further discussion. Many of the factors listed can be viewed as disruptions or obstructions of the continuous column of blood that exists between the RA and LV. This is the case for valvular defects and pulmonary factors.

The goal for placement of a PAC is to have it reside in a West zone III[26] of the lung; this usually does occur, because the bulk of pulmonary blood flow lies within this region of the lung. In this position, the PAP is greater than the pulmonary venous pressure, which is greater than the alveolar pressure. This zone corresponds to a complete circuit or conduit that allows for direct communication between right-sided heart and pulmonary pressures with left-sided intraventricular pressures (see Figure 16-6). It is important to recall that each of the lung zones is physiologically -not anatomically- defined; thus a zone III can change into a zone II (PAP > alveolar pressure > pulmonary venous pressure) or zone I (alveolar pressure > PAP > pulmonary venous pressure).

Table 16-5 Factors That Alter the Relationships among Central Cardiovascular Pressures and Volumes

CVP ≠ PADP	• Change in RV compliance (e.g., PS) • Tricuspid valve disease
PADP ≠ PAOP	• Pulmonary HTN • MR or AR • Lung zone I or II • Tachycardia • ARDS • RBBB
PAOP ≠ MLAP	• Juxtacardiac pressure (e.g., PEEP) • Lung zone I or II • Mediastinal fibrosis • RBBB
MLAP ≠ LVEDP	• Juxtacardiac pressure (e.g., PEEP) • Mitral valve disease • Change in LV compliance (e.g., AS)
LVEDP ≠ LVEDV	• Juxtacardiac pressure (PEEP) • Ventricular interdependence • Change in LV compliance (e.g., ischemia)

AR, Aortic regurgitation; ARDS, acute respiratory distress syndrome; AS, aortic stenosis; CVP, central venous pressure; HTN, hypertension; LVEDP, left ventricular end-diastolic pressure; LVEDV, left ventricular end-diastolic volume; MLAP, mean left atrial pressure; MR, mitral regurgitation; PADP, pulmonary artery diastolic pressure; PAOP, pulmonary artery occlusive pressure; PEEP, positive end-expiratory pressure; PS, pulmonic stenosis; PVR, pulmonary artery vascular resistance; RBBB, right bundle branch block; RV, right ventricle.

Factors that contribute to the dynamic state of zone III include the application of PEEP (Figure 16-6), significant diuresis, hemorrhage, and a change in patient position (e.g., supine to sitting). The influence of PEEP is contingent on the quantity applied, intravascular volume status, and pulmonary compliance. Normally, less than 50% of PEEP is transmitted to the microvasculature –even less if pulmonary compliance is poor (e.g., patients with adult respiratory distress syndrome).[25] In contrast, patients with decreased volume status (e.g., left atrial pressure less than 5 mm Hg) who receive PEEP as low as 7.5 cm H_2O can have collapse of the pulmonary capillaries, which distorts the PAOP.[24] A PAC located in zone I or II will produces marked variations in the PAOP waveform recording during the ventilatory cycle. In addition, *a* and *v* waves (cardiac influences) are lost, and the PAOP exceeds the PADP. This is in contrast to a PAOP recording produced by a catheter located in a true wedge position. The distinguishing criteria include the development of a characteristic waveform with balloon inflation and a PAOP reading less than or equal to the PADP. The latter criterion assumes that no valvular defect, which could also cause the mean PAOP to exceed the PADP, is present.

A rapid heart rate (HR) can also skew the relationship between PADP and the PAOP. Research has demonstrated that left atrial paced-induced tachycardia (increased HR from 74 to 124 beats per minute) can produce an 11 mm Hg gradient between the PADP and LVEDP.[27] The increase in PADP and decrease in LVEDP result from the shortening of diastole, which reduces the amount of blood being transported from the pulmonary circulation to the LV.[27] Also, as HR increases, the left atrium begins to contract against a partially closed mitral valve.[28]

Another variable that significantly influences PAC data is a change in ventricular compliance. To illustrate this point, consider the fact that a high PAOP (or LVEDP) can exist in patients with an elevated preload with normal ventricular compliance, as well as in patients with a low preload with poor ventricular compliance. A patient with reduced ventricular compliance (e.g., myocardial ischemia, left ventricular hypertrophy, cardiac tamponade, ventricular interdependence) has a high PAOP or PADP that results in overestimation of LVEDV (Figure 16-7) and underestimation of LVEDP. In the setting of poor compliance, PAOP is not a reliable index for LVEDV.[29] In fact, it has been shown that during myocardial revascularization procedures, high PAOP values exist more than 50% of the time in conjunction with a low volume status (as determined by echocardiography), with patients responding favorably (despite a high PAOP) to an increase in intravascular volume.[30] As previously stated, one must be careful not to be misled by the wedge.[29]

To summarize, the PADP correlates poorly (by 5 mm Hg or more) with the PAOP under the following circumstances: when pulmonary vascular resistance (PVR) is elevated (e.g., chronic obstructive pulmonary disease, human papillomavirus, pulmonary embolus, adult respiratory distress syndrome, hypercarbia), when heart rates exceed 130 beats per minute, when severe mitral or aortic regurgitation is present, or when a lung zone III has changed to a zone II or I (e.g., in the presence of hypovolemia, PEEP). Increases in PVR and HR cause the PADP to exceed PAOP. Severe regurgita-

tion and lung zone changes produce the opposite effect, with PADP being less than the PAOP; this may also hold true for right bundle branch block, based on one researcher's findings of how this conduction defect caused the PADP (in the setting of normal PVR) to be up to 7 mm Hg less than the mean left atrial pressure.[31] A review of the gross interpretation of CVP and PAOP values is presented in Table 16-6.

Table 16-6 Potential Clinical Diagnosis via the Use of Hemodynamic Values: Interpretation of Pulmonary Artery Catheter Data

CVP	PADP	PAOP	Interpretation
Low	Low	Low	Hypovolemia, transducer not at phlebostatic axis*
Normal or high	High	High	LV failure
High	Normal or low	Normal or low	RV failure, TR, or TS
High	High	Normal or low	Pulmonary embolism
High	High	Normal	Pulmonary HTN
High	High	High	Cardiac tamponade, ventricular interdependence, transducer not at phlebostatic axis*
Normal	Normal or high	High	LV myocardial ischemia or MR
Low	High	Normal	ARDS†

ARDS, Acute respiratory distress syndrome; CVP, central venous pressure; HTN, hypertension; LV, left ventricular; MR, mitral regurgitation; PAC, pulmonary artery catheter; PADP, pulmonary artery diastolic pressure; PAOP, pulmonary artery occlusive pressure; RV, right ventricular; TR, tricuspid regurgitation; TS, tricuspid stenosis.

**Phlebostatic axis is the fourth intercostal space midanteroposterior level (not midaxillary line); for the right lateral decubitus position, fourth intercostal space midsternum; for the left lateral decubitus position, fourth intercostal space at the left parasternal border.*

†ARDS patients commonly require initial fluid administration for hemodynamic stability.

Other Hemodynamic Indexes

Some authors encourage the use of calculated indexes to optimize the care of critical care patients. These indexes include the pulmonary vascular resistance index (PVRI), systemic vascular resistance (SVR) index (SVRI), and cardiac index (CI). The potential advantages and limitations of each index will be reviewed.

The PVRI (PVR calculated with the cardiac index [CI] instead of the CO) is equal to the difference in pressure across the pulmonary circuit (mean PAP - PAOP) divided by flow (CI) times 80. This formula is taken from Ohm's law (with the variables mathematically manipulated) for electric currents (R [Resistance] = V [Voltage] = I [Current]). A normal value is considered to be 45 to 225 dynes • sec/cm^5 • m^2. Two limitations of extrapolating physiologic resistance from Ohm's law are that blood flow is pulsatile (not flowing continuously through a set of rigid pipes), and resistance is not uniform throughout the pulmonary circuit; the electrical counterpart describes resistance not in alternating currents, but direct currents.[32]

When PVR is used clinically, it is viewed as an *estimate* of RV afterload. *Afterload* is defined as systolic wall stress or the impedance the ventricle must overcome to eject its stroke volume. Vascular resistance is not synonymous with afterload but is used as an extension of the concept. Pulmonary vascular resistance, like SVR, can affect afterload, but neither formula accounts for changes in ventricular wall thickness or radius, which are components of afterload.

SVR is commonly used to provide guidance in the use of vasoconstrictors (e.g., phenylephrine infusion) or afterload reduction (e.g., intravenous nitroglycerine or sodium nitroprusside). The limitations described previously for PVR also hold true for SVR, although perhaps to a lesser extent, because the systemic vasculature has lower compliance. Nevertheless, manipulation of SVRI to achieve normal or high values in shock syndromes (e.g., septic shock with low blood pressure, low blood flow, and low SVRI) has been shown not to correlate with survival, and the development of a low SVRI in shock syndromes does not correlate well with death.[33] In general, the use of vasoconstrictors to support afterload should be deferred until maximization of preload or the use of positive inotropes has proved ineffective. Indiscriminate use of α-adrenergic agonists can worsen microcirculatory blood flow by exaggerating existing nonuniform vasoconstriction; this can lead to a further deterioration in cellular oxygen debt.[34] The SVRI is calculated as the difference between systemic input pressure (mean arterial pressure) minus the output pressure (right atrial pressure or CVP), divided by the CI times 80. The normal range is 1760 to 2600 dynes • sec/cm^5 • m^2.

Determination of CO assists critical care specialists in providing rational hemodynamic therapy; evaluating the response to therapy; and determining the adequacy of tissue perfusion, which is linked to maintenance of arterial blood pressure, the delivery of oxygen, and removal of wastes. It also permits the calculation of other hemodynamic indices (e.g., PVR and SVR). A normal CO value should be qualified by taking into account age differences, metabolic activity (declines with anesthesia and increases with hyperthermia), and patient size.

This last factor may be adjusted for by converting a CO to a CI, which attempts to normalize CO for the large number of values found in the general population. However, CI adjusts only for the variables of height and weight; it does

not address the lack of uniformity of predicted basal oxygen consumption and metabolic rates resulting from differences in sex and age.[35] In addition, the relationship between body surface area (BSA) and blood flow is indistinct.[35] CI is calculated by dividing CO by BSA. The plotting of height and weight on a body surface chart estimates the BSA in square meters (Figure 16-8). Commonly quoted "normal" values are 5 to 6 L/min for CO and 2.8 to 3.6 L/min • m^2 for CI.

The most commonly used technique for determining CO is thermodilution, whereby an analog computer calculates the CO by using the modified Stewart-Hamilton equation. This method was first utilized by Fegler in 1954.[36] It entails the injection of a known quantity of an indicator solution (most commonly 5% dextrose in water, although 0.9% normal saline has a similar density factor)[37] through the proximal port of a thermodilution PAC.[38]

The injected solution is considered a thermal indicator because it is cold relative to body temperature. It rapidly mixes with the incoming blood and is carried through the RV until it is detected by the thermistor near the end of the catheter in the PA. The computer plots a time-temperature curve, with the area under the curve being inversely proportional to the CO; therefore larger curves are not desired. Variables that can influence recorded values include the computation constant (which varies with catheter size, injectate volume, and temperature), temperature of the injectate (desired range of 0α to 24α C),[37, 39] volume of injection,[37, 39] speed of injection (should be done in 4 seconds or less),[37, 40] and the timing of injection (it should be consistent, i.e., the same time during each respiratory cycle).[37, 41, 42] Iced injectates have not been shown to offer any significant advantage over room-temperature injectates.[37, 39] In fact, cold indicator solutions injected rapidly into the right atrium have been shown to produce dysrhythmias, such as sinus bradycardia.[43, 44] Research that has examined the impact of valvular or septal defects on thermodilution CO (TDCO) values has produced conflicting results.[45-47] A list of variables that can skew CO measurements is provided in Table 16-7.

Table 16-7 Variables That Influence Thermodilution CO Values

Overestimates	Underestimates	Unpredictable
• Low injectate volume	• Excessive injectate volume	• Right-to-left ventricular septal defect
• Injectate that is too warm	• Injectate solutions that are too cold	• Left-to-right ventricular septal defect
• Thrombus on the thermistor of the PAC		• Tricuspid regurgitation
• Partially wedged PAC		

CO, Cardiac output; PAC, pulmonary artery catheter.

The accuracy for TDCO (including when performed in patients in the lateral position) is α10%, and the reliability is α5%.[48, 49] These values are lower in the pediatric population,[50] in patients who have low CO,[51] and for measurements taken in the operating room.[52] Anesthetists should be careful not to overinterpret small changes (e.g., 5% to 10%) and should never express values beyond one decimal point. The common practice of averaging three CO output values has also been shown to improve accuracy.[48]

A further advancement in CO technology has been achieved via the placement of thermal filaments within the right ventricular portion of the PAC and near the tip of the thermistor. With the former, a sophisticated computer algorithm permits for analysis of a thermal signal created by small quantities of heat being emitted from the PAC–a pulsed warm thermodilution technique. This heat signal is eventually transmitted by the blood to the distal thermistor, which permits for continuous cardiac output (CCO) assessment.[53] An adequate signal-to-noise ratio is necessary to produce accurate CCO measurements. Research has shown a low ratio (derived from a core body temperature > 38.5° C) can result in inaccurate CCO values.[54] One advantage of a CCO catheter is the elimination of the time-consuming administration of a thermal injectate through the proximal port of the PAC. It also reduces the number of discrepancies in thermodilution CO values that can occur with inconsistent injectate administration relative to the respiratory cycle.

A significant drawback to the CCO device is the hysteresis in recording hemodynamic information. Although the monitor displays updated CO figures every 30 seconds, they nonetheless do not represent real-time data. Instead, the CCO values depict the average CO from the prior 3 to 6 minutes.[55] This can be a significant limitation in patients who develop acute hemodynamic changes occurring in response to hemorrhage and resuscitation.[56] In this setting a standard bolus thermodilution technique is preferable. Manufacturers of CCO monitors have attempted to circumvent this limitation by developing "Fast-Filter" and "Urgent" modes to supplement the "Normal" mode of data processing.

One investigation found a significant decline in the precision of CO measurements when the Fast-Filter and Urgent modes were employed.[57] The reliability and accuracy of the device with intensive care and surgical patients has been established with recordings taken in the supine position [54, 58-67] and with the backrest elevated up to 45 degrees.[68] Nevertheless, some investigators have found the CCO technique to be less precise than iced-bolus thermodilution.[69, 70] In spite of reports in the literature of a positive clinical outcome based on the use of CCO,[71] future studies will be required to establish whether CCO measurements (as well as other monitoring modalities such as Doppler techniques) reduce the length of hospitalization and improve morbidity and mortality rates.[72]

Mixed Venous Oxygen Saturation

Since its introduction in 1981, use of $S\overline{V}O_2$ as an estimate of systemic oxygen delivery has generated controversy. The purported usefulness of monitoring $S\overline{V}O_2$ is based on the knowledge that it is determined by pulmonary function, cardiac function, oxygen delivery, tissue perfusion, oxygen consumption, and hemoglobin concentration. During the course of an anesthetic procedure (excluding cases of major trauma or hemorrhagic shock), it is not unusual for pulmonary function, hemoglobin content, and oxygen consumption to remain relatively stable. Therefore proponents of $S\overline{V}O_2$ monitoring state that it is reasonable to assume that a decrease in $S\overline{V}O_2$ reflects a change in oxygen delivery, presumably via a reduction in CO. However, numerous studies have shown that in the intensive care unit $S\overline{V}O_2$ values correlate poorly with CO,[73, 74] causing some investigators to criticize its use. Nevertheless, other researchers have found changes in $S\overline{V}O_2$ to parallel changes in CO,[75, 76] as well as reduce hospital morbidity and mortality.[62, 77, 78] In addition, $S\overline{V}O_2$ monitoring may serve as a prognostic indicator in patients with acute myocardial infarction.[79]

Continuous mixed venous oximetry is measured with the use of fiberoptic reflectance spectrophotometry through two fiberoptics housed in the PAC. One fiberoptic transmits light-emitting diodes (narrow wavebands of light) to the distal catheter. The extent of light absorption and reflection is a function of the quantity of oxyhemoglobin and deoxyhemoglobin present in the PA.[80]

The receiving fiberoptic transports the reflected light to a microprocessor, which interprets the signal and displays an $S\overline{V}O_2$ value; the normal range of $S\overline{V}O_2$ is 65% to 77%. Factors that increase $S\overline{V}O_2$ values include left-to-right shunts, hypothermia, sepsis, cyanide toxicity, a wedged PAC, and an increase in CO. $S\overline{V}O_2$ decreases with hyperthermia, shivering, seizures, reduced pulmonary transport of oxygen, hemorrhage, and decreased CO. Sustained low values (e.g., 50%) merit investigation followed by appropriate intervention(s).

It has also been demonstrated that some $S\overline{V}O_2$ monitoring systems adapt well to acute changes in hematocrit.[81] In addition, research with two-wavelength and three-wavelength $S\overline{V}O_2$ oximetry catheters has shown the systems to be comparable in accuracy.[82] It has also been demonstrated that some $S\overline{V}O_2$ monitoring systems adapt well to acute changes in hematocrit.[66] In addition, research with two-wavelength and three-wavelength $S\overline{V}O_2$ oximetry catheters has shown the systems to be comparable in accuracy.[67]

In conclusion, the cost-benefit ratio of using PACs that provide CCO or $S\overline{V}O_2$ measurements remains controversial.[5, 55] The use of the PAC has the potential to promote health[11] or cause harm–the major determinant is the clinician's ability to interpret and apply data from this sophisticated diagnostic tool.[83] Therapeutic strategies should be guided by a knowledge of the patient's underlying pathophysiology.

Automated St-segment Monitoring

Computerized real-time ST-segment analysis continues to be incorporated in operating rooms (ORs), intensive care units (ICUs), and post-anesthesia care units (PACUs) across the country. Many factors support this trend, including the development of practice guidelines by professional societies that advocate such monitoring techniques in select patient populations[84] and the demographics of the general surgical population. Approximately one-third of patients scheduled for noncardiac surgery have risk factors for coronary artery disease (CAD) and postoperative myocardial infarction is three times as frequent in patients with ischemia.[85, 86] Research has shown prolonged stress-induced ischemia (i.e., ST-segment depression) to be the major cause for cardiac morbidity (myocardial infarction) after significant vascular surgery.[87] The overall incidence of perioperative ischemia in patients with CAD scheduled for cardiac or noncardiac surgery ranges from 20% to 80%.[88, 89]

Because of its low cost, noninvasiveness, widespread availability, and designation as a standard of care for monitoring of all anesthetized patients,[1] the ECG remains a common and required diagnostic tool in the operating room. Compared to Holter monitors, ST segment trending monitors have on average a sensitivity of 74% and specificity of 73% in detecting myocardial ischemia.[90] When used in high-risk cardiac patients to guide early treatment, they may reduce morbidity.[91]

Although universal standards for an "ECG ischemic threshold" do not exist, acceptable ECG criteria *suggestive* of myocardial ischemia include the following: (1) $^{3}1$ mm horizontal ST-segment depression; (2) $^{3}1$ mm upsloping or

downsloping ST-segment depression measured 60 ms (1.5 mm) or 80 ms (2.0 mm) from the J point; and (3) 1 mm ST-segment elevation (Figure 16-9).[92-94] The J point is used in analyzing depressed ST-segments that are upsloped or downsloped. It is defined as the junction (hence J point) between the S wave and ST segment (Figure 16-10). The magnitude of ST-segment depression is determined by measuring a previously established horizontal distance (e.g., 60-ms) from the J point. For example, a vertical line is drawn at a distance of 60 ms from the J point and the intersection of this line with the ST segment is noted. This point of intersection defines the degree of ST-segment deviation relative to the isoelectric line which is referenced as the *Iso point* (i.e., intersects an extended PR segment [see Figure 16-10]).

A 60-ms distance measured from the J point is preferred with rapid HRs, because during tachyarrhythmias a shortened ST-segment can result from the T wave encroaching upon the ST segment. The use of a J + 80-ms distance in this circumstance could actually lead to an ST point that intersects a T wave instead of the ST-segment. Should this occur, the computer-derived ST-segment deviation value would reflect a false significant shift in the ST segment, suggesting myocardial ischemia (false positive) or masking a significant ST-segment depression (false negative [Figure 16-11]).

Regarding the significance of the various forms of ST segment depression, it is important to recall that a horizontal or downsloping depressed ST segment has greater specificity (fewer false positives) than an upsloping depressed ST segment. Adding upsloping ST segment changes to ischemia diagnostic criteria does improve overall sensitivity but at a sacrifice to specificity and positive predictive value.[95, 96]

Setting the ST-Segment Parameters

Most manufacturers of automated ST-segment analysis monitors have sophisticated algorithms that allow fairly consistent and accurate placement of the ST measurement points, but no system is perfect. Anesthetists should periodically assess ST measurement points and change them as needed; responding to false trends could lead to iatrogenic injury. In fact, manufacturers have incorporated software that permits the health care provider to override the monitor's placement of the ST measurement points. A common technique for setting ST measurement points involves adjustment of three variables: Iso point, J point, and ST point (Figure 16-12). Manipulation of a keypad on the ECG monitor permits the operator to scroll each of these "points" or vertical lines along a horizontal axis. Figures 16-13 and 16-14 illustrate the consequences when real-time ST segment analysis software incorrectly places ST-segment measurement points (i.e., the display of inaccurate ST-segment deviation values). As noted previously, even accurate placement of all three ST-segment variables does not assure reliable ST-segment deviation values are displayed (see Figure 16-11). The application of an ST-segment deviation algorithm can reduce the occurrence of such mishaps and improve overall management of patients at risk for ischemic changes (Figure 16-15).

Other significant variables to account for when monitoring patients at risk for ischemic events include ECG electrode placement, ECG lead selection, gain setting, and frequency bandwidth. Each of these is briefly reviewed here.

Electrocardiograph Electrode Placement

It is not uncommon to see ECG electrodes inaccurately placed on a patient in an attempt to "move an operating room schedule along." Many times in a Physical Status (PS) I or II patient, correct ECG electrode placement is a moot point. However, in patients with risk factors for CAD, such inattentiveness can lead to iatrogenic injury by producing deviated ST segments or flipped T waves that can be viewed as "real" problems. Proper placement of the limb lead and chest lead electrodes is described in Table 16-8. For emphasis, the precordial leads should be placed via palpation of the costae, not by gross visual estimation of an intercostal space (Figure 16-16). Understandably some surgical procedures do not permit the use of optimal ECG lead selection and placement; ECG electrode(s) can interfere with skin preparation and surgical incision. Under these circumstances a less than optimal ECG lead placement is acceptable.

Table 16-8 Proper Placement of Electrocardiographic Electrodes for Monitoring Limb Leads and Chest Leads*

RA	Near the right shoulder directly the beneath clavicle
LA	Near the left shoulder directly beneath the clavicle
LL	Near the left iliac crest
RL	At any convenient location
V1	Fourth intercostal space right of the sternal border
V2	Fourth intercostal space left of the sternal border
V3	Equal distance between V2 and V4
V4	Midclavicular line at the fifth intercostal space
V5	Horizontal to V4 on the anterior axillary line
V6	Horizontal to V5 on the midaxillary line

LA, Left arm electrocardiographic (ECG) electrode; LL, left leg ECG electrode; RA, right arm ECG electrode; RL, right leg ECG electrode.
**Placement of the LL electrode in a more superior location (e.g., near the left nipple) can affect the accuracy of ST-segment interpretation and dysrhythmia analysis.*

Electrocardiographic Lead Selection

The decision regarding which ECG leads to monitor during the course of an anesthetic can be extremely important relative to the medical history of the patient. Improper selection can result in unrecognized myocardial ischemia, injury, or infarction. Research has validated that use of a single ECG lead for ischemic monitoring in patients with documented CAD is inadequate; monitoring with multiple leads enhances patient safety.97 In patients at risk for ischemic events, this author recommends the maximum number of ECG leads be displayed (e.g., three, seven, twelve [Derived 12-lead]) during the perioperative period to enhance continuous and comprehensive assessment of ST-segment and T wave changes (Figures 16-17 and 16-18). Which lead is or leads are best in detecting significant ST- segment changes remains somewhat controversial. First and foremost, if a preoperative 12-lead ECG has been done, "fingerprinting" of this tracing should serve as the primary guide for lead selection during the perioperative period. If the baseline 12-lead shows significant primary ST segment changes in leads V3, V4 and V5, then this lead set should be prioritized for continuous display in the operating room. The ECG monitoring system will dictate what lead display options can be configured. For example, with Philips software and a five-cable ECG lead system, a derived 12-lead (EASI™) can be continuously displayed (see Figure 16-18). With other manufacturers and a five-cable ECG lead system, a true V3 or V4, a modified chest lead V5 (e.g., central subclavicular 5 [CS5]), and a bipolar limb lead (e.g. lead II) can be configured for ECG monitoring (e.g., Fig. 16-19).

In patients without a preoperative 12-lead or who have a baseline 12-lead that is essentially normal, the literature suggests leads V3, V4, and limb lead III be selected for continuous monitoring for ST-segment elevation.[97-99] Leads V3 and III are sensitive for detecting supply ischemia/transmural myocardial injury (as seen during angioplasty procedures). Lead II is recommended for assessment of narrow QRS complex rhythms, particularly if the P wave is significant for diagnostic criteria (e.g., atrial flutter, atrial fibrillation, junctional rhythms). If the anticipated change in ST-segment is depression, which would correlate with subendocardial injury (demand and/or supply ischemia), then perhaps V5, limb lead II, and III may be best.[100-102] However, some researchers with strong internal validity in their study have found V5 and II to be insensitive leads for detecting ST segment changes.[103] The recommendation for V5 and limb lead II as preferred leads[101] has also been challenged by Landesberg et al in 2002. In their research, 185 consecutive patients undergoing vascular surgery were monitored by continuous 12-lead ST-trend analysis during the perioperative period and up to 72 hours postoperatively. Chest lead V3 was found to detect ischemia earliest and most frequently (86.8%). Lead V4 was the second most diagnostic lead (78.9%), and V5 was third (65.8%). With those patients sustaining a myocardial infarction, V4 was the most sensitive lead (83.3%), and V3 and V5 were equally sensitive (75%).[104] In this study, myocardial infarction was diagnosed if cardiac troponin I levels were greater than 3.1 ng/mL and were accompanied by symptoms of ischemia or the presence of ECG criteria (i.e., ST-segment elevation, ST-segment depression, or large Q waves). As reported by other researchers, monitoring in multiple leads improved sensitivity.[97, 101, 105] Of interest was the observation that 97% of ischemic events were expressed as ST-segment depression -not elevation- and ST shifts were considered significant if their duration of change exceeded 10 minutes.

Given this information, it is prudent for anesthesia providers to monitor and assess multiple ECG leads in the operating room. In the absence of an ST-segment fingerprint, this author advocates the following ECG lead combinations (for ST-segment elevation or depression) in patients with documented or identified significant risk factors for ischemic heart disease:

1) For a five-cable ECG recording system, the 3-lead set of V4, MCL_3, and MCL_5 or V4 or V3 combined with limb lead III and limb lead aVF.

2) For a three-cable ECG recording system, a two-lead set comprising MCL_4, and $MCL_{3\ or\ 5}$ or $MCL_{4\ or\ 3}$ combined with limb lead aVF.

Extended monitoring capabilities help to optimize detection of regionalized myocardial ischemia. Many times this entails nothing more than changing the lead selector switch to another ECG lead (e.g., III changed to aVF) or displaying a multilead ECG when indicated. The latter produces an ECG recording of all six limb leads and a single chest lead, permitting the anesthetist to more comprehensively assess ECG data, including dysrhythmias, the mean QRS axis (limb leads 1 and aVF), T-wave morphology, ST-segment changes, and QT intervals.

With the introduction into clinical practice of the derived 12-lead lead system (EASI™), nurses and physicians have a convenient method to globally assess the overall well-being of the myocardium (see Figure 16-18). The 12-lead is derived from modified vectorcardiographic leads and requires the use of a five-cable ECG lead system106, 107 To monitor with this system, the five ECG electrodes are placed in the following locations: LA electrode over the manubrium; chest (V) electrode over the lower body of the sternum; LL electrode left midaxillary, horizontal to the chest electrode; RA electrode right midaxillary, also horizontal to the chest electrode; and RL electrode in any convenient location. Current and past research suggests the derived 12-lead is comparable to the standard 12-lead for multiple cardiac diagnosis in adults and children (e.g., ST-segment changes, myocardial infarction, wide QRS-complex tachycardia, QT-interval measurements).99, 107-117 It is likely that patients at substantial risk for CAD would benefit from global ischemic monitoring via a derived 12-lead. This software option also eliminates any need to consider "preferred" ECG leads, since all six limb leads and six chest leads can be viewed during an anesthetic.

In contrast to a derived 12-lead or five-cable ECG electrode system, a three-cable system offers challenges to anesthesia providers concerning potential errors with ECG lead configuration. The literature documents that health care providers consistently struggle with modified chest lead configuration -even those who routinely monitor the ECG.[19] Modified chest leads offer an alternative to true chest leads when only a three-cable ECG recording system is available. Recently introduced into clinical practice is the modified chest lead $MAC_{1(L)}$ (modified augmented chest lead V1). This modified chest lead is configured using unipolar limb lead aVL and has been shown to have a diagnostic accuracy similar to true chest lead V1. The internal validity of this finding was based upon His-bundle recordings, used as the gold standard for distinguishing between premature ventricular ectopy and premature aberrantly conducted beats. The simplicity of this unique ECG lead has the potential to reduce modified chest lead configuration errors (e.g., through application of a unipolar lead system rather than a bipolar limb lead system to replicate a V1). To substantiate this theoretical advantage (e.g., ease of configuration of $MAC_{1(L)}$ versus modified chest lead V1 [MCL_1]), more research will be needed. Figure 16-20 illustrates the ECG configuration of $MAC_{1(L)}$, as well as the similarities in morphologic characteristics of single cardiac cycles recorded in V1 and $MAC_{1(L)}$.

In summary, practitioners who limit ECG monitoring and assessment to a single lead or pair of leads *in patients with documented or recognized risk factors for ischemic heart disease* are potentially compromising patient safety by not using (when available) multiple-ECG-lead display configuration options. In such patients, the continuous display of three ECG leads (e.g., V4, MCL_5, and limb lead II with a five-cable ECG recording system [see Figure 17-19]) or a derived 12-lead could be of clinical benefit. The literature substantiates myocardial ischemia (ST segment and/or TW changes) can be regionalized and completely missed when viewing two or fewer ECG leads. Unarguably, critical assessment of all available patient data will help anesthetists exercise better judgment during an anesthetic and potentially improve anesthetic outcome.

Gain Setting and Frequency Bandwidth

Two other potential problems with continuous ST-segment monitoring relate to the amplitude at which the ECG monitor has been set and whether filtering of the electrical signal is excessive. When accurate visual assessment of ST-segments is a priority during an anesthetic, the gain of the ECG monitor should be set at standardization (i.e., a 1 mV signal delivered by the ECG monitor produces a 10 mm calibration pulse). This gain setting fixes the ratio of the ST-segment and QRS-complex size so that a 1 mm ST-segment change is accurately assessed (e.g., potential myocardial ischemia). Failure to recognize the use of other gain settings can lead to overdiagnosis or underdiagnosis of ischemic ST-segment changes. Figure 16-21 illustrates how changes in gain settings and improper lead placement can confound ST-segment assessment.

The filtering capacity of the ECG monitor is yet another potential source of artifact. Prior research has demonstrated that filtering out the low end of the frequency bandwidth (e.g., 0.05 to 0.5 to produce a new bandwidth range of 0.5 to 40 Hz) of the monitor's electrical signal can lead to distortion of the ST-segment (elevation or depression).[118, 119] For this reason in many (but not all) cases the diagnostic mode of an ECG monitor should be used when ST-segment analysis is a priority during an anesthetic.

Clearly, the sensitivity and specificity of computerized real-time ST-segment analysis software is dependent on the ability of the anesthetist to critically analyze the large number of factors that influence ST-segment values. Attentiveness to such variables as the patient's physical status, ECG lead placement and selection, type of electronic filtering employed by the ECG monitor, and gain setting used can affect anesthetic outcome in patients at risk for ischemia.

Arterial Pressure Monitoring

As with ECG monitoring, professional societies have designated the routine assessment of arterial blood pressure (BP) to be essential for the safe conduct of any anesthetic; at minimum, BP should be recorded at least once every 5 minutes. This frequency of assessment should be increased for patients noted to have any systemic disease that limits physiologic reserve, such as coronary artery disease (CAD) or valvular heart defects (e.g., aortic stenosis). This author advocates BP assessment at 1 minute intervals during the induction period of most anesthetics, the rationale being that many commonly administered induction agents are associated with cardiac depressant effects and the concomitant disruption or gross activation of homeostatic reflexes can lead to substantive changes in hemodynamics- even in relatively healthy patients. It is also known that the hemodynamic response to many drugs used during induction of anesthesia can be unpredictable owing to differences in pharmacokinetics and pharmacodynamics among patients.

BP monitoring can be accomplished through both noninvasive and invasive techniques. Each recording modality will be reviewed with an emphasis on clinical relevance. Other resources provide a comprehensive description of the theoretical underpinnings for the calculation of noninvasive and invasive arterial BP data. In today's modern operating-room (OR) environment, noninvasive blood pressure (NIBP) monitoring is most often recorded by automated BP cuffs that can be configured to measure systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial blood pressure (MAP) in a standard mode, stat mode, at varied frequencies of assessment, and adjusted for patient age and habitus. The literature recommends BP cuffs have a bladder dimension of approximately 40% of the circumference of the extremity. Bladders not properly sized and cuffs not applied firmly to the extremity can lead to inaccurate recordings. For example, cuffs that are applied loosely to the extremity, positioned below the level of the heart, or too small can produce arterial blood pressure values that are falsely elevated.[120]

The physics associated with auscultation of BP relates to the audible discernment of Korotkoff sounds through a stethoscope. These sounds are produced by turbulent blood flow within an artery during cuff deflation. A second mechanism for BP assessment is via an oscillometric technique (see Figure 16.22). NIBP devices have inflation and deflation cycles controlled by a microprocessor. During deflation of the cuff, oscillations are sampled over the span of several cardiac cycles. Any oscillations sensed by the pressure transducer are then processed numerically; if none are sensed, a step-wise reduction in cuff pressure, followed by sustained measurement for oscillations occurs. This process repeats until SBP, DBP, and MAP are derived. MAP can also be estimated by taking the sum of the SBP and DBP- the latter multiplied by two, then dividing this figure by three. Example: a BP of 120/80 has a MAP of $\frac{(120 + 80 + 80)}{3}$ = 93 mmHg. This formula accounts for diastole comprising approximately two-thirds of a normal cardiac cycle.

Generally speaking, the benefits outweigh the risks of frequent NIBP recordings taken during an anesthetic. Nevertheless, injury and harm can occur with automatic NIBP measurements and may include damage to peripheral nerves (e.g., ulnar), development of a compartment syndrome, or interference with delivery of drugs through an intravenous (IV) line. For example, propofol sequestered in a forearm during BP-cuff inflation can cause intense pain. The latter can be avoided by routinely placing the BP cuff on the extremity *without* the peripheral IV. In circumstances where the scheduled surgery involves an upper extremity, the BP cuff and IV can be placed on the contralateral arm (brachium or antebrachium), with the caveat that the NIBP be configured so BP measurements are recorded in the manual mode to prevent unexpected disruption of the delivery of IV induction drugs. Alternatively, a lower extremity (thigh or calf) can be used for BP measurements.

In morbidly obese patients, it is not unusual to have to relocate a BP cuff from the upper arm because of the cone-shape of the extremity. An alternative BP monitoring site is the forearm. However, NIBP measurements taken in the forearm with the patient in the supine or sitting position or the head of the bed elevated 45 degrees can overestimate the more proximal brachial BP.[121, 122] Formulas have been proposed to correct for such discrepancies. For example, in an obese patient with a diastolic forearm pressure of 80 mm Hg and arm circumference between 32 and 44 cm, the adjusted DBP would equal 72.4 mmHg. This is derived from the following equation:

$$\text{Brachial DBP} = 25.2 + 0.59 \times \text{Forearm DBP}.$$

This formula was proposed relative to 129 subjects with an average body mass index of 40 ± 7 kg/m^2.[121] Discrepancies in BP measurements have also been noted between upper and lower extremities and between arms. In study participants up to 16 years of age, SBP has been shown to be *greater* in the thigh and calf than the arm. In contrast, DBP and MAP are *lower* in the calf and thigh than the arm.[123] Patients most likely to exhibit inter-arm BP differences are those who are obese and have a higher HR and SBP.[124] Concerns about accuracy also arise when measuring BP noninvasively versus invasively. One group of investigators found NIBP taken in the upper arm in patients with septic shock to correlate poorly with arterial-line pressure measurements, -specifically causing an overestimation of MAP with the noninvasive technique.[125]

It is apparent that in the demographics of the population of the United States, that a substantive change has occurred in recent years in the number of adults and children who are classified as obese. Consistent with this change are the findings that mean mid-arm circumference has increased across the country- with the greatest increase occurring in the

20- to 39- year-olds.[126] This change should cause anesthesia providers to be more attentive to the daily task of selecting properly sized BP cuffs. In fact, research has shown that up to 39% of all hypertensive patients and 47% of self-reported diabetics should not have their BP measured with the standard adult-size cuff. [126] Inattentiveness to this basic and essential monitoring need could cause the anesthetist to process inaccurate hemodynamic data (e.g., overestimated BP recordings) and ultimately contribute to a poor surgical outcome.

Direct measurement of arterial BP is considered by many the gold standard for recording BP. Many anatomic locations can be used for direct BP measurement, with the most common being the radial artery. Other less commonly used arteries are the ulnar, brachial, axillary, femoral, and dorsalis pedis. Risks associated with placement of an intra-arterial catheter include infection (localized and systemic), thrombus formation, hematoma, vasospasm, embolization, injury to adjacent nerves and veins, ischemia to extremities or digits, loss of a limb secondary to poor collateral circulation, iatrogenic injuries (air embolization, intraarterial injection of drugs meant to be administered intravenously), and acute blood loss due to an unexpected disruption of the transducing system (e.g., cracked or disconnected stopcock). A displaced transducer (no longer level with the phlebostatic axis) can cause an "increase" in arterial blood pressure if positioned substantially below the level of the heart. Assessment of an abnormal BP recording should include an understanding of problems inherent to a fluid-pressure monitoring system. To mitigate the ongoing risks of direct arterial BP monitoring, constant vigilance on the part of the anesthetist is paramount.

Monitoring BP directly offers several distinct advantages including beat-to-beat assessment of BP, limited hysteresis in measured values, and easy access for arterial sampling of blood for any number of laboratory tests (e.g., arterial blood gasea, serum electrolytes, glucose, hemoglobin levels). Indications for direct arterial BP monitoring include surgical procedures in which there is potential for acute and/or gross changes in hemodynamics. This would include operations such as repair of aortic aneurysms, carotid endarterectomy, and craniotomies. Even with lower risk surgical procedures, direct arterial BP monitoring may be indicated, particularly if preoperative BP is poorly controlled (labile). Patients with comorbidity may be at substantial risk for a stroke or heart attack during periods of acute stress (e.g., laryngoscopy or emergence from an anesthetic) if BP is not directly monitored.

Risks associated with placement of a radial artery catheter can be minimized if precautionary measures are taken. This would include positioning of the hand and wrist on an arm board. A roll should be placed beneath the wrist, fingers and thumb should be taped securely across the board. This position keeps the hand from interfering with manipulation and placement of the needle-catheter system; it also facilitates palpation of the radial artery. Commonly, a 20-gauge nontapered catheter is used (a 22-gauge is also optional) to penetrate an area of skin that has been prepped with antiseptic solution and infiltrated with local anesthetic. The needle, bevel pointing upward, is directed at approximately a 45-degree angle towards the palpated pulse. If bone is encountered with the tip of the needle during advancement, the complete catheter system (catheter and needle) is slowly withdrawn while observing for the free flow of arterial blood; sometimes the artery can be pierced without a "flash back" (unintentional transfixion-withdrawal method). If during catheter withdrawal no blood is seen, the needle system is directed slightly laterally (in either direction) and re-advanced. Once arterial blood is seen in the lumen of the catheter, the angle of the needle is reduced to approximately 30 degrees, then advanced slightly (a few millimeters). The catheter is subsequently threaded off the needle. "Fatigue" at a puncture site may occur at which time a new artery may be chosen to cannulate or a "fresh set of hands" (perhaps another anesthesia provider or member of the surgical team) used to repeat the attempt at arterial puncture. After verifying correct placement of the catheter within the lumen of the artery (free flow of blood through the rigid tubing when vented to air), it is important to securely fasten the arterial catheter to the skin; preferably with suture and a sterile dressing applied on top of the puncture site.

The transducing system should be zeroed to atmospheric pressure (with the stopcock vented to air) and referenced at the level of the left atrium. In patients with poor vascular compliance, the arterial tracing can produce an "overshoot" or "ringing" phenomenon. If not recognized, BP recordings will overestimate SBP and MAP values. In contrast, a dampened waveform, which can develop with a flexed wrist or low pressure in the continuous-flush device, can lead to an underestimation of BP recordings (Figure 16.23). Direct arterial pressure measurements, although very accurate in many clinical circumstances, can still produce BP recordings that are significantly skewed and lead to inappropriate interventions (e.g., preload augmentation, indiscriminate use of vasoactive drugs).

Transeophageal Echocardiography Monitoring

Transesophageal echocardiography (TEE) has been established as a safe, noninvasive diagnostic tool for monitoring numerous cardiac parameters to guide medical and nursing care. Systolic wall motion abnormalities (SWMA), vascular aneurysms, calculation of ejection fraction, ventricular preload, and measuring blood flow within heart chambers and across valves are a few of the utilities of ultrasound imaging applied during TEE. Guidelines for indications and training proficiency have been advocated by medical professional societies.[127, 128]

Sound used waves used to define anatomic structures in the human body were first described by Dussik et al. in 1947.

These investigators attempted to outline the cerebral ventricles by driving sound waves across the skull.[129] In 1971, C. D. Side and R. G. Gosling were the first to report the assessment of cardiac function via transesophageal techniques.[130] Thirty-six years later, substantial advancements in the medical application of ultrasound have occurred, leading in some circumstances to an improvement in surgical outcomes.[131] Fundamental to the interpretation of data obtained by TEE is an understanding of the physics of ultrasound. Ultrasound waves are inaudible to the human ear, having a frequency greater than 20,000 Hz. Piezoelectric crystals are known to produce ultrasound by vibrating when exposed to an electric current; the opposite also occurs, in that they produce voltage in response to an ultrasound echo or when pressed (mechanical stress) or released. The electric current produced has been shown to be of sufficient magnitude to temporarily illuminate a small bulb. Thus they function as both generators and receivers of ultrasound waves and electric currents.

Within the esophagus, ultrasound waves emitted by piezoelectric elements are absorbed, reflected, or scattered. When reflected by an organ (e.g., heart), the ultrasound echo produced is received by the piezoelectric elements housed within the TEE probe. These elements then generate an electrical impulse that is processed, amplified, and subsequently displayed as an image on the echograph machine (Figure 16.24). Manufacturers can place as many as 32 linearly arranged elements within a probe (Figure 16.25). The frequency of the piezoelectric crystals in TEE probes ranges from 3.7 to 7 MHz. This frequency range allows for greater detail in displayed images. Unfortunately, the tradeoff for clearer images is lower tissue penetration. Thus smaller frequency values (e.g., 2.5 MHz) are required in transthoracic echocardiographic (TTE) probes because of greater distances between elements and distal anatomic structures.

Clinically, three primary ultrasound imaging techniques are used: the M-mode, 2-Dimensional (2-D) imaging, and the Doppler exam. The M-mode provides high picture resolution with 1000 images per second. It is commonly referenced as being unidimensional and produces a well-focused, narrow ultrasound beam. It is sometimes referred to as an ice-pick view. With the 2-D scan, the ultrasound beam is electronically steered across a target field. The intermittent pulses of ultrasound are produced by varying the firing sequence (phasing) of individual piezoelectric crystals. The monitor subsequently displays an image that is somewhat triangular or appears as a "slice" of pie. This produces excellent spatial orientation; however at 30 images per second, the pictures are less well defined. The Doppler exam incorporates the concept of frequency shift, which was first described in 1842 by Austrian physicist, Christian Doppler. The clinical application of this concept involves viewing red blood cells (RBCs) as moving reflectors of ultrasound. As ultrasound reflects off the moving RBCs, echos are produced, which are then recorded by the TEE transducer. With the flow of RBCs toward the TEE probe, the distance between the sound source and its reception is changing. This phenomenon is referred to as a *frequency shift*. It is analogous to the change in pitch of a train whistle as the locomotive approaches the station; sound waves are compressed, and the pitch increases (frequency shift). In contrast to RBCs, body fluids (plasma) only minimally reflect ultrasound. Spectral and color-flow Doppler exams performed with echographs incorporate this concept by assigning different colors to RBCs that move towards and away from the source of ultrasound. This permits easy visualization of retrograde flow of blood across incompetent heart valves, as may occur with mitral regurgitation (MR). For example, the retrograde flow of blood from the left ventricle into the left atria during MR is seen distinctly as a mosaic pattern of color. Doppler exams are recognized as being beneficial in determining the etiology of regurgitation and the adequacy of valve repair, as well as influencing surgical management, such as the use or nonuse of cardiopulmonary bypass.[131, 132]

Fundamental elements of the TEE exam include positioning the TEE probe in the esophagus, either under sedation or after induction of the anesthetic (Figure 16.26). During the examination, cardiac anatomy can be assessed, myocardial ischemia diagnosed via the presence of SWMA, and blood flow through heart chambers and across valves seen. By convention, the posterior structures are displayed at the top of the screen (apex of the sector) and anterior structures at the bottom. The first image displayed in a standard exam is the short-axis view of the aortic valve. At a depth of approximately 35 to 40 cm from the teeth the aortic valve leaflets and coronary arteries are seen. Rotation and angulation of the probe can allow a long-axis view of the right and left atria, tricuspid and mitral valves, pulmonic and aortic valves, and right and left ventricles. This view is useful for assessing stenotic valves, identifying masses within the atria or ventricles, and observing the overall size of each heart chamber. A short-axis view of the left ventricle can be obtained with further advancement of the probe and angling of the tip. This position is also referred to as the *standard monitoring view* which allows the echocardiographer to assess for SWMA. Normal ventricular wall motion (which is not entirely uniform) thickens during systole, and the endocardial surface moves inward. Approximately 87% of the normal stroke volume is derived from shortening in the short axis of the ventricle-with little contribution from the long-axis.

Abnormal wall motion can be described by three terms: hypokinesia, akinesia, and dyskinesia. *Hypokinesia* represents contraction that is less vigorous than normal; wall thickening is decreased. *Akinesia* depicts the absence of wall motion and can be associated with myocardial infarction. *Dyskinesia* correlates with paradoxical movement (i.e., outward motion during systole) and is a hallmark of myocardial infarction and ventricular aneurysm (Figure 16.27). Not all wall

motion abnormalities are diagnostic of an imbalance between myocardial oxygen supply and demand. Abnormal loading conditions, asynchronous ventricular depolarization (e.g., left bundle branch block), echo dropout due to haphazard reflection of ultrasound off myocardial walls in lateral fields of the sector arc, or improper use of the gain controls of the TEE probe can lead to an erroneous diagnosis of SWMA. Also, the duration of SWMA can persist well after coronary reperfusion has been restored (e.g., 6 hours), indicating a stunned myocardium.[133] In canine research, a 50% decline in coronary blood flow has been shown to serve as a threshold for hypokinesia. In contrast, a 75% reduction in coronary blood flow commonly produces ST-segment deviation. Thus there is greater hysteresis and less sensitivity with ischemia-induced ECG changes than with ischemia-induced SWMA.[103, 134]This finding is consistent with classic research done by Tennant and Wiggers in 1935.[135]

To summarize, the best single view for routine monitoring for SWMA (myocardial ischemia) is the short axis at the midpapillary muscle level (see Figure 16.27), followed by the apical segment in the same axis. The midpapillary muscle level includes segments of the myocardium perfused by all three coronary arteries. This level is created by dividing the long axis of the left ventricle into three parts (i.e., basal, mid, and apical regions). The mid region extends from the tips to the bases of the papillary muscles. Interesting is the finding that the skills required for recognizing gross SWMA by anesthesiologists, residents, and CRNAs (compared to trained observers) can be acquired with little training; the study group successfully identified 95% of regional wall motion abnormalities.[136]

Newer imaging techniques introduced with TEE include contrast echocardiography, selected three-dimensional techniques, parametric imaging modes, and harmonic imaging modalities. Continued research with these echocardiographic diagnostic tools will help illucidate what patient populations may benefit most from their application. A recent investigation found real-time, three-dimensional (3-D) echocardiography in biplane mode to be a feasible way to estimate the area of the aortic valve orifice in patients with stenotic lesions.[137] Also of interest was porcine research that showed intracardiac transvenous echocardiography (ICE) to be superior to precordial Doopler and TEE techniques in diagnosing venous air embolism and retrieving as little as 0.05 to 1 mL of air.[138]

Summary

With continued advancements in technology and improved clinical databases derived from research, future monitoring techniques offer promise for improving anesthesia care. The development of specialized task forces comprising multiple professional societies also contributes substantively to professional practice. Understandably, anesthesia providers should continue to maintain a healthy skepticism of reported advancements in monitoring modalities. The decision to change practice routines should only occur after critiquing the reported merits of any research findings. Ultimately, this clinical paradigm will allow patients to benefit from medical and nursing care derived from evidence-based practice.

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IT Control Deficiencies that Impact Financial Reporting

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Introduction

The Public Company Accounting Oversight Board's (PCAOB) Statement of Auditing Standard No. 5 (AS 5) states that effective internal controls over financial reporting is essential to the reliability of financial statements. If a material weakness exists in a company's internal control environment, the weakness must be reported. Accordingly, a company's internal controls cannot be considered effective if a material weakness exists (PCAOB, 2007). Sections 302 and 404 of the Sarbanes-Oxley Act of 2002 (SOX) require management and external auditors to evaluate and report on these material weaknesses in internal controls over financial reporting. AS 5emphasizes the important role of the internal auditor by allowing the external auditor to rely on the work of the internal auditor when assessing internal controls.

IT plays a significant role in financial reporting, and Statement of Auditing Standard (SAS) No. 94 affirms that the nature and character of an entity's use of technology in its information system affects the entity's overall internal control structure. The SOX reporting requirements provide rich documentation for the study of weaknesses in the IT control structure. However, minimal amounts of current research focus on the relationship between material IT weaknesses and financial reporting through documented accounting errors, which ultimately impair financial reporting. The abundance of post SOX data now allows researchers to analyze the relationships between weak IT controls and accounting errors.

The purpose of this study is to examine specific categories of ITCDs and their related effect on financial reporting. These IT deficiency categories include controls such as, system security and access; end-user computing; software program design, implementation and maintenance; and segregation of duties. This study focuses on accounting errors described in the 2006 annual reports of companies reporting ITCDs and determines the statistical significance of the relationship between specific ITCDs and specific accounting errors. Currently, no available analysis of the data exists to identify the relationship between weak IT controls and the accounting errors that may result. Under new reporting requirements, auditors must gain a sufficient understanding of the impact of IT deficiencies on the control environment, and managers need to recognize the financial implications of preventing, verses correcting, risks and errors associated with IT deficiencies. This study provides information for both auditors and managers regarding the risk of IT deficiencies and the possible impact these deficiencies have on financial reporting through accounting errors.

Results indicate that companies report security and end-user computing controls more often than other types of ITCDs. In addition, companies that report security and access ITCDs report significantly more deficiencies related to program change controls; segregation of IT duties; and IT policies, procedures, and documentation than companies without security and access deficiencies. Also, companies that report security and access ITCDs report more accounting errors associated with expense recording and inventory, vendor and cost of sales issues than companies not reporting security and access deficiencies. Results also reveal that companies with end-user computing control deficiencies report significantly more IT period-end closing deficiencies. These companies also report more accounting errors in recording executive compensation and stock options and tax expense, benefits and deferrals. Moreover, the study also finds that these two deficiencies may generate accounting errors severe enough to force companies to restate their financial statements.

The first section of this study describes the responsibility of management and auditors under various regulatory requirements regarding internal control assessment and summarizes prior research on related topics. The second section focuses on the importance of IT controls, guidance for IT controls. Next, the study discusses methodology and sample selection used in this research followed by the results and analysis. The final section concludes with a summary and contribution of the findings.

Background

AS 5 requires auditors to audit management's assessment and express an opinion on the effectiveness of the company's internal control environment. In addition, external auditors may rely on the work performed by internal auditors and other company personnel to obtain evidence of the effectiveness of internal controls over financial reporting. A company's internal control environment is considered ineffective if a material weakness exists. AS 5 defines a material weakness as a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement exists in the company's annual financial statements. A deficiency

exists when the design or operation of a control does not allow management or employees, in the normal course of business, to prevent or detect misstatements on a timely basis (PCAOB, 2007).

Previous research examines the impact of poor internal controls over financial reporting. Prior to SOX, Icerman and Hillison (1990) found more accounting errors in weak internal control systems. Post SOX studies find more specific relationships between weak controls and financial reporting. Studies find that companies reporting material weaknesses in internal controls have lower earnings and accrual quality (Ashbaugh-Skaife et al., 2008; Doyle et al., 2007; Bedard, 2006), more restatements (Krishnan and Gnanakumar, 2007; Ashbaugh-Skaife et al., 2008), lower stock prices and returns (Beneish et al., 2005; Hammersley et al., 2008), higher audit fees (Raghunandan and Rama, 2006), and higher cost of capital (Ogneva et al., 2005). Additional studies find that companies with internal control weaknesses are smaller (Bryan and Lilien, 2005) with weaker IC governance (Krishnan and Gnanakumar, 2007; Zhang et al., 2007) and weaknesses related to revenue recognition deficiencies (Ge and McVay, 2005) than comparable companies without internal control weaknesses.

Studies specifically focusing on IT control weaknesses support the overall findings for internal control weaknesses. These studies also indicate that companies with IT control weaknesses report lower earnings or financial performance (Stoel and Muhanna, 2007; Boritz and Lim, 2007), incur increased audit fees (Boritz and Lim, 2007; Canada et al., 2006), and generate more misstated accounts (Watson and Klamm, 2007). Grant et al. (2008) identify four specific accounting errors reported more often by companies with overall weak IT controls: revenue recognition issues; receivable, investments and cash issues; inventory, vendor and cost of sales issues; and financial statement, footnote, US GAAP, and segment disclosures issues.

Our study identifies the most commonly reported IT deficiencies and additionally examines the relationship of these deficiencies with accounting errors reported by companies with weak IT controls. These new findings benefit managers and auditors by allowing them to focus on key areas for risk assessments when evaluating IT controls. The following section addresses the importance of these IT controls in the overall IC structure.

IT Controls

The purpose of an information system is to capture and store data in order to provide useful information needed by managers to conduct and control the operation of the entity. Systems also provide financial information to external parties – creditors, investors and regulators. In order to reduce costs, integrate data and processes, and quickly respond to information needs, most companies have implemented automated systems. IT has become an integral part of all aspects of business.

The American Institute of Certified Public Accountants (AICPA) recognized the importance of effective IT controls as early as 1974 by stating in Statement of Auditing Standard (SAS) No. 3 that the objectives of internal controls are the same regardless of a manual or automated system. In addition, SAS No. 48 and SAS No. 94 provide guidance for the auditor when assessing IT controls. SAS No. 48 requires auditors to evaluate the extent and complexity of computer processing activities (AICPA, 1984). SAS No. 94 extends the auditor's responsibility and requires the auditor to assess the company's use of IT and its relationship to the overall internal control environment by specifically assessing how IT may affect processing and reporting financial information (AICPA, 2001).

More recently, AS 5 provides additional guidelines and requirements for auditors as part of the period-end reporting process. Auditors must assess inputs, processes, and outputs used to produce financial statements and evaluate the extent of IT usage to perform these tasks. Auditors must understand how transactions flow through a company's IT system. Auditors must also be aware that an audit of internal controls in an automated system does not constitute a separate audit but is instead a part of the integrated financial statement audit.

Since SOX does not provide definitive guidance for the audit of IT controls, managers and auditors must carefully consider the implication of the IT control framework and the extent that IT weaknesses could affect compliance with SOX. In addition, AS5 requires management to adopt a framework when assessing the effectiveness of their internal controls (PCAOB 2007). Therefore, each company must decide which framework to use when evaluating IT controls. Companies currently rely on the control components of the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Internal Control-Integrated Framework and/or the IT Governance Institute's CobiT: Control Objectives for Information and Related Technology.

COSO

COSO (1994) identifies two broad categories of IT control activities – general controls and application controls. General controls ensure that the financial information generated from a company's IT system can be relied upon to provide accurate information. Application controls, normally embedded in the software application, validate proper transaction processing. In addition, COSO places these controls at either the company level (tone at the top) and activity level (applied) controls.

General controls include policies and procedures that support secure and continuous operations and include access security, system development and implementation, and backup and recovery controls as well as other controls pertinent to the overall control environment of the company. According to a recent survey by Tyson and Bean (2005), only 54 percent of internal audit departments think IT general controls are a critical component of compliance with SOX, leaving the authors concerned that systems access security may lack the appropriate scrutiny when evaluating IT controls. On the other hand, Boritz and Lim (2007) note that general controls have more pervasive effects than application-control weaknesses due to their complexity and costly remediation, which would also generate a large impact on financial performance.

Application controls include check digits, reasonableness test, predefined master data files, and other input controls designed to prevent data processing errors and unauthorized transactions (ITGI, 2000). Automated application controls are not subject to human errors and are generally thought to be less risky if IT general controls are effective. Even less risk is associated with application controls when companies implement pre-packaged software applications with limited software modifications. Application controls normally depend on related files, data, and tables and are vulnerable to the controls over these data storage entities (ITGI, 2006).

Both general controls and application controls are essential to ensure proper transaction processing as well as the accuracy and integrity of financial reporting. COSO provides only broad, high-level guidance on IT controls and endorses CobiT, a widely recognized framework for IT controls, as an authoritative benchmark for management's compliance with SOX.

COBIT

Published and maintained by the IT Governance Institute, the CobiT framework centers on four IT control domains: planning and organization, acquisition and implementation, delivery and support, and monitoring. Planning and organization involves the strategic design of IT systems and the use of IT to meet the goals and objectives of the company. Acquisition and implementation involves strategies to acquire, implement, and integrate IT into the existing environment, as well as any changes that develop over the life of the system. Delivery and support addresses the physical implementation of IT including security, training, continued support, data processing, and other application control issues. Monitoring is the continuous assessment of IT services including internal and external auditor evaluation (ITGI, 2006).

Tuttle and Vandervelde (2007) suggest that CobiT provides an appropriate supplement to COSO for evaluating IT control effectiveness. Results of our study of companies that report ITCDs indicate ineffective IT controls in two primary areas – (1) security and access controls and (2) controls over end-user computing. Both of these areas encompass the COSO general controls at the activity level and the CobiT delivery and support domain.

Security and Access Controls

Security and Access controls become increasingly important as businesses expand beyond its internal boarders. Network connectivity with internet capabilities can generate thousands of users with access to a company's information system. In an IT environment, financial data is constantly subjected to unethical intruders, malicious software, and business interruptions.

Boritz and Lim (2007) document evidence that security control is the only statistically significant IT control weakness affecting financial performance. Given the pervasive nature of general controls and the potential impact of security weaknesses, IT controls that prevent security breaches could be a key risk for companies. Unfortunately, management may undervalue these IT security controls due to the difficulty in valuing prevention costs and allocating expenditures for a "potential" problem (Quinn and Brill, 2002).

End-User Computing Controls

End-user computing involves the departmental or individual use of digital tools, such as spreadsheets, databases, and statistical analysis packages, and has evolved to be a vital extension to enterprise systems. Employees with access to centralized databases can easily analyze data and create reports with end-user applications adding undue risk to a company's internal control system. Rittenberg et al. (1990) identify over 130 types of end-user applications, with over half related to accounting applications. Spreadsheet software is one of the most common applications due to flexibility, ease of use, and accessibility. Spreadsheets allow end users to develop their own systems and models without relying on the professional IT experts for assistance (Cragg and King, 1993). Balancing the efficiency and effectiveness of spreadsheets with the risk of control is challenging. Louwers et al. (2007) indicate that although financial reporting controls cover the entire process from initiation of transactions to the financial statements, many final adjusting entries, consolidation entries, and footnotes are created by spreadsheet applications. An article by PricewaterhouseCoopers (2004) indicates that spreadsheet use directly affects the financial statement transaction amounts and account balances that become part of the financial statements.

Sample and Methodology

Using the most current year of complete data, this study analyzes 88 companies that reported ITCDs in 2006. We identify the companies using Audit Analytics and the SEC Edgar Database, and we examine the Management Report on Internal Controls as well as the Auditors' Report of each company. We then categorize the specific ITCDs reported by the companies. Appendix 1 contains a list of these categories and the description of the specific ITCD. The data are coded to indicate whether companies have an ITCD (1) or do not have an ITCD (0) and to indicate whether the ITCD is a general or an application control per the COSO framework. In addition, each ITCD is categorized using the four CobiT domains: (1) planning and organization (PO), (2) acquisition and implementation (AI), (3) delivery and support (DS), and (4) monitoring (MO). We also collect data regarding the accounting errors reported by these 88 companies. The accounting errors are coded similarly to the ITCDs with companies reporting an accounting error receiving the code 1, and companies not reporting an accounting error receiving the code 0.

First, this study identifies and ranks the number and percentage of companies reporting ITCDs and accounting errors. The study then analyses the impact of the two most common ITCDs reported in the sample on financial reporting. A cross tab analysis compares these two ITCDs with other categories of ITCDs in the sample and with the accounting errors reported by the company. Finally, the study analyzes the differences in these two ITCDs by comparing financial and other related variables. To confirm our findings, we obtain restatement data for the companies in the sample to examine whether the errors in the particular accounts related to the ITCDs are materially sufficient to result in restatement of the financial statements. This latter test provides more direct evidence of the relationship between ITCDs and accounting errors.

Results

Table 1 provides the ten categories of ITCDs identified in the sample companies along with their related COSO categories and CobiT domains. This study identifies 88 companies reporting 271 ITCDs, averaging 3.08 deficiencies per company. Eight of the ten categories of ITCDs involve general controls; only two involve application controls. Seven of the ITCDs represent deficiencies at the activity level. In addition, six of the ten categories of ITCDs involve the delivery and support CobiT domain. The most common ITCD among these companies involves IT security and access controls. Fifty-five companies (63 percent of the sample) reported security control deficiencies. This confirms prior research by Boritz and Lim (2007) who find security to be a significant weakness affecting financial performance. Surprisingly, poor controls over end-user reporting ranks as the second most reported ITCD. Almost 50 percent of the companies in this sample reported problems with end-user computing applications, most commonly spreadsheet applications. Both of the most commonly reported ITCDs in this sample fall under the COSO categories of general controls at the activity level and are classified under the CobiT domain, delivery and support.

Table 1
Categories and Characteristics of ITCDs
(88 Companies Reporting 271 ITCDs)

ITCD Category	COSO Control Categories	COSO Control Level	COBIT Domains	Number of Companies Reporting ITCDs	Percent of Companies Reporting ITCDs
IT security and access controls	General	Activity	DS	55	63%
End-user computing controls	General	Activity	DS	43	49%
Controls over computer program design and implementation	General	Activity	AI	33	38%
Controls over IT application processes	Application	Activity	DS	25	28%
Segregation of IT duties	General	Company	PO	25	28%
IT policies, procedures, and documentation	General	Activity	AI	24	27%
Program change controls	General	Activity	AI	23	26%
IT personnel and training	General	Company	DS	18	21%

IT closing	Application	Activity	DS	15	17%
Backup and recovery controls	General	Company	DS	10	11%
Total ITCDs Reported				271	
Average Number of ITCDs per Company				3.08	

Table 2 provides a list of the accounting errors reported by the 88 sample companies reporting ITCDs. These ITCD companies reported 349 accounting errors, averaging almost four errors per company. Revenue recognition issues represent the most common accounting error reported by these companies confirming prior reports by Grant et al. (2008) and Ge and McVay (2005).

Table 2
Accounting Errors Reported by ITCD Companies
(88 Companies Reporting 349 Accounting Errors)*

Accounting Errors	Number of Companies Reporting Accounting Errors	Percent of Companies Reporting Accounting Errors
Revenue recognition issues	38	43%
Receivable, investments and cash issues	33	38%
Liabilities, payables, reserves and accrual estimate issues	30	34%
PPE intangible or fixed asset value issues	29	33%
Tax expense, benefit, deferral, and other FAS109 issues	29	33%
Expense recording issues	26	30%
Inventory, vendor, and cost of sales issues	24	27%
Financial statement, footnote, US GAAP, segment disclosures	18	20%
Foreign, related party, affiliated and/or subsidiary issues	18	20%
Deferred stock based or executive compensation issues	13	15%
Consolidation and/or foreign currency translation issues	12	14%
Unspecified, unidentified, inapplicable FASB/GAAP issues	12	14%
Acquisition, merger, disposal or reorganization issues	10	11%
Capitalization of expenditures issues	10	11%
Depreciation, depletion, or amortization issues	8	9%
FAS5 legal contingency commitment issues	7	8%
Lease, leasehold and other FAS13 issues	7	8%
Intercompany and investment with subsidiary issues	6	7%
Debt, quasi-debt, warrants, and equity security issues	4	5%
Balance sheet classification of assets issues	3	3%
Cash flow statement (FAS 95) classification errors	3	3%
Debt and/or equity classification issues	2	2%
Financial derivatives or hedging (FAS133) issues	2	2%
Gain or loss recognition issues	2	2%
Income statement classification margin and EPS issues	2	2%
Defective or unreliable accounting reporting records	1	1%
Total Number of Accounting Errors Reported	349	
Average Number of Accounting Errors per Company	3.96	

A cross-tab analysis compares the two most common ITCDs – security and end-user computing – to all other reported ITCDs and accounting errors. The analysis in Table 3 shows that companies with IT security and access control deficiencies report significantly more program change controls; segregation of IT duties; and IT policies, procedures, and documentation issues than companies that do not report IT security control deficiencies. These findings emphasize the noted pervasive nature of general control weaknesses. Each of the three ITCD weaknesses associated with security and access control deficiencies fall under the COSO general control category. Based on the significant reporting relationship of these deficiencies in our sample, managers could possibly see improvement in multiple IT deficient areas by placing more importance on the security and access control deficiencies. The comparison also finds that companies that report IT Security issues report significantly more accounting errors associated with expense recording and inventory, vendor and cost of sales errors. The related accounting errors impact accounts that play a major role in financial performance indicators, and thus financial reporting.

Table 3
IT Security and Access Controls Deficiency
Cross-Tab Comparison with other ITCDs and Accounting Errors

	Number of Companies				
	Reporting IT security and access control deficiencies	Not Reporting IT security and access control deficiencies	Chi-Sq	Phi	Approx. Sig.
ITCDs					
Program change control deficiencies (n=23; expected count 8.63)	23	0	18.638	.461	.000
Segregation of IT duties control deficiencies (n=25; expected count 9.38)	25	0	20.952	.488	.000
IT policies, procedures, and documentation control deficiencies (n=24; expected count 9.00)	20	4	6.111	.264	.013
Accounting Errors					
Expense recording issues (n=26; expected count 9.75)	21	5	5.255	.244	.022
Inventory, vendor, and cost of sales issues (n=24; expected count 9.00)	20	4	6.111	.264	.013

Table 4 provides the results of the cross-tab analysis between companies that report end-user computing control deficiencies and companies that did not report the end-user computing deficiencies. The analysis shows that companies with end-user computing control deficiencies report significantly more IT closing deficiencies than companies that do not have end-user computing deficiencies. In addition, companies with poor end-user computing controls report more accounting errors when recording stock based compensation and tax expenses.

Table 4
End-User Computing Controls Deficiency
Cross-Tab Comparison with other ITCDs and Accounting Errors

	Number of Companies				
	Reporting End-user computing control deficiencies	Not Reporting End-user computing control deficiencies	Chi-Sq.	Phi	Approx. Sig.
ITCDs					
IT closing deficiencies (n=15;expected count 7.33)	12	3	7.016	.285	.008
Accounting Errors					
Deferred stock based or executive compensation issues (n=13; expected count 6.36)	11	2	7.803	.298	.005
Tax expense, benefit, deferral, and other FAS109 issues (n=29;expected count 14.17)	22	7	12.618	.379	.000

The results documented above confirm the findings of Ge and McVay (2005) that companies reporting material weaknesses frequently report deficiencies related to complex accounting issues such as derivatives and income tax. However, our study suggests that spreadsheets may contribute to the errors associated with calculating values associated with these intricate issues. Few will deny the complexities associated with accounting for stock options and income tax. The use of spreadsheets in these circumstances may also be an indication that enterprise systems lack the capability to produce reliable financial statement values for such complex accounts, and accountants must rely on manual calculations, which are more prone to errors, in order to adhere to current accounting standards.

This study also compares the companies with security control and end-user control deficiencies with companies not reporting these ITCDs to determine if the companies have differentiating characteristics. These financial characteristics include revenue, earnings, total assets, audit fees, non-audit fees, and companies with net losses. Although prior research finds that companies with ITCDs tend to be smaller, pay higher audit fees, and are audited by smaller accounting firms than companies that do not have ITCDs (Grant et al., 2008), our research reveals that the specific type of ITCD does not create differences based on these financial variables. However, we do find that companies in this sample with security control deficiencies (mean= 3.85) have significantly more ITCDs overall than companies that do not have security issues (mean=1.79) (at p=.000), but do not incur significantly more accounting errors. On the other hand, companies that have end-user computing control deficiencies (mean=3.40) have significantly more accounting errors than companies not reporting end-user computing control problems (mean=2.78) (at p-value .023), but do not report significantly more ITCDs.

Table 5 provides descriptive statistics for the 28 firms in this sample (approximately 32 percent) that restated their financial statements. Restatement firms also report the same top two ITCDs as those reported by the entire sample: IT security and access and end-user computing control deficiencies.

Table 5
ITCDs Reported by Restatement Companies
(28 Restatement Companies Reporting 89 ITCDs)

ITCD	Restatement Companies (n=28) 32% of Total Sample	
	Number of Companies Reporting ITCDs	**Percent of Companies Reporting ITCDs**
IT security and access controls	17	61%
End-user computing controls	16	57%
Controls over computer program design and implementation	11	39%
Segregation of IT duties	9	32%
Controls over IT application processes	9	32%
Program change controls	7	25%
IT personnel and training	7	25%
IT closing	6	21%
IT policies, procedures, and documentation	4	14%
Backup and recovery controls	3	11%
Total ITCDs reported	89	
Average Number of ITCDs Reported Per Company	3.17	

To help determine the impact of IT security and access and end –user computing control deficiencies on financial reporting, we compare these ITCDs with the related accounting errors found in the previous analysis for companies that restated their 2006 financial statements. Table 6 provides the results of this cross-tab analysis. Restatement companies with IT security and access control deficiencies report significantly more inventory, vendor, and cost of sales accounting errors than those reporting no IT security and access control deficiencies (p=.036). However, expense recording errors was not significant between the two types of companies.

Restatement companies with end-user computing control deficiencies report significantly more deferred stock based and compensation accounting errors than companies reporting no end-user computing control deficiencies (p=.040). Although the restatement companies report more tax expense, benefit, and deferral accounting errors, the difference is only marginally significant (p=.069). The identification of the significant relationships in control deficiencies of restatement companies with specific accounting errors confirm the overall findings and indicate that inventory and stock-

based compensation reporting errors may relate to restatements. This should help managers pinpoint areas of control deficiencies that can improve financial reporting to avoid restating.

Table 6
ITCDs reported by Restatement Companies
Cross-Tab Comparison of ITCDs with Accounting Errors

	No. of Companies				
Accounting Error	**Reporting IT security and access control deficiencies**	**Not Reporting IT security and access control deficiencies**	**Chi-Sq**	**Phi**	**Approx. Sig.**
Expense recording issues (n=14; expected count 5.50)	10	4	1.348	.219	.246
Inventory, vendor, and cost of sales issues (n=9; expected count 3.54)	8	1	4.414	.397	.036
Accounting Error	**Reporting end-user computing control deficiencies**	**Not Reporting end-user computing control deficiencies**	**Chi-Sq**	**Phi**	**Approx. Sig.**
Deferred stock based or executive compensation issues (n=8; expected count 3.43)	7	1	4.215	.388	.040
Tax expense, benefit, deferral, and other FAS109 issues (n=10;expected count 4.29)	8	2	3.319	.344	.069

Summary and Conclusions

This study examines the relationship between weak IT controls and accounting errors as noted in 88 sample companies reporting ITCDs in 2006. The two most commonly reported ITCDs among these companies include security and end-user computing issues. Both of these ITCDs are general control weaknesses noted by COSO, highlighting the importance and the pervasive nature of general controls in a company's overall control structure. Both of these ITCDs are also activity controls in the Delivery and Support domain under the CobiT framework.

Based on this sample, companies with IT security issues report significantly more accounting errors associated with expense recording issues and inventory, vendor, and cost of sales issues than companies that do not report IT security deficiencies. This study also notes the impact and pervasiveness of security weakness issues upon the overall IT control structure. Companies in this sample reporting security weaknesses also reported significantly more ITCDs overall than companies not reporting security issues. This does not indicate that security issues generate other IT weaknesses, simply that companies with the security ITCDs tend to also report weaker IT controls in other areas well. Improving IT security and control access issues could be a good starting point for managers to improve the overall quality and structure of company-wide IT control deficiencies.

The study also highlights the impact of end-user computing on erroneous financial reporting. Based on this sample, companies with end-user computing control deficiencies reported significantly more accounting errors than companies not reporting end-user control deficiencies, possibly noting the importance of spreadsheet controls to generate accurate information for financial reporting. Specifically, companies with poor end-user computing controls report significantly more accounting errors when recording stock based compensation and tax expenses, which may signify that spreadsheets are more prominently used when calculating more complex accounting issues. End user computing deficiencies are also related to IT controls over year-end closings and may indicate a weakness in the company's enterprise system to accommodate year-end adjusting and consolidation entries, as well as schedules required for footnote presentations. Managers should be able to reduce accounting errors generated by end-user reporting by placing more emphasis on controls over spreadsheet data. In addition, enterprise systems should be reengineered to produce automated, reliable financial reports, eliminating the need for manual end-user computing in complex financial accounts.

Our study also documents the potential impact of weak IT controls on financial reporting by examining companies that restated in 2006. In relation to the four accounting errors detailed above, three of these accounting errors were more significant in companies that reported the specific ITCD than companies that did not report the ITCD. This analysis provides evidence of the severity of the accounting problems associated with weak IT controls. Taken together, the analysis of this sample indicates that specific categories of ITCDs are associated with specific accounting errors, and these accounting errors are severe enough to generate restated financial statements.

These findings may help both internal and external auditors to better identify key areas of risk when integrating the IT control function into the overall audit of financial statements. In addition, these findings should help managers realize the benefit of fine-tuning IT controls to prevent accounting errors in accounts that have a pervasive impact on financial analysis and could lead to financial restatements.

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Appendix 1
Categories of ITCDs

Category	Description
Backup and recovery controls	Deficient controls associated with backup and recovery of data and applications.
Controls over computer program design and implementation	Control deficiencies associated with program design, legacy programs, and implementation and development of programs and databases.
Controls over IT application processes	Control deficiencies associated with data entry, transaction processing, and other general operations within the computerized system.
End-user computing controls	Deficient controls over changes to end-user applications, specifically spreadsheet formulas and data as well as controls over databases.
IT closing	Control deficiencies associated with IT period closing of the financial statements
IT personnel and training	Control deficiencies associated with inadequate staffing of personnel in the IT department or inadequate training of IT personnel.
IT policies, procedures, and documentation	Lack of documented policies and procedures associated with IT processes and activities.
IT security and access controls	Control deficiencies associated with access to electronic data and/or programs and physical access to computer hardware and servers, including deficient controls related to password access.
Program change controls	Deficient controls associated with authorization and/or changes to existing computer programs, databases, and other applications.
Segregation of IT duties	Control deficiencies associated with incompatible duties within the IT environment.

The Morality of Profit-Making: A Scale Development

*Note: Published in *Journal of Business & Economic Perspectives*

by Walton Padelford & Darin White

The superiority of the market system as a producer of goods and services *vis a vis* centrally planned systems has long been proposed and logically demonstrated. Ludwig von Mises (1966) in his book *Human Action*, begins Chapter 26, "The Impossibility of Economic Calculation under Socialism," with the sentence; "The director wants to build a house. Now, there are many methods that can be resorted to." He then proceeds to show that least-cost production methods under planned price systems are almost impossible to develop, because planned prices cannot reflect the true relative scarcity of resources. Hence, the system of free market economy is the only system that can possibly perform efficient (least-cost) production.

The champion of theoretical economic planning in the 1930's was Oskar Lange (1964) who lectured at the universities of Cracow, California, and Chicago. He demonstrated that careful central planning could succeed in publishing accurate scarcity prices through a process of adjusting prices centrally in response to shortages and surpluses. "Socialists have certainly good reason to be grateful to Professor Mises, the great *advocatus diaboli* of their cause. For it was his powerful challenge that forced the socialists to recognize the importance of an adequate system of economic accounting to guide the allocation of resources in a socialist economy." Theoretically then, the debate in terms of efficient production of the two approaches was joined.

The truth of Mises' theoretical demonstration was given by the great empirical demonstration of the superiority of the market system in the collapse of the Soviet Union.

This provides some powerful, pragmatic proof of the desirability of free markets in producing low cost, abundant consumer goods and services. The pragmatic demonstration is not totally ended, however, because of the emerging prowess of Communist China (albeit with significant use of markets).

Pragmatic proofs, such as "free markets work" are not sufficient to carry the moral argument particularly among idealistic or ethically-minded individuals. "Free markets produce low-cost goods," is not necessarily the same thing as saying that "free markets are ethically superior."

The founding father of modern economics, Adam Smith (1976), set the course for business school analysis by emphasizing the realistic economic response to human nature as he understood it: "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages."

Smith (1966) did have a system of ethics which can be integrated into his economic presentation. "In the middling and inferior stations of life, the road to virtue and that to fortune, …are, happily, in most cases very nearly the same. In all the middling and inferior professions, real and solid professional abilities, joined to prudent, just, firm, and temperate conduct, can very seldom fail of success….In such situations, therefore, we may generally expect a considerable degree of virtue; and, fortunately for the good morals of society, these are the situations of by far the greater part of mankind." This sounds like praise for the business world for its role in producing virtue ethics. However, producing virtue is not a requirement for Smith's system. "For Adam Smith (1776) the rules of justice and their enforceability combine with the self-interest of individuals to explain economic behavior….These rules of justice inhibit the self-interest seeking of individuals, thereby allowing economic organization. In this description of human behavior, Smith regards morality, though nobler in his eyes than the rules of justice, as unnecessary to the establishment of order in society."

The famous self-interested passages in *The Wealth of Nations* seem to overpower the virtue ethics passages in *The Theory of Moral Sentiments*, and economists are left on an apparently lower ethical playing field than professional ethicists, theologians, and moral philosophers (although Smith was a moral philosopher). It is interesting how this ethical devolution has occurred. Amartya Sen, (1988) Nobel Prize winning economist, has worked for many years on defining and discussing the interactions between ethics and economics. In commenting on the central question of ethics, "how should one live?" he states:

Another surprising feature is the contrast between the self-consciously 'non-ethical' character of modern economics and the historical evolution of modern economics largely as an offshoot of ethics. Not only was the so-called father of modern economics', Adam Smith, a Professor of Moral Philosophy at the University of Glasgow …, but the subject of economics was for a long time seen as something like a branch of ethics. The fact that economics used to be taught at Cambridge until fairly recently simply as a part of 'the Moral Science Tripos' is no more than an instance of the traditional diagnosis of the nature of economics.

We in the business school need to continue to develop a moral argument in favor of free markets. It is the purpose

of this scale development to assess attitudes toward the morality of profit making. We are particularly interested in the attitudes of university students in the business school and in the university as a whole. We hope that this scale can be used to understand perceptions about business ethics, and to continue to develop moral arguments about business which will give us a respected voice in public policy ethical discussions. Indeed work has been done in assessing attitudes toward similar questions.

For instance, much discussion has taken place concerning virtue ethics in business. These virtuous characteristics aid in the development of a business and, reciprocally, a career in business can push an individual into virtuous character development (McCracken, Martin, and Shaw, 1998). Robert Solomon (1992) developed a catalogue of business virtues, resulting in a discussable list of forty-five specific business virtues (1999). This work resulted in the development of a virtue ethics scale by Shanahan and Hyman (2003).

Other ethics scales have been developed: perceptions of corporate social responsibilities (Elias, 2004), ethical leadership of Indian managers (Khuntia and Suar, 2004), and the perceived role of ethics and social responsibility (Singhapakdi, 1995, 1996 and Etheredge, 1999). Our scale development has a more modest goal: that of assessing the perception of the morality of profit making.

Method

Preliminary Scale Development Studies

The development of a scale to measure the morality of profit making (MPM) began with a thorough literature search to locate related scales that could provide guidance about needed items. This search identified multiple scales developed for specific economic attitude applications; Dawson's (1980) attitudes and opinions in economics scale, Jackstadt, Brennan, and Thompson's (1985) conservatism scale, Jensen and Owen's (2001) interest in economics scale, and O'Brien and Ingels' (1987) economic values inventory. In addition to these existing economic attitude scales, we performed a thorough content analysis of the economic socialization literature, from which concepts and themes of possible relevance to an affective measure were identified. Using these sources, we initially developed 42 items.

Focus Groups

Following Churchill's (1979) standard scale development procedures for defining the domain of a construct, five focus groups of undergraduate and graduate students were conducted. All groups were engaged in a general discussion relating to the morality of profit making. With these discussions in mind, a list of 16 additional items was generated. Other researchers who were knowledgeable in economics and business ethics reviewed the entire list, and their comments resulted in the elimination of six items, primarily on the basis of redundancy.

Pretest

The 52-item MPM instrument on a seven-point Likert-type scale (strongly disagree to strongly agree) was pre-tested on a convenience sample of 127 random individuals from a community in the south eastern part of the United States. These respondents were diverse with respect to race, socioeconomic background, age, and gender. They were asked to indicate to what extent they agreed with each statement regarding their feelings towards the morality of profit making. When the responses were analyzed, 14 items had response variability (SD) near to zero and they were dropped for not providing any differential information. Given the complex nature of some of the questions, respondents were given the opportunity to answer "Don't Know". An additional 18 questions were deleted for eliciting high rates of "Don't Know". As a result of such procedures, we reduced the number of items to twenty for the full-scale study. The final questionnaire also included a wide range of demographic variables.

Results

The Pilot Study and Scale Reliability

These scale items were included in an unrelated study involving the causality of college student perceptions of capitalism that generated a usable sample of 480 completed questionnaires. According to Shanahan and Hyman (2003), students are valid respondents for exploratory studies when asked to answer questions that are relevant to them. Given the exploratory nature of this study and its topical relevance (i.e., the majority of students attend college in an effort to obtain a good job with a for profit corporation), a student sample was deemed acceptable (Churchill, 1979; Yavas, 1994). In addition, many published empirical studies on business oriented topics have demonstrated the usefulness of utilizing student subjects to refine scale (Hansen, 1992; Hyman, 1996; Pressley and Blevins, 1984; Reidenbach and Robin, 1990; Zahra and LaTour, 1987).

In an effort to obtain a diverse sample of college students, data was collected via an internet survey and included

students from 38 different states. Three thousand five hundred random, current college students were e-mailed a letter requesting their participation in the study. Four hundred and eighty completed, usable responses were obtained resulting in 13.7% response rate. More than half of the sample was female (57%), a majority was Caucasian (84.6%), and the average age was 21.2 years. College classification was fairly evenly distributed with 29.7% freshman, 16.0% sophomores, 23.7% juniors, 25.9% seniors, and 4.7% graduate students. All of the primary major areas of study were included in the sample as well.

The ratings of all of the respondents on the 20 items of the MPM scale were subjected to exploratory factor analysis using principal component analysis. The primary purpose of this analysis was to determine the extent to which scale items loaded onto various factors. An eigenvalue of one was used as a criterion for creating the dimensions (Green, 1978; Hair et al., 1992). Items that loaded on more than one factor were deleted. After all split loading items were deleted a final principle components factor analysis was conducted to assure scale dimensionality. Items with a commonality of 0.40 or greater remained in the factor solution. The final step was to calculate a Cronbach alpha. Ideally the coefficient alpha for purified scales should exceed 0.70 (Nunnally, 1978).

Two factors emerged that had eigenvalues greater than one. These two factors jointly explained 69.51% of the total variance of the scale (Table I). In an effort to provide a meaningful interpretation of the factor loadings, they were rotated using the varimax procedure. The first factor loaded significantly on four items and the second factor on five items. The total scores of the two factors correlated significantly (r = .363). Eleven items had to be deleted due to low overall loadings or split loadings. Both factors exhibited excellent reliability coefficients; 0.88 for the first factor and 0.84 for the second factor. The overall scale produced a final coefficient alpha of 0.86. The lower a respondent scored on the MPM scale, the more positive their opinion of the morality of profit making.

Table I

Item contents and factor structure of MPM	Rotated factor loadings	
	I	II
1. Most corporations exploit demand and cost to raise (already high) rates of return.	.764	.092
2. In general, big companies are so completely absorbed in their profit positions they are willing to exploit innocent humanity for the sake of a few extra dollars of profit.	.856	.153
3. I feel that it is immoral for individuals to take a profit.	.013	.732
4. Big businesses are willing to exploit human frailty for the sake of monetary return.	.919	.123
5. Corporations are willing to exploit human frailty for the sake of monetary return.	.891	.163
6. I feel that the best definition of capitalism is the exploitation of man by man.	.383	.710
7. The pursuit of profit by private individuals is totally immoral.	-.049	.813
8. Free enterprise has been responsible for most of the evils in our society.	.189	.849
9. In general, I feel that capitalism is bad.	.300	.728
Eigenvalues	4.21	2.03
Percentage of variance	46.81%	22.70%

Note: (R) = Reverse Scored Item.

Based on the factor structure, it is apparent that the morality of profit making is indeed a multidimensional construct. Observation of the item contents of the second factor unfolded the "attitudinal" dimension of MPM. This factor contained item-themes that reveal respondents underlying attitude or belief structure relating to the morality of profit making. Items such as "free enterprise has been responsible for most of the evils in our society" sheds light on the economic value system guiding an individual in relation to profit making.

The first factor, titled "behavioral business", exhibits how respondents believe businesses operate and function in the real world. This dimension contains items with concepts that logically flow from factor two. If an individual holds the attitude (factor 2) that the taking of profit is immoral, it logically flows that these individuals would believe that businesses in the real world are acting so as to exploit humanity in an immoral fashion.

Construct Validity

In addition to scale reliability, the underlying construct must be valid, i.e., it must measure what it purports to measure. Since no single method can provide a definitive test of validity (Kline, 1998), we have taken a number of steps to establish instrument validity. First, we administered it to 43 members of the Students in Free Enterprise (SIFE) chapter at a local university. SIFE is an avowedly conservative group that "gives students the tools to learn the free enterprise system in a real working situation." SIFE's student teams actively promote, educate, and develop the free enterprise (thus, profit making) system around the world. The mean MPM score for the group was 2.76, a score that places them between one and two standard deviations below any other subgroup we tested. Thus, the scale seems able to distinguish between individuals that have differing views on the morality of profit making. The entire sample exhibited a mean MPM score of 3.45 with a standard deviation of 0.61. Second, we distributed the instrument to several business academicians for review and criticism. The comments were universally positive and the overwhelming sentiment indicated that the instrument did indeed accomplish our stated goal. Third, we conducted a test-retest to determine the consistency of responses. The results of this validity check yielded very high correlations for all nine items, giving us confidence that respondents logically understood the questions and answered them in a consistent way.

In order to determine if the scale exhibited discriminant and convergent validity, it is necessary to compare the construct with other constructs in the context of theory (Turner and Valentine, 2001). For the MPM scale to evidence convergent validity it should be correlated positively with validated scales measuring conservative economic constructs, e.g., trust in business, government role in setting prices, and individual conservatism. Discriminant validity is demonstrated by the lack of a significant relationship between the MPM scale and scales measuring unrelated constructs, e.g., age and home state. The current study included measures of these constructs, which were used to validate the MPM scale. Table II summarizes the correlations of these measures. Trust in business and government role in setting prices was measured using O'Brien and Ingels (1987) economics values inventory while individual conservatism was measured using the conservatism scale developed by Jackstadt et. al. (1985). Based on the findings evidenced in Table II and those discussed above, adequate evidence of construct validity is provided.

Table II
Pearson correlations with MPM scale

Convergent Validity				Discriminant Validity		
TB	r	0.406		AGE	r	0.018
	Sig	0.000			Sig	0.177
	N	381			N	381
GRSP	r	0.208		HOM	r	-0.076
	Sig	0.007			Sig	0.212
	N	366			N	346
CONS	r	0.281				
	Sig	0.000				
	N	384				

Notes: TB = Trust in Business, GRSP = Government Role in Setting Prices, CONS = Individual Conservatism, AGE = respondent age, HOM = respondent home state.

Uses of the MPM scale

The MPM scale is ready to be used by the practitioner. The tedious work of validation has been done. The scale is easy to use in that the mean value of the scale is 3.45 and the standard deviation is 0.61. A value of less than 3.45 indicates a more favorable perception of the morality of profit-making, while a mean value of greater than 3.45 indicates a perception that profit-making per se is immoral.

This scale should prove valuable to researchers in the business school who are interested in the ethical perceptions of their students. Other subgroups of the population can be tested using this scale. Other disciplines such as sociology and ethics might use the MPM scale as a research tool in their disciplines.

The authors are particularly interested in the relation between ethics and economics. The MPM scale can be used

to measure perceptions of the morality of profit-making in various sub-groups of students and workers. This future work can be used to continue to refine the moral argument in terms of the legitimacy of profit-making so as not to rely exclusively on the pragmatic argument that "capitalism works." This argument is not enough to capture the imagination of ethically oriented students.

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The Shaping of a Society's Economic Ethos: A Longitudinal Study of Individuals' Morality of Profit-Making Worldview

by Walton Padelford & Darin W. White

Introduction

In the spring of 2006 in the midst of the highest gasoline prices America had ever experienced, Exxon Mobil Corporation announced its largest ever quarterly profit, $9.92 billion, up 75 percent from the same quarter a year earlier (U.S. Survey). A few days later other oil companies like Royal Dutch Shell PLC and British Petroleum PLC also reported soaring quarterly profits. A news media firestorm erupted with state and national leaders alike loudly complaining about "exorbitant profits" and "unethical Big Oil." Members of Congress reacted by calling for a windfall-profit tax on oil companies. Senator Byron Dorgan, who introduced the measure, said, "These gains come from pain at the pumps that the American people are feeling" (Blum). In addition, Congress held hearings in which executives from major oil companies testified, and, as in the past, were exonerated (Big Oil).

Obviously, consumers were not immune to the events surrounding the "Gas Price Crisis of 2006." In addition to anger and resentment of the oil companies, many consumers began questioning the very ethical foundations of capitalism, namely, the morality of profit-making. Internet blog sites sprang up by the hundreds through which consumers expressed their views. One blogger wrote, "If their practices aren't the definition of a racket, I do not know what is. If you think they are pricing oil fairly…you're a deluded human being." (Too Much).

This was an important story to most Americans, and the communications media were doing their duty in reporting it. Many times throughout this time period, however, the reporting was accompanied by editorial pieces which raised the question of price gouging by the oil companies.

Our goal in this paper is not to attribute saint-like motives to Big Oil, nor to discuss the allocative efficiency of the price system. Our basic concern is with the process by which a society's economic ethos is shaped. To pursue a detailed ethical analysis of oil company behavior is beyond the scope of this paper. The public's perception of ethical behavior is our main concern. By utilizing the newly developed morality of profit-making scale (MPM), the authors Journal of Business Ethics _ Springer 2008 DOI 10.1007/s10551-008-9749-5 seek to understand how respondents' economic ethical worldview shifts over time in response to external influences. Specifically, we theorize that the news media's copious negative coverage of the gasoline price crisis of 2006 would significantly impact individuals' MPM worldview.

Historical survey

The business school needs to continually propound the proposition that there is a legitimate and virtuous sphere of profit-making because of the ethical slam that this topic tends to receive in other parts of the university. Breeden and Lephardt (2002) found their business students at Marquette University had a growing tendency to believe that "the market encourage[d] greed and materialism, a popular theme among Ethics and Theology instructors which are core curriculum requirements at this University."

Profits, indeed, make possible our striving for higher ends. Economic motives are subservient to other motives, whether care for our families or furthering the arts. Economic ends are not simply a lower, secondary part of life. "[This] is largely a consequence of the erroneous belief that there are purely economic ends separate from the other ends of life. Yet, apart from the pathological case of the miser, there is no such thing. The ultimate ends of the activities of reasonable beings are never economic" (Hayek, 1994, p. 98).

Given the valuable things that may flow from successful business enterprise – care of families, altruism, development of virtue – the need for company profits is evident. Social contribution by companies is possible only if the company is profitable. Profitability in this scenario is not the primary purpose of business, but a limiting factor. Profits test the validity of the business enterprise (Drucker, 2001, pp. 18–19).

Profits act as a numerical limit on the other objectives the firm wishes to accomplish. Making profits, then, could act as an ethical motivation for business for accomplishing other socially valuable and discussable goals. Profits need not act as another moral constraint from the field of business ethics (Solomon, 1992). However, we are not interested in inculcating a mentality of greed. Greed may, indeed, be a perversion of some of the virtues such as prudence or even love which may be a strong motivator in work life and pursuit of profits. In her book, *The Bourgeois Virtues,* Deirdre McCloskey comments:

> … the economy cannot actually get along without a good deal of love. Over half of consumer purchases at point of sale, for example, are on behalf of children and husbands and mothers and friends. Love runs consumption. Feminist economists have been noting for some time that without such altruistic purchases, the human race would promptly die out. A theory based on selfishness alone therefore cannot work scientifically. And if it became the way the social world actually worked, the social world would collapse. Some balance of virtues is in order. (McCloskey, 2006, pp. 56–57)

To which Susan Rose-Ackerman adds; "Psychological studies of helping behavior confirm the importance of altruism in everyday life" (Rose-Ackerman, 1966; see also Monroe, 1994; Piliavin and Chang, 1990). Probably, a reciprocal altruism would be in line with ethical teaching in the business school. This would be more in keeping with our Smithian heritage also.

The medieval theologian, Hugh of St. Victor in 1156, commented more expansively on the salutary side effects of commerce, and the positive good produced from it:

> Commerce penetrates the secret places of the world, approaches shores unseen, explores fearful wildernesses, and in tongues unknown and with barbaric peoples carries on the trade of mankind. The pursuit of commerce reconciles nations, calms wars, strengthens peace, and commutes the private good of individuals into the common benefit of all. (McCloskey, 2006, p. 61)

Catholic theologians have a long history of nuanced presentation of legitimate and illegitimate spheres of profit-making. Pope Pius XII has stated:

> How much capital is lost through waste and luxury, through selfish and dull enjoyment, or accumulates and lies dormant without being turned to profit! There will always be egoists and self-seekers; there will always be misers and those who are short-sightedly timid. Their number could be considerably reduced if one could interest those who have money in using their funds wisely and profitably, be they great or small. It is largely due to this extent by making ordinary depositors collaborators, either as bond or shareholders, in undertakings whose launching and thriving would be of great benefit to the community, such as industrial activities, agricultural production, public works, or the construction of houses for workers, educational or cultural institutions, welfare or social service". (Pius XII, 2004)

Professors in the business school should also be considering a nuanced presentation of the morally legitimate pursuit of profits. Both entrepreneurs and workers within the corporation can live the life of virtue in their vocations. Moral virtues do not arrive with us in the workplace as wholly developed character traits. The moral virtues may be trained, developed (Dawson, 2005). They are not simply a natural characteristic (Velasquez, 1998, p. 133). The business organization, therefore, may be the most important context in which the virtues are worked out.

As working people, we tend to get our identity from the communities with which we are associated, in this case, the companies and corporations in which we are employed. This community association contributes to the wholeness of our personalities, meaning, fulfillment, and the practice of virtue (Solomon, 1992, p. 322). The organization or the community has profit goals, but "the existential unit of responsibility and concern is and remains the individual" (Solomon, 1992). This discussion concerning the moral locus of decision making has a long and interesting history under the heading of corporate moral agency (Shaw and Barry, 2007, pp. 210–212).

French philosopher, Andre´ Comte-Sponville, argues that businesses, as such, do not have ethics, but the people in these organizations have ethical positions and should practice them.

> …. precisely because there doesn't exist morality of the business, there needs to be morality in the business, by the mediation of the only ones that ought to be moral, by the mediation of the individuals that work in it, and especially (the more power, the more responsibility) by those that direct it. The same thing happens with the ethic of business: given that the business doesn't have it, the individuals that work in it or that direct it ought to have it. (Comte-Sponville, 2004, p. 134)

Businesses have profit goals, and individuals within the firm can pursue profit goals along with developing virtuous character traits. The question of profits is not a simple right or wrong question, but, following Robert Solomon, we should ask of profitmaking these questions: "Does it manifest the best ideals of the organization? Does it render an employee or manager 'whole' or does it tear a person to pieces, walling off one aspect of a personality from another and leaving one part to apologize or feel ashamed before the other" (Solomon, 1992).

Individuals' views of the morality of profitmaking change in response to current economics events. These shifts can make our teaching job easier or more difficult depending on the events themselves and the way the reportage is spun. The vicissitudes of events and their normative implications tend to propel economists into positive analysis, leaving normative discussion to the ethicists. As Amartya Sen has argued:

The methodology of so-called 'positive economics' has not only shunned normative analysis in economics, it has also had the effect of ignoring a variety of complex ethical considerations which, from the point of view of the economists studying such behavior, are primarily matters of fact rather than of normative judgment. If one examines the balance of emphases in the publications in modern economics, it is hard not to notice the eschewal of deep normative analysis, and the neglect of the influence of ethical considerations in the characterization of actual human behavior (Sen, 1988, p. 7).

Following Sen, we would like to continue the discussion of ethical analysis with respect to praxeology of which economics is a part. In light of current media attention to profit-making by the oil companies, we hypothesize that a current survey of perceptions will show that the public has been negatively impacted.

Thomas L. Carson has stated that earlier business scandals at Enron, Arthur Andersen, and WorldCom contributed to a loss of confidence in American companies and also negatively affected stock prices during 2000–2002 (Carson, 2003). Confidence in American business is assumed to be undermined by a high degree of negative publicity (Tsalikis and Seaton, 2006). According to the Pew Research Centers 2002 study entitled, "Americans Struggle with Religion's Role at Home and Abroad," business leaders are viewed as possessing very low ethical standards by over two-thirds of the population. They The Shaping of a Society's Economic Ethos found the American public perceived business leader's ethical standards as lower than almost every other group measured including politicians, religious leaders, television news reporters, and military leaders. These thoughts lead to a discussion of our hypotheses.

Hypotheses

Previous attempts to empirically measure the morality of profit-making have been limited or tangential. Dawson (1980) developed a scale which contains a few MPM-related items which measures an individual's attitudes and opinions of various economic issues. Jackstadt et al. (1985) sought to determine people's underlying economic value system by crafting a conservatism scale that is most applicable to the study of capitalism and politics. O'Brien and Ingels (1987) presented an economic values' inventory that has some relevant items, but this measurement schema also includes items related to a myriad of unrelated economic issues.

More recently, Padelford and White (2006) developed a scale to specifically measure individuals' views of the morality of profit-making. According to these researchers, a great need exists in the academy for further study of the MPM concept. Pragmatically speaking, the superiority of the free market system for producing goods and services efficiently has been confirmed with numerous theoretical and empirical proofs; albeit, the role of institutions in encouragement of production and just distribution is very important. Nonetheless, the morality of profit-making is still seriously doubted in discussions of ethics. However, some economists such as Smith and Sen, as previously mentioned, have been intensely interested in the relationship between economics and ethics.

We theorized that news media stories related to the rapid rise in gasoline prices will negatively impact individuals' perceptions of the morality of profitmaking. Previous research has shown that media coverage impacts the public's view on a variety of commerce-related topics. Fombrun et al. (2000) investigated the impact of the news media on the public's perceptions of executive performance, workplace environment issues, organizational financial performance, product and service reputation, and social responsibility. Using corporate reputation data from the Annual Reputation Quotient Survey Study, they found that overall corporate reputation was significantly impacted by the news media. In a similar study, Deephouse (2000) found a media effect on the public's belief about the overall level of profitability of businesses. Researchers have observed that business information disseminated by the national media constitutes a source of "institutional isomorphic pressure" on businesses (Deephouse, 2000; Fombrun and Shanley, 1990; Gioia and Corley, 2002; Rao, 1994; Rindova and Fombrun, 1999; Rindova et al., 2005). Martins (2005) argues that the news media is able to impact consumers primarily because of the reach and prominence of the media, and consumers beliefs that the media has "superior access to information" and/or proficiency in evaluating issues. Thus, based on the previous discussion we hypothesize the following.

Hypothesis #1

Individuals' belief about the morality of profitmaking will be impacted negatively by news stories focusing on rising gasoline prices and "exorbitant" oil company profits.

According to Padelford and White (2006), the morality of profit-making construct is multidimensional in nature. The first dimension of the construct is entitled "attitudinal" and sheds light on a respondents' underlying value system, belief structure, or worldview relating to the morality of profit-making in particular and capitalism in general. Based on Gawronski and Bodenhausen's (2006) dichotomy of attitudes, this dimension of the MPM construct is theorized to

represent an individual's "implicit" attitude toward capitalism and is based on their deeprooted economic ethos. The second dimension of the construct is entitled "behavioral business" and it exhibits how respondents believe businesses operate and function in the real world. This dimension of the PM scale represents a more deliberate, "explicit" attitude.

We theorized that news media stories which decry the "excessive" profits of oil companies and rising gasoline prices will have a stronger impact on an individual's belief about the functioning of the real business world (the explicit dimension) than it would on their underlying economic ethos relating to the morality of profit-making (the implicit dimension). Engendering a shift in a deeply held belief or value requires significant time and persuasive argumentation. A central theme in the psychology literature on attitudes is the distinction between deliberate, explicit attitudes and automatic, implicit attitudes (Gawronski and Bodenhausen, 2006). Implicit and explicit attitude change is guided by differing processes, namely, associative and propositional processes. Associative processes, which are more effective in shifting an individual's explicit attitudes, are characterized by "mere activation independent of subjective truth or falsity" argumentation (Gawronski and Bodenhausen, 2006). Such a process, however, is not effective in changing an individual's implicit, deeply held beliefs or worldview. For this, propositional reasoning, which is concerned with the validation of evaluations and beliefs, is required. Typical news media stories in the U.S. purposely lack subjective truth or falsity argumentation related to the philosophy of the story. In addition, the vast majority of major, national news stories (like the gas price crisis of 2006) tend to be chronologically short term in nature. Thus, a news media story about the evils of big business could potentially be effective in shifting an individual's explicit attitudes about the behavior of businesses but it is unlikely to significantly impact an individual's implicit, deeply held beliefs about capitalism in general. Thus, the preceding discussion leads us to hypothesize the following.

Hypothesis #2

Individuals' belief about the morality of profitmaking implicit, attitudinal dimension will be impacted to a smaller degree by major national news stories focusing on rising gasoline prices and "exorbitant" oil company profits than will individuals' belief about the morality of profit-making explicit, business behavioral dimension.

Method

Data collection and sample selection

Data for the current study were collected at two different points in time. The original survey was taken in October 2005, at which time oil prices were static and little media attention was focused on oil company profitability. The second dataset was collected during April 2006. The intervening six months provided a significant increase in media attention on oil prices and profitability.

The two samples consisted of 727 individuals between the ages of 17 and 28. All respondents were currently enrolled as full-time students at a college or university. According to Shanahan and Hyman (2003), students are valid respondents for exploratory studies when asked to answer questions that are relevant to them. Given the exploratory nature of this study and its topical relevance (i.e., the majority of students drive automobiles, live on a tight budget, and would be affected by rising gas prices), a student sample was deemed acceptable (Churchill, 1979; Yavas, 1994).

Four-hundred-and-eighty respondents completed an initial survey in 2005 during a time when very little national media attention was focused on oil company profitability concerns or gasoline prices. In April 2006 at a time when the national news media was heavily focused on oil company profitability, price gouging, and rising gas prices, the survey was administered to 247 current college students. During this time frame, national media giants like CNN, FOX, and ABC were daily covering the "gas price crisis." Much of the media attention focused on the profitability of oil companies like Exxon and Mobil. With average gasoline prices in the U.S. at well above $3 per gallon, multiple experts were daily decrying the exorbitant profits oil companies were earning.

In an effort to obtain a diverse sample of college students, data were collected via an internet survey and included students from 38 different states. In the 2005 study, three-thousand-five-hundred random, current college students were e-mailed a letter requesting their participation in the study. Fourhundred- and-eighty completed, usable responses were obtained resulting in 13.7% response rate. More than half of the sample was female (57%), a majority was Caucasian (84.6%), and the average age was 21.2 years. College classification was fairly evenly distributed with 29.7% freshmen, 16.0% sophomores, 23.7% juniors, 25.9% seniors, and 4.7% graduate students. All the primary major areas of study were included in the sample as well.

The 2006 sample produced a response rate of 17.6%. 62.1% were female, a majority were The Shaping of a Society's Economic Ethos Caucasian (88.5%), and the average age was slightly younger at 20.9 years. 21.7% of the sample population was freshmen, 14.3% sophomores, 30.7% juniors, 30.3% seniors, and 2.9% graduate students.

Measurement of variables

The researchers utilized a sixteen-item survey instrument made up of the MPM scale developed by Padelford and White (2006) and several demographic measures. The morality of profit-making was measured by nine seven-point items anchored at 1 ("strongly disagree") and 7 ("strongly agree"). The MPM instrument measures an individual's belief about the attitudinal dimension and the business behavioral dimension of the morality of profitmaking. The lower a respondent scored on the MPM scale, the more positive their opinion of the morality of profit-making. The text of the instrument used in this study is provided in the Appendix.

The initial MPM study involving over four hundred respondents, reported a reliability coefficient f 0.86. For the current study, the Cronbach's alpha-reliability test result was 0.77. The varimax factor rotation on both samples produced similar results. Items strongly loaded on their expected factors in both studies. In both studies two factors emerged that had eigenvalues greater than one. The first factor loaded significantly on four items and the second factor on five items. The total scores of the two factors correlated significantly (r = .363) in the first study and (r = .312) in the second study. The factor analysis of the first sample produced an eigenvalue of 6.24 and explained 69.5% of the variation whereas the second sample produced an eigenvalue of 5.89 and explained 68.19% of the variations. Again, this supported Padelford and White's (2006) findings.

Results

To test our hypotheses we needed to determine whether or not each population (2005 sample versus 2006 sample) had a statistically different score on the dependent variable in question. To achieve this, we conducted a univariate ANOVA test for the dependent variable.

According to the first hypothesis, respondents' belief about the morality of profit-making would be negatively impacted by major national news stories decrying the rising gasoline prices and profitability of oil companies. The results indicate that this is indeed true. The mean score using a seven-point Likert scale was 3.45 which was obtained from subjects who were surveyed in 2005. A value of greater than 3.45 would indicate that the population being interviewed perceives profit-making *per se* as more immoral than the benchmark population of 2005. The greater the score, the stronger the indication would be. Respondents surveyed in 2006 during a time of intense national news media attention to high oil company profits produced a mean score of 3.85, clearly showing a movement toward a perception of profit-making as immoral. Use of an ANOVA showed that the mean difference in the MPM scale was significant (f = 9.08) at the 0.003 level. Thus, the first hypothesis is supported.

The second hypothesis predicted that individuals' belief about the morality of profit-making implicit "attitudinal" dimension would be impacted to a smaller degree by major national news stories focusing on rising gasoline prices and "exorbitant" oil company profits than would individuals' belief about the morality of profit-making explicit "business behavioral" dimension. In support of this hypothesis, an ANOVA which compared the 2005 group to the 2006 group on the implicit "attitudinal" dimension produced an f = 1.03 which is not significant at the 0.05 level. However, the same test comparing the same two groups along the explicit "business behavioral" dimension produced an f = 15.78 which is significant at the 0.01 level. Thus, it seems that short-term national news media stories can have a significant impact on individuals' explicit attitudes about the morality of profit-making, but they fail to significantly change individuals' implicit, deeply held economic ethos.

Discussion of the factor findings

The annual big business scandal, whatever it might be, makes our ethical work in the business school more difficult. The recent rise in gasoline prices has made our presentation of ethical profitmaking problematic. However, it is imperative that Walton Padelford and Darin W. White we continue to build our case. The production of generations of cynics and moral sellouts is not a desirable function of business education.

The results of this study are statistically robust and show that respondents were influenced toward viewing profit-making as more immoral when media attention was focused on rapidly rising gasoline prices and oil company profits. However, their deeply held beliefs were not significantly changed. University business education, then, can aim at influencing those deeply held beliefs through patient explanation of the workings of market economy, a realistic assessment of human nature, and continued discussion of the possibility of virtuous behavior within the modern firm. A positive moral assessment of profit-making is foundational to effective functioning of market and capitalist economies. Patient explanation and argumentation can affect our students' foundational beliefs.

Conclusion and future research

Over the last two decades, scholars have researched media effects on the reputation of a myriad of business-related topics (e.g., Carroll, 2004; Carroll and McCombs, 2003; Deephouse, 2000; Fombrun and Shanley, 1990; Stone et al.,

1966; Verčič, 2000; Wartick, 1992). Previous research has examined the effect of news media coverage on corporate reputation, return on average assets, and product reputation (Fomburn et al., 2000). However, to date, no formal studies have been conducted addressing the impact of the media on a society's economic ethos. Thus, a primary contribution of this study is to present quantitative evidence on this heretofore-overlooked issue within the overall academic research stream. Much future research is needed to further understand the formation and evolution of individuals' economic ethos in general and MPM perceptions in particular.

The findings that emerge from this study, though consistent with previous studies regarding the relationship between issue news and its impact on people's beliefs (Meijer and Kleinnijenhis, 2006), raise several questions worthy of additional research. Clearly, a need exists to test psychometrically a broader range of variables which potentially influence a society's MPM views. It would be particularly interesting to seek to determine if culture plays a role in MPM perceptions by collecting data from various countries around the world. Also, the impact of gender, socio-economic status, education, and even religious beliefs should be correlated with the MPM scale. These additional questions suggest that a more comprehensive survey or surveys could be developed for explaining perceptions of the morality of profit-making. Further research is needed to develop a greater understanding of the explicit and implicit structure of individuals' economic value system.

Turning to limitations, the present research suffers from the possibility of similar demography bias. Respondents in the current study were all very close together in age and stage of the family life cycle. Thus, it could be argued that a common generational effect could be present which would influence this group's view on various social and political topics. To circumvent this problem, in the future this study should be replicated with more diverse population samples.

Another limitation of the current study relates to the succinctness of the survey instrument. The goal in designing the questionnaire was to encourage full participation of potential respondents. However, this approach also limits the prospects of testing other potentially fundamental determinants of MPM. long these lines, the degree of exposure a respondent has had with economic theory, industry experience, nd political rhetoric might have an influential effect on the studied relationship. Also, the level of exposure a respondent has had with the news media's overage of the oil crisis could have an effect on their perceptions of MPM. Personal experience (for example, traveling abroad to socialistic or communist countries or having friends from such countries) could also impact the relationship between news media coverage and MPM perceptions. Given that such variables were not measured with the current study's survey instrument, several related questions remain open for future researchers to ponder.

Appendix

Morality of profit-making scale items

1. Most corporations exploit demand and cost to raise (already high rates of return).
2. In general, big companies are so completely absorbed in their profit positions that they are willing to exploit innocent humanity for the sake of a few extra dollars of profit.
3. I feel that it is immoral for individuals to take a profit.
4. Big businesses are willing to exploit human frailty for the sake of monetary return.
5. I fee that the best definition of capitalism is the exploitation of man by man.
6. The pursuit of profit by private individuals is totally immoral.
7. Free enterprise has been responsible for most of the evils in our society.
8. In general, I feel that capitalism is bad.
9. Corporations are willing to exploit human frailty for the sake of monetary return.

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Samuel Johnson, the Fear of Fiction, and Ethical Representations of Power

by Patricia L. Hamilton

Two months after the World Trade Center attacks on September 11, 2001, I was conducting a discussion in my World Literature class when I mentioned that in the recent debate over the Harry Potter series we could see the same kind of cultural anxiety about what constitutes proper reading material as Cervantes depicted in Don Quixote in 1605. A sophomore named Belinda raised her hand to share that her pastor had preached his sermon that Sunday on Harry Potter and had said we shouldn't read those books. I was stunned on several counts, not the least of which was the pastor's choice to single out poor, orphaned Harry over, say, the Taliban or Osama bin Laden.

The incident has stayed with me because of the way it encapsulates certain deep-seated fears in parts of the Christian community. Every few years, a vocal sub-group of Christians rises up in condemnation of this or that book—usually a work of fiction—and calls for it to be banned or repudiated. Inevitably this elicits an outraged battle cry of "censorship!" from the secular community. In the war of words that ensues, the Spanish inquisition is often invoked to portray Christians as wielding a monolithic and oppressive cultural power aimed at destroying our constitutional freedom of expression. Or Christians are represented as ignorant, gun-toting, Bible-thumping red-necks—intolerant bigots who would seek to revoke our constitutional freedom of conscience. Either way, the Christian apologetic of the few is taken to be the Christian apologetic of the many. Unfortunately, the actual apologetic moment—the opportunity for Christians to gently and reverently "give an account for the hope" that is in them (I Peter 3:15, NASV)—gets lost in the way the media represents the drama playing out. Each time the stereotype of Christians shouting epithets at others without listening to what is being said is reinforced, any meaningful Christian witness is damaged, if not lost altogether.

In order to reclaim the apologetic moment on such occasions, we need insight into the deep-seated fear of fiction that characterizes certain parts of the Christian community. To that end, it will be helpful to consider issues connected with the emergence of the novel as a genre in the eighteenth century.

Among the problems that eighteenth-century readers wrestled with were those prompted by prose narratives that presented themselves as factual but were essentially works of fiction. For familiar examples one has to look no farther than Daniel Defoe's Moll Flanders, which purports to be a spiritual autobiography, or Robinson Crusoe, which passes itself off as a travel narrative, or even Henry Fielding's criminal biography of the infamous highwayman, The Life and Death of Jonathan Wild, the Great. To add to readers' confusion, in the early eighteenth century, chroniques scandaleuses—sensationalized, thinly disguised stories about the rich and the famous—were as popular as the tabloids are today. Moreover, precursors to modern-day newspapers such as Addison and Steele's Tatler and Spectator featured op-ed pieces written by fictional characters. Given the pervasive blurring of boundaries between the factual and fictional worlds, is it any wonder that Samuel Johnson, that preeminent mid-eighteenth-century critic and Christian moralist, developed anxieties about fiction?

Johnson's fears are worth examining to see how they may help us come to terms with issues confronting our own age. Johnson's most famous essay on the subject of fiction is his Rambler no. 4, which was published on Mar. 31, 1750. He takes as his assumption Horace's dictum that the purpose of poetry—and by extension, narrative fiction—is to teach and delight. In other words, literature should unite didactic or moral value with entertainment value. Johnson actually preferred works that slid toward the didactic end of the spectrum, but in any case, he allowed that fiction might convey the knowledge of virtue and vice more effectively than dry axioms or precepts about morality. Still, Johnson had a fear "mixed characters." He thought good characters should be good, and wicked characters should be wicked, with no overlap. Writers who blurred the boundaries between virtue and vice by mixing together admirable and objectionable traits in a single character were only creating problems. Johnson was afraid that readers who became interested in the fortunes of mixed characters during the course of a story would "lose the abhorrence of their faults," or worse, "regard them with some kindness for being united with so much merit."[1]

Today we might say Johnson's fear seems simplistic. After all, real people—all of us included—are mixed characters whose quirks and foibles (not to mention sins) often counterbalance our better qualities. And most of us would agree that if we are to sustain committed marriages and maintain successful relationships with co-workers, neighbors, and especially fellow church committee members, we need to learn a degree of tolerance for others' faults. Tolerance does not mean that we encourage or promote other people's vices. Quite the contrary. It means we realize that just as God has forgiven us, we must bear with and forgive others' infirmities, weaknesses, bad habits, wrong thinking, and ill temper induced by PMS, exacting bosses, and/or lack of adequate parking. To that end, perhaps we can all benefit from reading

[1] Samuel Johnson, The Rambler, vol. 1, ed. W. J. Bate and Albrecht B. Strauss (New Haven: Yale University Press, 1969), 23. Hereafter page numbers will be cited parenthetically in the text.

fiction peopled by mixed characters. Among other things, fiction offers us the chance to reflect on traits that produce harmful effects and those that produce good.

So why was Samuel Johnson afraid of mixed characters? The answer lies in his beliefs about the power of example. He reasons this way: "if the power of example is so great, as to take possession of the memory by a kind of violence, and produce effects almost without the intervention of the will, care ought to be taken that, when the choice is unrestrained, the best examples only should be exhibited; and that which is likely to operate so strongly, should not be mischievous or uncertain in its effects" (22). To translate into post-Freudian terms: examples can work on our minds unconsciously, subliminally; they sometimes exert their power insidiously. Therefore, we should carefully guard against exposure to bad examples.

At this juncture I should point out that Johnson was harboring another assumption, one concerning the constituency of fictional works. He believed that novels were "written chiefly to the young, the ignorant, and the idle, to whom they serve as lectures of conduct, and introductions into life." (21). Today we would undoubtedly disagree that fiction is read only by the young, the ignorant, and the idle. Some of us who are devoted to fiction (ahem!) are middle-aged, educated, and extremely pressed for leisure time. But let us entertain Johnson's premise for a moment in order to see where it leads. Johnson argues that fictional works serve as "introductions into life" to those who are "easily susceptible of impressions; not fixed by principles, and therefore easily following the current of fancy; not informed by experience, and consequently open to every false suggestion and partial account" (21). It is upon this basis that Johnson concludes "nothing indecent" should be represented to young readers "to secure them from unjust prejudices, perverse opinions, and incongruous combinations of images" (21). Suddenly Samuel Johnson sounds like a modern parent at a school board meeting raising questions about the library's holdings or exploring the negative behaviors that spring from immersion in violent video games or gangsta rap.

If we're honest, we have to admit that Johnson's fears about the unconscious and sometimes forceful ways that examples seize the imagination have some basis in fact. Don't we have plenty of evidence that repeated exposure to images of violence can produce violent behavior? That playing Grand Theft Auto can result in real attempts to steal cars? That filling the mind with "indecent" examples can produce a Columbine or a Virginia Tech? It might be argued that violence of this sort is primarily associated with visual images derived from TV, films, and the Internet. But didn't the same basic concerns about imitation and desensitization inform the flap over the Harry Potter series?

Of course, the problem with the Harry Potter example is that no matter how hard a child wishes for it, a broomstick is never going to levitate to become a Quidditch stick. Some images are more fanciful than others, whether they originate from a book or a TV screen, and thereby they pose less of a risk to potential imitators. But how do we separate harmless fantasy from realistic threats? I would suggest the answer has less to do with characters that are strictly good or evil than with how power is represented.

A useful paradigm for discussing representations of power can be found in the second temptation of Christ, recorded in the gospel of Luke: "And [the devil] led [Jesus] up and showed Him all the kingdoms of the world in a moment of time. And the devil said to Him, 'I will give You all this domain and its glory; for it has been handed over to me, and I give it to whomever I wish. Therefore if You worship before me, it shall all be yours'" (Luke 4:5-7, NASV). The temptation begins with the devil showing Jesus an image—digitally manipulated, as it were, in that many centuries are collapsed into a single moment and far-flung kingdoms are joined in a single montage. The image itself is distorted. Then the devil promises Jesus what the image represents—power and glory—with the assurance that it is his to give. I suspect this claim is also a distortion since it sidesteps the facts of God's sovereignty and His providential working in the lives of individuals and nations. Finally the devil discloses the condition his promise is based on: Jesus must worship him.

Now, isn't this a lot like how modern advertising works? We are shown an image of a truck barreling through the rugged wilderness in stormy weather, and the implied promise is that if we buy this truck, we will have power over the elements and thus will be in control of our destiny. Or we are shown an image of a beautiful woman in a diaphanous gown and sparkling jewels, and the implied promise is that if we buy the same shade of lipstick she is wearing—or the same brand of mascara, nail polish, perfume, deodorant, toothpaste, or tampons—we will be alluring and irresistible to men and thus will have love, or at least sexual gratification, at our command. The pattern in each case is the same: a distorted image, an illusory promise, and voila! Fame, riches, and glory will be ours if we will just buy the same athletic shoes that the latest NBA superstar is wearing. What a small price to pay for power.

You may wonder, however, if my analogy doesn't break down at this point. Is buying shoes, or lipstick, or a Ford F-150 really the equivalent of worshiping the devil? It depends on whether we believe those implied promises. If we think that wearing Nikes will somehow automatically invest us with Michael Jordan's skill as well as all the accoutrements of his success, then what we're really looking for is shortcuts. The quality of an athlete's shoes as part of the equation for his success pales in significance compared to the hours of training and discipline necessary to hone his skills to a professional level. The same is true for other endeavors: playing the cello, designing a skyscraper, managing a mutual fund, or sending a manned rocket into space. Having the right shoes, or lipstick, or pickup truck is not the key to success. And this fact brings us back to the story of Christ's temptation.

The immediate issue facing Jesus was the devil's offer to substitute himself for God. If Jesus would simply bow down to him, Satan would be happy to reward him with worldly riches and power. But Jesus replied, "It is written, 'You shall worship the Lord your God and serve Him only'" (Luke 4:8). He understood that Satan wanted to usurp God's rightful place as the Creator and thus as the sovereign shaper of purpose and meaning in our lives. So to return to our earlier question about whether indulging in consumer goods can ever be analogous to worshiping the devil: it can be, in a metaphorical sense, if we expect the acquisition of material things to give meaning to our lives. The bumper sticker that proclaims "he who dies with the most toys wins" captures the philosophy I'm talking about. Sadly, many people in our culture have succumbed to the temptation to find their purpose in acquiring thing—things that, like a tube of lipstick, are quite harmless in themselves.

But something else was going on in Christ's temptation, something connected to the notion of shortcuts. Satan promised Jesus could have power without the experiencing the limitations and agonizing pain that carrying out his earthly ministry in human form would entail. In essence, Satan was offering a shortcut: glory and power without the cross. But Christ knew that seizing power in this way would negate God's purposes and would ultimately result in the spiritual death of the entire human race. Therefore he humbled himself, as Philippians 2 tells us, submitting to the painful discipline of obedience, until his work was completed, whereupon "God highly exalted him," restoring his rightful power and glory as a member of the godhead.

The first lesson here is that real power is paradoxical in nature. It is by being servants that we become leaders. It is by giving that we receive. It is by humbling ourselves that we are exalted. The second lesson here is that with power comes responsibility. The ethical exercise of power requires self-discipline, and restraint, and self-control, whether it is the power we wield as the parents of cranky toddlers or as the leaders of nations armed with nuclear warheads.

This is where I think we can learn something from Samuel Johnson's anxiety. We need to think responsibly on behalf of the young, the ignorant, and the idle of our own time. Our culture feeds us a steady diet of messages that suggest power is to be obtained by taking shortcuts. Such messages are based on a lie. Consider, for instance, images that portray guns as a requisite enhancement to personal power. Whether these images occur in hip-hop videos or graphic novels or the latest shoot-'em-up TV show, they encourage the possessor to believe that shooting his gun at someone will make him powerful, when in fact it may render him completely powerless. He is likely to wind up in prison, or dead.

Ultimately, the danger to young minds does not stem from a particular genre or medium. Some fantasies may nurture a spirit of revenge, but others engage readers in healthy contemplations of the cosmic struggle between good and evil. Nor does the danger lie with mixed characters, as Johnson supposed. The heroes of some epics and most tragedies are great men with fatal flaws. Few of us are tempted to imitate them unthinkingly. Rather, the greatest danger to impressionable minds lies with a narrative's storyline. Does it promise that we can attain success by cheating, beating the system, or taking shortcuts? Does it suggest that it's perfectly all right to increase our own personal power at the expense of others? Does it encourage us to think that our actions won't have consequences as long as we don't get caught? Fiction can be just as useful for telling the truth about such matters as nonfiction, and flawed characters can be just as instructive as paragons of virtue.

We need to ask ourselves hard questions about what constitutes ethical representations of power. It is precisely at this point that I believe we can reclaim the apologetic moment often lost in the public forum. Many people, Christians and non-Christians alike, care deeply about reducing violence in our society and instilling the kind of values in our children that will promote civic virtues such as diligence, honesty, and compassion for others. Based on our common goals, we need to encourage and engage in thoughtful dialogue within our communities about the role that literature and imaginative works in other media play in character formation, for good or ill. As readers, writers, and especially teachers, we owe it to the impressionable minds among us.

Those of us in the academy who are Christians may also need to help fellow Christians understand that the mere absence of wizards or warlocks or profanity or "adult themes" is not what "sanitizes" a work or legitimizes it for consumption. And we may need to engage in thoughtful reflection to determine if our own reading and viewing choices are consistent with the ethic we espouse. Ultimately, we must teach ourselves and others to read for more than just a work's plot; we must be able to discern the assumptions and values it embodies and discuss why these may or may not be ones we want to promote as a society. This means that on occasion we may have to read or view material that we find distasteful. Otherwise, we will not have earned the right to participate in the discussion. Nothing kills one's credibility faster than confessing one has not actually read the book one is condemning.

Shouting matches with people who do not share our faith or values are of little profit. But engaging in dialogue with non-Christians about the assumptions and values that specific narratives embody can provide us with valuable opportunities to "give an account for the hope" that is in us.

Evil Music From God? Critics of Christian Rock

by W. Terry Lindley

It was a hot summer night in 1983 in the small East Texas town of Lindale. Several thousand Christian youth, who had been participating in a Youth With a Mission conference, were ready for an evening of praise, music, and fun. The main performing band was the Christian rock group Mylon Lefevre and Broken Heart. In the crowd that evening was evangelist David Wilkerson of *The Cross and the Switchblade* fame. Wilkerson had met with LeFevre earlier that day to discuss the issues of music and ministry, and the evangelist found the rocker sincere and humble in spirit. However, everything changed that summer evening when Broken Heart, after playing two "devotional-type songs," cranked up the fast-paced and extremely loud "Crack the Skies," a tune about the Second Coming. With the smoke and light machines going full blast and the performers standing "like phantoms rising from a murky swamp," Wilkerson testified, "Suddenly I was on the ground, on my back, weeping and sobbing, and groaning in the Spirit. . . I SAW DEMONIC IMAGES RISING FROM THE THAT STAGE! I HEARD SATAN LAUGHING!" Like a modern-day Elijah, the evangelist ran through the crowd, warning the young people of the devil's musical assault on their souls, but to no avail. He even charged the stage in an attempt to seize a microphone so that he could shout, "THIS IS VOMIT ON THE TABLE OF THE LORD!" But the crowd was too tightly packed for him to reach his goal. Wilkerson later wrote that LeFevre's band that night "put their stamp of approval on a paganism right out of the Devil's treasury. They were saying, by their music and their worldly, ghastly performance—that Jesus and the garbage of this world are compatible."[1]

The above was not an exception but the rule when it came to critics of Christian rock music from the 1970s through the early 1990s. These opponents, surprisingly, are found in both the Pentecostal and Fundamentalist camps, two camps that are often at odds with each other. This paper will examine the views of two Assemblies of God ministers, David Wilkerson and Jimmy Swaggert, and three Fundamentalists preachers and teachers, David Noebel, Frank Garlock, and Bill Gothard, on the issue of Christian rock. Wilkerson is best noted for his inner-city ministry to street gangs in New York City and as the founder of Teen Challenge. His opposition to rock 'n' roll dates back to the late 1950s.[2] Swaggert, the cousin of 1950s rock legend Jerry Lee Lewis, was a popular televangelist who, before his fall in 1988, and was carried on 3,200 TV stations in nearly 150 nations and viewed worldwide by over 300 million people.[3] Noebel came out of the camp of Billy James Hargis and headed Summit Ministry, which is still very active today and has been endorsed by the likes of Dr. James Dobson. He continued the anti-communist stance of his mentor and first attacked rock music in 1964. Garlock was a professor of music at Bob Jones University for many years, a music evangelist, and a prolific author. His antipathy to Christian rock evidently came from the teachings of Bob Jones, III, who denounced the Jesus Movement as "unbiblical."[4] Since Contemporary Christian Music came out this evil movement, such music by association must also be bad. Gothard, a former youth minister, put together a teaching ministry, known initially as the Institute of Basic Youth Conflicts and now it is the Institute of Basic Life Principles, which stresses obedience to authority. After observing that Christians were failing to live a godly life, he concluded that the reason for their defeat was that they were listening to rock music on the radio.[5]

Of these five church leaders, all have been consistent in their opposition to rock 'n' roll, and all but Wilkerson, have been steadfast in their antagonism to Christian rock. Having Dallas Holm as worship/song leader at his crusades and becoming friends with Buck Herring, manager of the Christian group Second Chapter of Acts, and singer-songwriter Keith Green, Wilkerson in 1982 wrote that he had been wrong about Christian rock. The evangelist apologized for what he had called "compromise" and "double standard" in the lives of Christian performers and attributed his dislike of Christian rock to differences in culture.[6] But as seen above, he reverted to his original position within a couple of years. Wilkerson claimed in 1993, "I have never moved away from my deep aversion to this music," and his 1982 confession "was simply trying to move away from judging the individuals involved."[7] Of these five men, only two, Wilkerson and

[1] David Wilkerson, "Driven to Darkness" (Lindale, TX: World Challenge, 3 August 1987), 1-2.

[2] David Wilkerson, "Rock and Roll—The Devil's Heartbeat," *Protestant Evangel*, 12 July 1959, 4-5. Betty Daffin at Last Days Ministries writes that Gothard's teachings influenced Wilkerson's view of both rock 'n' roll and Christian rock. Betty Daffin to Dr. W. Terry Lindley, 21 October 1993.

[3] Charles H. Lippy (ed.), *Twentieth-Century Shapers of American Popular Religion* (Westport, CT: Greenwood Press, 1989), 418-19.

[4] Bob Jones, III, *Look Again at the Jesus People* (Greenville, SC: Bob Jones University Press, 1972), 4. The reasons for "the unbiblical nature of the Jesus Movement" was its warped views of he church, the sonship of Jesus Christ, and Scripture as well as an ungodly lifestyle. See pp. 4-16.

[5] Wilfred Bockelman, *Gothard: The Man and His Ministry—An Evaluation* (Milford, MI: Quill Publications, 1976), 90. This was confirmed to me in an unofficial interview with a high ranking official in the Institute of Basic Life Principles in the mid-1990s.

[6] Wilkerson,"Confessions of a Rock n Roll Hater!" (Lindale, TX: Last Days Ministry, 1982), 1-2.

[7] David Wilkerson to Dr. Terry Lindley, 8 November 1993.

Swaggert, appear to have talked with Christian rock musicians or attended Christian concerts. And only Noebel seems to differentiate between Contemporary Christian Music and Christian rock. In a 1986 interview, he praises the music of Dallas Holm and applauds Amy Grant for singing "really good quality Christian music." Noebel then pointedly asks, "Why would we want to baptize a form of music [rock 'n' roll] that is born, bred, and raised in sin?"[8]

A number of questions need exploration. Why is rock music evil? Is rock music redeemable? Can this musical genre be used for Christian ministry and outreach? Finally, what do the arguments of critics of Christian rock tell us about Satan and his power?

There are a number of reasons why these ministers and teachers suggest that rock 'n' roll is bad. First, it is evil in origin. Wilkerson declares that "rock and roll is the Devil's heartbeat"[9] and was "born in the womb of Satan."[10] Thus, nothing good or holy can come from this type of music. Agreeing with this assertion, Swaggert adds that youth are being demon possessed through rock 'n' roll, and, in turn, this leads "to Satan worship." The Rolling Stones' song, "Sympathy for the Devil," he asserts, inspired "rock groups, album concepts, and musical influence for years to come."[11] Both Gothard and Garlock contend that the origin of rock music is voodoo worship. The latter goes on say that Satan uses this music to "corrupt their [teenagers'] minds, dishonor their bodies, and destroy their souls."[12] Also accepting the African origin of rock music, Noebel adds that the sound of this music in Africa "incite warriors to such a frenzy that by nightfall neighbors were cooked in carnage pots!"[13] To all five men, music is either evil or bad, godly or ungodly, and they reject the argument by some that music is neutral and only the lyrics make music good or bad. Rock music of all types, these critics assert, falls into the evil, ungodly category.

Second, rock music leads to a whole host of criminal and immoral actions. Garlock associates the rock sound with "drug addicts, revolutionaries, rioters, Satan worshippers, drop-outs, draft-dodgers, homosexuals and other sex deviates, rebels, juvenile criminals, Black Panthers and White Panthers, motorcycle gangs, blasphemers, suicides; heathenism, voodooism, phallixism, Communism in the United States . . ., paganism, lesbianism; immorality, demonology, promiscuity, free love, free sex, disobedience (civil and uncivil), sodomy, orgies of all kinds, night clubs, dives, strip joints, filthy musicals such as 'Hair' and 'Uncle Meat.'" Regarding rock and violence, he cites the August 1970 Rolling Stones' concert at Altamont raceway, where the band employed Hell's Angels as security guards. At one point in the concert, members of the motorcycle gang went berserk, killing one concert goer and injuring several others.[14]

Wilkerson also lists a host of evils caused by rock 'n' roll, including "fleshy lusts and sexual desire," murder, and riotous behavior. Teenage gang leaders, he claims, formulate "their war plans" after listening to loud rock 'n' roll music. *"I am in a position to prove that three teen-age murders took place within half an hour after a rock-and-roll hop."* Wilkerson even connects "uncontrollable desires for speed and recklessness" in automobiles to rock music blaring from the car radio.[15] Swaggert writes that the rock message of the late 60s "centered around anti-establishment themes of protest, violence, drugs, and sex," while heavy metal promotes "sex, drugs, and Satanism" and punk rock encourages "rebellion against parental authority, anarchy, and bodily perversion." Punk rockers are violent, and the televangelist concludes that "violence is nothing more than worship to Satan"[16]

Noebel contends that this music "is destroying our youth's ability to relax, to reflect, to pray, and to meditate, and is in fact preparing them for riot, civil disobedience and revolution." Moreover, rock 'n' roll instigates riots, causes mental instability, promotes all manner of sexual sins, and leads to "emotional, psychological, spiritual, [and] moral" problems. To prove his point, he quotes several doctors and studies regarding rock music and its relationship with violence and emotional instability among teenagers.[17] Gothard relates the harmful sound of this form of music "to rebellion, drugs, immorality, and the occult," but its most destructive effect is the teenager's "alienation from parents."[18] In short, these five religious leaders associate every evil or sin one can imagine in one way or another with rock 'n' roll.

Rock music, Noebel also warns, is part of a communist conspiracy to tear down democracy and the capitalist West in general and the United States in particular. Communism, through the medium of rock music, seeks to destroy "the mental and emotional stability of America's youth through a scheme capable of producing mass neurosis." The enemy,

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[8] Steve Rabey, "A Noebel Cause: The Constant Crusader Shares His Rhetoric on Rock," *Contemporary Christian Magazine* (May 1986), 25.

[9] Wilkerson, "Rock and Roll," 5.

[10] Wilkerson to Lindley, 8 November 1993.

[11] Jimmy Swaggert, *Religious Rock 'n' Roll: A Wolf in Sheep's Clothing* (Baton Rouge, LA: Jimmy Swaggert Ministries, 1987), 31-34.

[12] Bill Gothard, *How to Conquer the Addiction of Rock Music* (Oak Brook, IL: Institute of Basic Life Principles, 1993), 43. and Frank Garlock, *The Big Beat: A Rock Blast* (Greenville, SC: Bob Jones University Press), 22.

[13] David Noebel, *The Marxist Minstrels: A Handbook on Communist Subversion of Music* (Tulsa, OK: American Christian College Press, 1974), 45. Brackets added.

[14] Garlock, *Rock Beat*, 12-13 and 23.

[15] Wilkerson, "Rock and Roll," 5.

[16] Swaggert, *Religious Rock 'n' Roll,* 32 and 34.

[17] Noebel, *Marxist Minstrels,* 5, 44, 64, 90, 98, and 115.

[18] Gothard, *How to Conquer,* 79. One of the songs of this album is the Apostles' Creed put to music.

Noebel claims, plans to replace the classical sound with the beat of African music, which will demoralize American youth, prepare "them for riot and ultimately revolution," and "destroy our American way of life and the basic Christian principles governing that way of life." The entire folk rock industry is under communist control, and Noebel describes performers like Pete Seeger, Woodie Guthrie, and Bob Dylan and songs such as "We Shall Overcome" and "Eve of Destruction" as communist at worst or pro-communist at best. He concludes that the nation's young people are "singing itself into defeatism, pessimism, a peace-at-any-price mentality, disarmament, appeasement, surrender, fear of death, hatred toward the South, atheism, immorality, drugs, revolution and negation of patriotism."[19]

Critics of rock 'n' roll imply that this music is a threat to life in general and human life in particular. Both Garlock and Noebel tell the story of Mrs. Dorothy Retallack, a resident of Denver, Colorado. In a three-week experiment, which a biology professor at Temple Buell College certified as "scientific," Mrs. Retallack exposed different types of plants to rock and semi-classical music. Those exposed to the latter grew and prospered, while those subjected to the former swiveled up and died.[20] Even Christian rock kills plants, according to Noebel.[21] Gothard recalls a life-threatening incident involving Christian rock. A seventeen-year old girl, while undergoing a routine operation to cut a non-cancerous tumor from her finger, suddenly developed what appeared to be a heart problem. However, when the girl's headset turned off, her heart returned to normal rhythm. She had been listening to the rock album "Beyond Belief" by Petra.[22]

Given all the above, is rock 'n' roll redeemable? The answer for Garlock, Gothard, Noebel, Swaggert, and Wilkerson is a collective and resounding NO. Yet, this is not the first time that a new form of entertainment has been condemned as so satanic that it could not be used by the church for any reason. A number of Fundamentalists denounced radio as "the devil's own province" from which Christians should stay away. However, this view was not shared by all Fundamentalist leaders, and soon Gospel music, sermons, and church services were filing the nation's airwaves.[23] An example of radio's rapid growth among Christians is Charles Fuller's *Old Fashioned Revival Hour*, which in 1942 was broadcast over 450 stations nationwide and was "the largest single release of any prime-time radio broadcast in America."[24] However, Christian rock 'n' roll was not as readily accepted by the church as radio. Why was that?

First, Christian rock brings the world into God's house and thus corrupts and hampers the spiritual growth of God's people. Gothard argues that both the Old and New Testaments teach that the holy and unholy, the believer and the non-believer cannot be linked or work together. "Any attempt to unite the Christian world and the secular world through rock music is a clear violation to God's command" in Judges 2:2 and II Chronicles 6:14-16. Such a combination is also mixing hot and cold together, which produces something that is lukewarm, and according to Revelation 3:15-16, God hates what is lukewarm.[25] In short, Christian rock destroys the church's spirituality and pulls God's people down to the world's level rather than redeeming this music with its devilish beat.

Garlock is just as strong in his condemnation of Christian rock's effects on the body of Christ. Christians are supposed to be different from the world, but the acceptance of rock 'n' roll is telling the world that God's people are not different; they are actually the same. This worldly music causes "spiritual blindness." He asserts that the only musicians who adopt rock music are those who have already lost their "spiritual power." Thus, Christian rock does not give one "spiritual power," but by implication it destroys whatever "spiritual power" one might already possess. Garlock emphatically concludes, "I do not know of one person that I consider to be spiritual—that is, one who loves the Word of God, has his prayers answered, and wins others to Christ—who likes rock 'n' roll music. **Not one!** On the other hand, I do not know of one devotee of rock music that I would consider to be a spiritual Christian. **Not one!**"[26]

Swaggert laments that the church, which for centuries set the moral standard of society, is embracing with Christian rock the world's standards for indecency and immorality. The church is in the business of redeeming culture (with the obvious exception of rock music), not in imitating it. God's people are clearly ignoring His Word. To speak of Christian rock is blasphemy to the evangelist's ears. The "linking of integrity with religious rock," he writes, "is like comparing Mary, the mother of our Lord, with a common prostitute."[27]

Like Swaggart, Noebel speaks of God's prohibition of uniting good and evil as proclaimed in Deuteronomy 22:10-11 and II Corinthians 6:14ff. Such music is leading Christian young people away from God and back into a world filled with "sexual liberation, smoking, drinking, drugs and four-letter words." Christian rock also encourages youth to pay attention to "secular rock with its emphasis on rhythm, body, drugs, promiscuity, violence and revolution." This music

[19] Noebel, *Marxist Minstrels,* ii, 45, 157, 173, 196, 208, and 210-11.

[20] Ibid, 118-20 and Garlock, *Rock Beat,* 17.

[21] David Noebel, *Christian Rock: A Strategem of Mephistopheles*. (Manitou Springs, CO: Summit Ministries, 1987), 27.

[22] Gothard, *How to Conquer,* 85-86.

[23] Tona J. Hangen, *Redeeming the Dial: Radio, Religion, & Popular Culture in America* (Chapel Hill, NC: The University of North Carolina Press, 2002), 21-22.

[24] Joel A. Carpenter, *Revive Us Again: The Reawakening of American Fundamentalism* (New York: Oxford University Press, 1997), 24.

[25] Gothard, *How to Conquer,* 53-57.

[26] Garlock, *Rock Beat,* 13, 26, 47 and *Can Rock and Roll Be Sacred,* 30.

[27] Swaggert, *Religious Rock 'n' Roll,* 63, 92-93, 104, 113, and 138.

also encourages young people to look and dress like the world, with "long hair" and "freaky clothes" and to accept this "subculture's leftwing stance." One's mind is conformed to worldly standards and not transformed by the Spirit of God.[28]

Wilkerson compares Christian rock to King Ahaz, who compromised with heathens and established a corrupt form of worship. Satan is using his music to "pollute the worship of the almighty God" and to hinder "worship in spirit and truth." Christian rock, the evangelist boldly asserts, is "devaluing holiness and making a mockery of purity and separation from the world." Baal has entered into the House of God via Satan's music. Christian rockers "look like freaks, with demonic and witch-like expressions. They put serpents and other grotesque creatures on their jackets. They are reflections out of hell itself." The church has become so corrupt that it can no longer clean its own house, and Wilkerson prophesies that God will soon have to cleanse the temple himself.[29]

But who is to blame for letting the evils of Christian rock into God's house? Both Swaggert and Wilkerson lay the responsibility at the feet of permissive, compromising pastors and youth ministers. Swaggert writes, "My disagreement is not fundamentally with these people but with their music and methods which I believe are not in harmony with the Gospel of Jesus Christ. I am most disturbed at pastoral leadership which permits the foregoing under the guise of a tool of evangelism." The solution is for the church to stop booking such musical groups, for Christian book stores to stop selling their records and CDs, and for Christian radio stations to stop playing their songs.[30] Wilkerson is more outspoken in his criticism of church leadership. He labels those who promotes such evil music as "smooth talking, sin-soft shepherds," "blind, compromised, undiscerning Christian leaders," and "a WHOREMONGER." "Hell," he writes, "must be ecstatic at the spectacle of ministers not just abdicating to the immoral music standards of the young—but actually promoting what only demons should be promoting." Wilkerson triumphantly warns, "The rock and roll 'prophets' of this generation are yielding a seed after their own kind—a seed that will one day bring forth a fruit that will wither and die."[31]

The second problem with the use Christian rock in the church is that it is like a sign before an inn, in which there is no wine. In other words, it promises something which it cannot deliver—God's spirit. According to Noebel, one cannot add Christian lyrics to rock music, since this music's "total mission is contrary to Christian values." The mixture of this "invigorating, vulgarizing, orgiastic and evil" sound with words about Jesus Christ, the resurrection, and righteousness only serves "to warp these lofty and spiritual concepts and values." Since the sound or beat is aimed at arousing the flesh, it can produce no acceptable fruit in the eyes of God. While the words speak of spiritual things, the sound is "atheistic and a denial of the image of God in man." Christian rock, Noebel argues, is divisive in that it sends out two divergent messages at the same time. While the lyrics speak of "true love" and "true worship," the sound seeks to destroy both concepts.[32]

Both Garlock and Swaggert agree with Noebel's assessment. Garlock lambastes Ralph Carmichael and Kurt Kaiser, writers of Christian youth musicals such as "Tell It Like It Is," for their "lack of reverence for God" and "lack of understanding of man and sin." This musical presents truth not as absolute but as relative. This pattern, according to Garlock, is how Satan infiltrates God's people and then leads them astray. The devil first moves away from Scripture, then portrays Jesus as a friend and forgets about the Cross, and finally replaces the true gospel with one that focuses on social ills. He adds elsewhere, "Those who compromise with the devil eventually become a vehicle for expressing his philosophy and error."[33] Wilkerson declares that "members of nearly every major Christian rock group" have "confessed sexual promiscuity, drug and alcohol abuse and financial shenanigans. When I accused some of the leaders, they freely acknowledged it."[34] Swaggert labels Christian rock lyrics as "nonsensical" and "perfectly vague and meaningless," often omitting the name of Jesus altogether. The only differences between secular rock groups and so-called Christian bands are that the latter tone-down their on-stage performances and have less vulgar lyrics. Otherwise, both types of groups sound and look alike.[35]

A third difficulty with Christian rock within houses of worship is the type of morality that this style supposedly promotes. Garlock believes that Christian rock musicians set the wrong moral tone for Christian young people. After all, these performers have left "a list of broken marriages, divorces, illicit sex relationships, and even homosexuality."[36] Swaggert voices his concern that Christian rockers, by citing secular bands and performers as their musical influences, are causing the church youth to turn back to secular rock with all its lustful temptations and inherent evils. He points to several articles about Amy Grant, where the singer sunbathes naked, praises a Prince concert, and proclaims that

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28 Noebel, *Marxist Minstrels,* 218 and *Christian Rock*, 13, 23-25.
29 Wilkerson, *Set the Trumpet to Thy Mouth: Hosea 8:1* Lindale, TX: World Challenge, Inc., 1985), 86-90, 102-04, and 112-14.
30 Swaggert, *Religious Rock 'n' Roll,* vii and 170.
31 Wilkerson, "Driven to Darkness," 2-3.
32 Noebel, *Christian Rock,* 6, 12, 14-15, and 26.
33 Garlock, *Rock Beat*, 46-47.
34 Wilkerson to Lindley, 8 November 1993.
35 Swaggert, *Religious Rock 'n' Roll,* 65, 77, and 106.
36 Garlock, *Rock Beat,* 48.

she wants to have sex. Yet, she is upheld as a roll model for today's Christian teenage girls.[37] And Noebel asserts that Christian rock musicians are not living "a lifestyle that befits Jesus, the Lord," but are, in fact, "leading Christian young people back into the world" with all of its immorality.[38]

A final concern with using Christian rock 'n' roll in the church centers on the issue of whether or not this medium can be used for evangelism. Swaggert defiantly maintains, "Music is *not* for evangelism." He quickly adds that "there is not one scriptural reference in the Bible tying music and evangelism together." Music has two purposes—to "praise and worship" the heavenly Father and "to prepare people's hearts for the preaching of God's Word." While music "can speak to us, soothe and challenge us," Swaggert believes, "it takes the preaching of the Gospel to transform a life." Thus, it is oxymoronic to wed Christian rock to evangelism, especially when the musicians "were *not* won to Jesus Christ by the same tactics they now claim must be employed to reach young people" with the gospel. Moreover, if the performers' goal is evangelism, then why, he asks, is the practice of altar calls almost non-existent? Is it because most of the audience consists of church members? Swaggert cites two examples of the futility of reaching youth through the medium of rock music. First, at a Stryper concert, he found no "clear-cut, straightforward presentation of the Gospel" as well as the absence of "*any* opportunity to receive Him." Second, in a poll of 800 young people who had attended at least one Christian rock concert, only one claimed to have been saved, but he later admitted that his "cousin had witnessed to him prior to the concert," thus already sowing the seed of salvation.[39]

Garlock calls attempts by Christian rock musicians to evangelize the lost "anemic, insipid, flabby, and spiritually bankrupt." He writes, "If decisions are not deeper than the message, then there are a lot of false decisions being made, and many people who think they are saved are still in their sins." Why is this the case? Garlock answers, "There is not enough about sin to bring repentance, and not enough about the cross and the blood to bring salvation." However, if one could be saved in such a venue, that person "will never be much good for God because he will not see any need to change from his old ways."[40] While Noebel admits that the Gospel can be presented and that a person might be saved at a religious rock concert, he believes that person would quickly turn his back on that type of music, "just like I would expect someone who heard the gospel in the gay Metropolitan Community Church to leave the sodomy [of that] church as part of his growth process."[41]

While all agree that rock 'n' roll comes from Satan, how does this exactly happen? Swaggert argues that the devil has "counterfeited and perverted God's gift of music to serve a demonic purpose."[42] Noebel suggests that Satan "initiated rock 'n' roll as an invaluable tool to populate hell."[43] Wilkerson initially agreed with Swaggert. Writing in 1959, he describes rock music as "*Satan's answer to Pentecost*," an attempt to replicate God's work on that day. However, later he proclaimed that rock 'n' roll was "born in the womb of Satan." Since the birthing process brings forth new life into the world rather than remakes what is already there, Wilkerson is clearly implying that the devil, the former choir leader of the heavenly hosts, has creative powers.[44]

But more disturbing than whether or not Satan has creative or imitative powers is the question of how strong the devil is in comparison to God. Garlock shockingly writes, "Even if the words that go with this worldly music are the actual words of Scripture, the message of sensuality which the music conveys will hold down and even annul the message of the words."[45] Gothard strongly agrees with this assessment, since the "beat" overshadows everything else, including the lyrics.[46] What both men are implying, whether they mean to or not, is that rock music, the devil's music, can actually nullify the literal Word of God. Thus, who is stronger—God or Satan? If the devil can use music to nullify Scripture, the implication seems clear. Hopefully, both men's vehement hatred of rock 'n' roll in all its musical forms, including Christian, caused them to misspeak.

In conclusion, the critics of Christian rock failed to carry the day. One reason for their defeat was that the Jesus People, who birthed this music, eventually joined evangelical or nondenominational churches, and these houses of worship became very casual and non-traditional in worship style, especially in the area of music. Even some mainline churches established a contemporary service to go along with its traditional one. Moreover, praise choruses supplanted hymns, and guitars and drums replaced the organ.[47]

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[37] Swaggert, *Religious Rock 'n' Roll,* 58-59, 62-63, and 84-85.

[38] Noebel, *Christian Rock,* 1 and 13.

[39] Swaggert, *Religious Rock 'n' Roll,* 12, 45-47, and 53-54.

[40] Garlock, *Rock Beat*, 47 and *Can Rock Music Be Sacred?*, 26, 35, and 41.

[41] Rabey, "Noebel Cause," 25.

[42] Swaggert, *Religious Rock 'n' Roll*, 22 and 25.

[43] Noebel, *Christian Rock*, 16.

[44] Wilkerson, "Rock and Roll," 4 and letter.

[45] Garlock, *Can Rock Music Be Sacred?*, 40.

[46] Bill Gothard, *Ten Scriptural Reasons Why the "Rock Beat" Is Evil in Any From* (Oak Brook, IL: Institute of Basic Life Principles, 1990), 3-19. See also *Striving for Excellence: How To Evaluate Music, A Course for Leaders* (Oak Brook, IL: Institute of Basic Life Principles, 1989).

[47] For a study of how Jesus People became part of evangelical and conservative churches and changed the way these congregations worshipped, see Preston Shires, *Hippies of the Religious Right* (Waco, TX: Baylor University Press, 2007).

Perspectives on the Cross: First-Person Accounts

by Webster F. Drake

Peter

I went to the cross filled with shame. I had denied Him. Three times. Just like He said I would. Just like I promised I never would.

But that night, that night everything seemed to go wrong. First, I felt like I offended Him when He wanted to wash my feet. Then, in front of everybody, He told me that I would deny Him. After that, I couldn't stay awake with Him while He prayed. Finally, when the soldiers came, I tried to defend Him and even that was wrong.

So, I followed at a distance. Followed Him all the way to the courtyard. The courtyard and that little girl. "Huh, what?" "No, I don't know Him." "Look, I don't know what you're talking about but I swear to God, I've never even met the Guy!"

And then the rooster crowed. In the middle of the night, the rooster crowed!

I looked over into the house, and there He was. His face was already swollen. His lips were already bloody. And He just looked at me. Not in judgment or hatred. Not even in desperation. He just looked at me.

So, I ran. And I cried.

I didn't want to go to the cross, but I didn't know where else to go. So, I went anyway. I wasn't at His feet where I should have been. I wasn't even in the crowd. I watched from a distance, a "safe" distance.

I saw John and the others, and I wished that I was with them. But . . . I wasn't. I just couldn't.

I saw Him, battered and bruised, struggling to breath, and I wished it was me. I knew I could join Him. All I had to do was step forward and say, "I believe that Jesus IS the Son of God," and I would have been up there beside Him before you could blink. But I didn't. I didn't.

I stayed in the background. And I watched. And I sulked. And then, suddenly, He found me.

In the distance, in the shadows, in my darkness, He found me. I saw Him lift His head. I saw Him scan the crowd, but I didn't know why. What could He have been looking for? A sympathetic gaze? A merciful prayer?

No, He was searching for me! His glance was only for a moment, a heartbeat. But when our eyes met, I found forgiveness. I found hope. I found a calling. You couldn't understand unless you've ever actually looked into His eyes. His eyes. . .

I came to the cross filled with shame, but at the cross, I found peace.

Mary

I went to the cross filled with expectancy. I know that sounds odd, but I had met with an angel. I had been witness to the worship and adoration of shepherds and magi. I had seen priests and rabbis humbled and thrilled. I had seen water become wine, sick people cured, and even the dead raised. I had been witness to these things.

But more than that, I had been promised that my Son would be a King and that His kingdom would last forever. I had been promised by angels. I had been promised by God. And so, I waited.

All through His childhood. He was a remarkable Child, but there was no coronation. And so, I waited.

Through my husband's sudden illness and death. I begged my Son to save him. "I'm sorry, Mother, but My time has not yet come." And so, I waited.

Through His adult years as He took over His father's carpentry shop, watching Him make chairs and tables. Seeing how people took to Him, listening to Him teach and pray. But still, there was no heavenly proclamation. And so, I waited.

And then, the wedding. The baptism. The miracles. The wait was over! The teaching. The crowds. The adoration.

But, then . . . arrested. . . tried. . . sentenced? No. No, this wasn't right!

So, I went to the cross fully expecting my Son to use that time and place to announce His reign. I didn't know why or even how it had come to this. But I was there to see Him shatter that cross. I had seen an angel. I knew those guards were no match for the heavenly hosts! I just KNEW that my Son would call down fire like Elijah, that He would halt the sun like Joshua, that He would open our eyes like Elisha. I just KNEW it!

But then, I saw Him. Beaten. Bruised. Savaged. And a piece of me died. Oh, I felt the ground, and I saw the darkness. But those were of little consequence to a mother whose Son was dying. I went to the cross filled with expectancy, but I left with only questions.

The Centurion

I went to the cross out of duty. It was simply another day. I never even thought about it. I was told that we had three crucifixions, so I got ready, and I got my men ready. Two of them were to be run-of-the-mill criminals. No problem. The other was a religious heretic of some nature. I was not informed of the details. I was, however, informed was that the Jews, in particular, wanted this man's death to be especially. . . painful.

On a personal note, I relished the opportunity. In my opinion, the region was becoming lax, dangerous. I looked at it as a chance to remind the Jews what happens when you defy the power and might of the Roman Empire.

When we took possession of the 3rd criminal. He had already undergone significant punishment, nothing that would have killed Him, but there was evidence of torture. His beard had been ripped out. His face was swollen from several direct blows. His body was bruised noticeably. My assessment of His condition led me to believe that He was despised by His captors. His injuries were not minor or cosmetic. There had been an emotional element to His mistreatment.

We put Him in the hot spot. That was our name for a 7-foot pole with leather straps attached at the top where criminals were flogged. The Prisoner was completely stripped of His clothes and secured to the pole. Physically, mentally, emotionally- He was all ours!

Scourging is a brutal thing, and my men are the best in the world at it. It's painful beyond words. Everyone cries out. Everyone. Everyone curses. So, that was the first thing that made this Man memorable to me. He cried out. He whimpered and moaned like all the rest. But He never cursed. Never.

My troops executed their task as ordered, mixed with perhaps a bit more venom than customary because of their hated for the Jews. We came very close that day to the unpardonable offense of killing Him at His scourging.

By the time we set out for Golgotha, He couldn't even carry His cross. He came down face first on that rock road with the entire weight of the cross on His back. Busted out what was left of His teeth.

When we got there, we stretched Him out on the beam, and I was about to drive in the nail, when I looked up, and saw Him looking at me. Not too unusual. Most of them either look away or at me. They never look at their hands. But most of them are looking at me for mercy or in anger. But this Man was looking at me almost sympathetically. Kind of like He was telling me that it was okay. I almost laughed! I put the nail in, then went over and did the other one. And we pulled Him up.

And there He was. He had a few friends and family there, nothing out of the ordinary. Just a Jew dying on a garbage heap. But still, that self-control, that look. Then, He prayed for my forgiveness. Nice touch, but I really didn't feel like I needed it!

Then, something happened. You see, as a soldier I'm a very big believer in what I can see, hear and feel. And when this Man died. The ground shook. The sky went midnight black, and the ground shook. I've been to Rome and met Caesar, but I have NEVER felt the ground shake. And when this Man died, the ground shook.

Look, I'm not hear to tell you that I have all the answers, but I know what I know. And the ground shook! I went to the cross that day because death was my business, but I left dying to know more.

Judas

I went to the cross with only disappointment. For three years I had been positioning myself for the upcoming revolution. I had infiltrated the inner circle of Jesus' disciples. There were hundreds of followers, thousands maybe. But I had gained His trust and been chosen as one of the 12 that He called "apostles." I had volunteered to take care of the money. And they had let me. I knew that I didn't have the battlefield expertise of Simon, the zeal of Simon Peter, or even the magnetism of John. But even though I lacked the financial expertise of Matthew, they still let me be their treasurer. You see, I figured that when the war came, all of the commanders would need cash flow, and as long as that flow ran through me, I would be in the pivotal position. Pretty solid plan, I thought.

So, for three years I followed Him, this Messiah. And I waited for Him to begin His revolution. I waited for Him to teach us battlefield tactics. I waited for Him to explain how to recruit and inspire troops. I waited for Him to begin setting up the new government and teaching us how to run it. I waited, and I waited.

But all He ever did was talk about service, and love, and kindness. What kind of messiah was this? But still I followed Him because everywhere He went, the people came! They came out of the woodwork to see Him. He was like a Caesar! And the thing that brought them out and made me stay was that He healed them. He would stretch out His hand and touch a sore, and it would disappear. He would whisper a few words over a leper, and the spots would just melt away. He would peer into the eyes of a blind man, and they would open for the first time!

Can you imagine an army led by a man like that? No soldier would stay injured. Nobody would ever die. There would be no reason for fear in battle. We would be invincible. The Romans wouldn't stand a chance. If Joshua won battles by staying the sun in the sky, can you imagine what a man who could raise the dead could do?

But He wouldn't start the war! We tried to force Him, but He just walked away. We begged Him, but He would always put us off. So finally, I knew that I had to force His hand. And what better place than the Passover. Jews from all

over the world would be in Jerusalem. With one proclamation, Jesus would have the largest army possible. We would overthrow the barracks in Jerusalem, kill Pilate and Herod, and begin storming the countryside. I could just picture it. I knew it was the right thing to do!

But how to go about it? That was the trick. I could have raised a private army and started the war on my own, but that still wouldn't have guaranteed His participation. There had been other uprisings during our years together after all. My ideal situation would have been to pit Him against the Romans, but He had broken no Roman laws. So, since I knew that the Pharisees wanted Him dead, and since I knew that they would have to eventually turn Him over to the Romans in order to execute Him, I did the next best thing. I turned Him over to those snakes. I hated it, but using them was the only way I could see of prodding Jesus into action. So, I did it.

I contacted them, and set it all up. And then, on our first night in town for the Passover, Jesus gave me the "Okay." He did! He looked me right in the eyes and said, "What you are about to do, do quickly." So, I knew He was on board with it. I just knew it!

But then, things just got out of hand. I turned Him over. There was a fight. Peter would have killed me if Jesus had let him. Then the trial, another trial. Pilate, Herod, Pilate again. The scourging, the cross.

What were You waiting on??!! Proclaim Your kingdom!! Call down fire!! Strike down Your enemy with the power of Your voice! YOU ARE GOD! ACT LIKE IT!

(sobs)

I watched from a distance as my Messiah became the only casualty in a war that I had started. And He never lifted a finger to stop it. The Man who could raise the dead did nothing to stop His own death.

I went to the cross filled with disappointment. I left with only grief.

Michael

I went to the cross ready to do battle, ready to rescue the Prince, ready to storm the stronghold of the adversary. I was ready to vanquish the foe and bring light to the dark realms of creation.

I was at the head of battalions, no, legions, of strong, skilled, determined warriors willing and able to go to hell and back if called upon for the sake of their Prince.

And we stood there waiting. Waiting on the command of the King. Waiting for Him to so much as nod His desire. Waiting for something that told us to go. . . Something. . . Anything.

But nothing came. No signal was ever given, and we stood their helpless. Rendered useless for the lack of a command.

We watched as evil and darkness surrounded the Crown Prince of the Universe. We watched as His soul was wretched, as His physical body was tortured, and as His mind was tormented. We watched, and we did nothing.

In all my time in service to the King, never have I disobeyed Him.

But until that day, I had never doubted Him, either. But as we stood there watching helplessly, I couldn't stop myself. I have watched as innocents suffered, stood by idly as children died, as good men got bad breaks. But I've always known that the King was in control, and that if He was allowing it, there must be some reason. But that day was just too awful.

The traitor, the enemy, the Prince of Darkness had the Son in his cold, dark clutches. It made no sense for us to stand around doing nothing. War had been declared. The Prince was under attack. And we were His legions. We were charged with His protection. Why? Why weren't we being allowed to do the very thing we were created to do, save the Prince?

We surrounded the area, filling the sky with unseen light and unfelt strength. Our stallions pawed the sky. Our chariots glistened in readiness. Our sinews and synapses, our very beings cried out for action. Swords, spears, shields: all stood at the ready!

And yet we did. . . nothing. NOTHING.

And the Prince died. Died in pain and agony. Died in the company of thieves and evil. Died the death of a pauper, a criminal. He deserved better. So much better.

I went to the cross in strength and vigor; I left in despair.

Lazarus

I wasn't at the cross. Just wasn't there. I don't have an excuse really. I just didn't go. I knew about it. I was in the area. I wasn't busy or prevented. I had every opportunity to go; I just didn't.

Still today, I'm not really certain why. You ever do that? You do something, or not do something, and not really be able to explain it, even to yourself.

I think back to that weekend, and it seems so hazy. We heard that He had been arrested. Several of His followers showed up at our house in the middle of the night. They told us what had happened, and they were all afraid that the Romans and Pharisees were looking for them, too. We let them stay with us.

The next morning, they went back to Jerusalem and found out that Jesus was being brought before Pilate. We all knew what that meant. Still, I didn't go.

I wasn't afraid. Or at least I don't think I was afraid. Well, maybe I was, but I wasn't afraid for myself. I was afraid for Him.

He had raised me from the dead. Literally. Not some fancy metaphorical raising where I was "dead drunk" or "dead on my feet." I was dead. Dead and buried. Four days dead and buried. And this Man had stood outside my tomb and called me out of it. I heard His voice, tried to move my arms and legs, and they worked. I had been dead, and then I was alive. Just like that.

And then, I heard that He was going to be crucified. Crucified. The most painful and embarrassing death imaginable. The Man that saved my life. . . How could He. . .?

You wanna know what I did that day? I'm embarrassed by it, but I'll tell you. I went out back, behind my house where no one could see me, and I whittled. Stupid, right? I sat on the ground, took out my knife, and whittled a stick down to almost nothing. Just slicing little shards of wood off of that stick and watching them float to the ground. All day long. One stick.

That night, well after sundown, a couple more of His followers showed up and told us that He was dead.

He was dead, and I hadn't done a single thing.

I hadn't gone to His trial. They offered to set Him free. Maybe I could have persuaded the crowd to cheer for Him instead of Barabas.

He had fallen when He was carrying His cross. Maybe I could have been there to help Him carry it. Maybe I could have made His final walk just a bit less lonesome.

Maybe I could have. . . I don't know, done SOMETHING!

But I wasn't there. I just wasn't there.

Mary Magdalene

I went to the cross out of compassion. Jesus had saved me from my torment. He had treated me like a human being. He had made others respect me and offered me a place of standing within His group. I had never been valued for anything or by anyone, but this Man treated me with decency. Me! And now, He was dying. He was dying the most horrible death imaginable, and I was powerless to stop it. I wailed and wept. I cursed the soldiers and screamed at the priests. I was inconsolable.

I watched Him writhe in pain, scream in agony, and weep in anguish. And I remembered. I remembered my own fight. I remembered what it was like to be beset by demons. To be tortured from within your own being. Jesus was being physically tortured, but what He was going through was far beyond the cruelty of the Romans or the evil intentions of the Jews. I knew that I was watching a struggle of epic proportions. What was going on within His tortured soul was eternal and cataclysmic. He wasn't fighting against the nails, He was fighting against all the evil in the entire universe. I recognized the signs!

My wailing turned into a sort of morbid fascination. I was watching a Warrior doing battle. I was watching the gates of hell itself under attack from a dying Man. I heard Him scream in agony and confusion. I heard Him call for help and consolation. I heard Him resound in victory and jubilation.

But in all of that, there was one thing He never did. He never tried to come down. It was like He knew that the cross was the battleground, and He wasn't leaving until the battle was over.

Look, I'm not a scholar or a priest. I'm not a great thinker or a zealot. I only know what my mind conceives and my heart feels. And my mind was in a panic, and my heart was breaking. But His were not. I went to the cross out of compassion for the Man, but I left in awe of Him.

Simon of Cyrene

I went to the cross because I had to. Literally. I mean, I was forced. I had no choice.

I was in Jerusalem for the Passover with what seemed like the entire world! It was Friday morning, and I was walking down the street toward the temple with my family when I noticed the streets started getting really crowded. And before I knew it, we were caught up in a great rush of people.

They were all shouting and cursing. Merchants' carts were getting turned over. It was turning into a bit of a mob scene, but I was pinned against a wall and couldn't get away!

Then, finally, I saw what all the chaos was about. Three criminals were being led out of the city to be crucified. The first two passed without much fuss, but the third One. . . man, the third One. I had never seen so much hatred directed at one Man. The people in the streets reviled Him. They were all cursing and throwing things at Him. He was beaten so badly He didn't even look human.

And just when I didn't think the crowd could get any worse, He stumbled and fell. It was like an enemy had fallen in battle. They were cheering this man's pain and weakness.

I just wanted to get away, even moreso because of my kids, but we were still being pushed against the wall by the crowd.

And then someone grabbed my arm. There were a lot of people crowded around me, so I tried to shrug them off. But when I turned and looked, it was a Roman guard. He was none too happy that I had pulled away from him, so he grabbed me by my hair and threw me to the ground. I landed right beside the third Criminal. You could tell the size and mood of the crowd really had the Romans on edge. He yelled something at me in a language that I didn't know, but I knew what he wanted.

So, I got to my knees, and lifted the wooden beam off the third criminal. I put it on my back and started walking. It was heavier than I expected. No wonder He fell.

What a crew we were: the other two criminals struggling and stumbling, the guards yelling, the crowd swearing, my two small children walking beside me crying, and the third Criminal barely able to put one foot in front of the other.

We finally got to Golgotha, the guards pushing the crowd back the whole time. They got the three up on their crosses really quickly. It was the first crucifixion I had ever seen. . .

I could tell you about the weird stuff that happened while He was on the cross: the ground shaking, the sky turning dark, and all that. I could tell you about it, but. . . He was who I was looking at.

There was something about Him that just made me look. He was so small. . . so weak. . . so frail. And yet, I couldn't stop staring at Him. In all the chaos, amidst all the confusion, He alone seemed certain of the situation. The guards seemed terrified of a riot. The Pharisees were consumed with hatred. Even the Man's family and friends were lost in their grief. But there was something about this Man.

I went to the cross because I was forced to. But as I stared at this Man on the day of His unspeakable death, I somehow knew that my life would never be the same.

James, Brother of Jesus

I went to the cross filled with anger. I am ashamed to admit this now, but the main reason I was at my brother's crucifixion was to make certain that He died. I know that sounds horrible. But it's true. He had been embarrassing my family for the three years. He had made life dangerous for us. We had been kicked out of the synagogue. The Romans were starting to know who we were. Him being out of the picture was simply necessary for the survival of the family. So, when I went to the cross that day, I was mad at Him, I was glad He was going to be gone, and I was afraid that I was next.

We were in town for the Passover. We knew He was there, too, but had no plans of searching for Him. Then, we got word that He had been arrested and was to be crucified. I begged Mother not to go. I told her that it would be dangerous, but she insisted. She had never really been able to explain to us all of the things about Jesus that she told us later. But she made it very clear that she was going to be there at His death. So, we went.

And somehow, in some way, it just clicked. I don't understand why I never "got it" before that day. I had seen Him perform miracles, but somehow they seemed more like trickery than majesty. Water into wine, the blind given sight, lepers healed, even the dead raised. But this was different.

When we first saw Him, my mother shrieked, and I almost got ill. His back was shredded. I had seen animal sacrifices before, and that was the closest thing I could compare it to. He was reduced to a bloody mass of flesh and gore. Sympathy sure, but still not worship. Then, they hung Him on that cursed tree. And even then my heart didn't budge.

But when the thunder boomed, when the ground shook, and when that sky turned black. . . it scared me, and it hit me. I tell people that the light entered my heart when it left the sky! He was exactly who He had claimed to be. My big brother. We had slept in the same room. We had eaten at the same table. We had worked in the same shop. And I blew it. The countless chances I had: to ask Him to tell me how He shaped the world, what the first dawn was like, what Eve looked like. I just missed it.

They call me "Camel Knees" now because I spend so much time talking to the my Brother, our Lord. But when He was here, I just didn't get it. I blew it!

I went to the cross that day filled with anger and hatred. But I left in wonder and awe.

John the Apostle

I went to the cross out of obligation. Oh, I know, "You're the one disciple who didn't abandon Him!" But the truth is, that's giving me too much credit. Way too much. You wanna know why I was there? I was there to be with Mary. She was like a second Mother to me. She had helped feed us and take care of us for three years. And she insisted on being there. I even tried to talk her out of it. Repeatedly. Loudly. But she wouldn't hear of it. If they were going to kill her Son, she was going to be there. So, I went with her.

The place, Golgotha, is just horrible. It's a garbage heap. Literally. You can't sit down unless you want to sit in something. The stench is terrible. There are flies everywhere. It's just awful. Then, what they do to the people they

are crucifying is unspeakable. And it seemed like they went extra-hard on Jesus. He was beaten black and blue. His face was one big open sore. His back was shredded. He was almost impossible to look at.

And as bad as all that was, as terrible as He was being treated. . . I was there feeling sorry for myself! This Man had been my best friend a day earlier. And I felt lied to, betrayed. He said He was the Messiah, and now this. My heart was breaking.

So, I was there stewing in my self-pity, when I heard Him. "John, your mother." He asked me to take care of His mom. I looked over at James, whose job it should have been, and he was steaming. Then, I looked at Mary, and she looked confused. So, finally I looked up at Jesus. Broken, beaten, bruised Jesus. And what I saw made my heart skip. He was staring at me, and our eyes just locked. Still today, when I close my eyes, that's what I see, His eyes. . . kind of like when you stare at the sun too long.

You see, He wasn't looking at me in the "Help me, I'm dying," kind of way. No, it was more His "You're going to do this for me, soldier" look. The same way He had looked at me when He had sent me into a village or out on a errand. And suddenly, I got it. I realized that He wasn't on the cross because of the strength of the Romans, the hatred of the Jews, or His own weakness. He was there because He chose to be.

I realized this, too: He wanted me to keep on loving. No matter what. No matter the circumstances, no matter the results, no matter what others do. My Lord wants me to keep on loving. That was His last command to me. With one of His final breaths, a breath that was almost impossible for Him to draw, He commanded me, "John, love." I went to the cross out of obligation, but what I learned at the cross was love.

Positioning of retail stores in Central and Eastern European Accession States: Standardization versus adaptation

by Darin W. White and Keith Absher

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Introduction

In May 2004, after 14 years of transitioning from a centrally planned economic system to a market economic system, eight Central and Eastern European (CEE) countries including Poland, Hungary, the Czech Republic, Slovakia, Slovenia, Estonia, Latvia, and Lithuania plus Cyprus and Malta joined the European Union (EU) (Cochran, 2004). When the celebrations died down, business executives began to scramble because this event only accentuated what they had known for a long time, i.e. the CEE countries will be new markets with lots of potential. Fuelled by foreign investment, Gross Domestic Product (GDP) growth in the region has increased at a rapid rate. An excellent example of this is the banking sector. With the exception of Slovenia and Latvia, the banking industry in the new EU countries is dominated by foreign banks. In the Czech Republic, Slovakia, Estonia, and Lithuania, foreign banks now own more than 80 percent of the industry (Parsons, 2004; Staff, 2003).

Enlargement of the EU will create an unprecedented opportunity for retail industry market growth and development. Thus, foreign retailers are expected to be on the heels of the financial industry in moving into the region. A number of the large European retailers have been preparing for the move into the CEE accession states for over a decade. Companies such as Tesco (UK), Kaufland (Germany) and Metro (Germany) (Parsons, 2004; Staff, 2003) are set to transform the face of retailing in this area.

As income levels rise across the region, so do the opportunities for Western companies to provide retail goods and services. The rising purchasing power within the accession countries combined with pent-up demand will naturally lead to a marked increase in sales of consumer goods. Many of the strong retail brands are particularly pleased with the enlargement of the EU and the forecast for increased consumption on the part of accession countries (Yee, 2003). An unprecedented number of retailers are exploring opportunities for internationalizing their operations (Feinberg *et al.*, 1995). In order to protect direct retail investment in these new member states, customer understanding is crucial on the part of retail strategists.

In this paper we seek to empirically examine similarities and differences in the retail store decision criteria between customers in founder member states of the European Union and customers in CEE accession member states. Based on the literature review we theorize that significant differences will exist between these two major customer groups and that retailers would be wise to forego a standardized retail mix in favour of strategies more precisely adapted to individual national markets. The comparisons are made based on 22 key decision criteria in valuing and selecting retail stores. This study should provide further support for the notion that retailing strategies for one country cannot be effectively extended to other countries without adaptation (de Mooij and Hofstede, 2002). It will also yield retail strategists with valuable information to make a more informed decision in transitioning into the CEE accession states.

Literature review

The globalization of retailing has been occurring for many years; however, academic research of international retailing has a relatively short history (Burt *et al.*, 2003; Helfferich *et al.*, 1997). As the internationalization of the retail industry continues to expand, so expands the study of this trend. Much of the research is concerned primarily with describing the scale and motivations for global expansion by retail businesses (Akehurst and Alexander, 1995; Williams, 1992). The portion of international retailing research that is applications oriented and predictive in nature is very limited. The relatively few studies conducted in this vein highlight the need for careful and well-informed strategic planning on the part of retailers before entering new regions.

Following Jain's (1989) call for studies which focused on "gaining insights into the standardization issue", numerous researchers have frequently debated whether a business should pursue an international strategy that is standardized across national markets or adapted to individual national markets (Laroche *et al.*, 2001; Keegan, 2000; Szymanski *et al.*, 1993). According to Shaoming and Cavusgil (2002), proponents of standardization believe that world markets are being

homogenized by changes in transportation and communication technologies. They theorize that, over time, customers on a worldwide scale will migrate towards similar preferences and demand the same products.

More recently, research has begun to warn against an unconditional acceptance of the standardization approach. Indeed, several studies in the international retailing literature have begun to show that retailers can benefit greatly by specifically tailoring the retail mix to local markets within a single country. For instance, de Mooij and Hofstede (2002) found that converging technology and disappearing income differences across countries does not lead to homogeneous consumer behaviour. Culture appears to drive consumer behaviour regardless of other exogenous variable shifts. Thus, retailing success in one country does not translate into success in another country just because of converging demographic and technological shifts (de Mooij and Hofstede, 2002; de Mooij, 2003, 2000).

A strong link between performance and adaptation retail strategies was provided by Beninati *et al.*'s (1997) research which showed that retail store chains can secure customer loyalty and increase profits by implementing local assortment management for each outlet. The approach requires a reorganization of operations and an investment in technology to gather useful data; however, the benefits are considerable. Retailers that span national borders could benefit from such an approach since the differences in product needs and preferences from one country to another would be even greater.

Further evidence supporting an adaptation approach was found when Keillor *et al.* (2004) analyzed the international service industry in eight countries (Australia, China, Germany, India, Morocco, the Netherlands, Sweden, and the USA). They found significant differences in the countries when looking at service quality and its impact on behavioural intentions.

Evans and Movondo (2002) studied the concept of psychic distance and organizational performance in international retailing. The basic premise of this study is that companies perform best in foreign markets most similar to their domestic market (Johanson and Vahlne, 1977; Vahlne and Wiedersheim, 1997; Nordstrom and Vahlne, 1994; Beckerman, 1956; Stottinger and Schlegelmilch, 2000). This negative relationship between psychic distance and organizational performance is attributed to the fact that psychically close countries are easier to learn about and understand (Nordstrom and Vahlne, 1994). The study finds that psychic distance does impact organizational performance negatively in distant markets; however, not in close markets.

Griffin *et al.*'s (2000) study which compared shopping values in the USA and Russia further demonstrates the need for adaptation in international retailing strategy. Their research showed that Russian shoppers reported lower ratings in the utility of their shopping systems, specifically their ability to complete a shopping task satisfactorily. However, when comparing the pleasure they received from shopping, the findings are similar to the USA. They concluded that habitation is more likely to be a factor with pleasure values rather than utilitarian factors.

A study by Feinberg *et al.* (1995) evaluated the prospects of using total quality management (TQM) concepts in international retailing. In this study they evaluated the prospects of how a company must deal with the challenge of delivering and assessing service quality in different cultures. The study is built on the idea that findings from foreign cultures mirror findings in western-developed countries such as the USA and the Netherlands where there is a direct link between service quality, sales, and profits. Understanding how consumers define and experience good and bad service; however, must precede the application of the principles of TQM in an international context. The results of this study clearly show that while there are similarities in how consumers in different countries define service quality, there are also considerable differences, which would require adapting service quality to local tastes. Thus, there is no magic solution or standardization in the delivery of service quality in an international retail setting. Training of employees and delivery of customer service should take into account the unique experiences and histories of the country, the culture, and the marketplace. In setting and assessing quality standards, international retailers should take these differences in quality definitions into account in order to determine the optimum level of service quality.

In an effort to demonstrate the importance of being marketing-oriented when entering emerging markets, Rogers *et al.* (2005) investigated the influence of a Western retailer's market orientation levels on the two markets of Hungary and Slovenia. They examined whether the market orientation-company performance link holds true for retailers in emerging economies, despite environmental differences. Through interviews with top management from Tesco and its subsidiaries and affiliates in Hungary and Slovenia, they found that the market orientation-business performance link is valid for western retailers operating in emerging countries.

In a research study by Bell (2000), the author evaluates retail power. He studies the changes that have occurred in retail power in food retailing in Central Europe and the Baltic Republics. Three of the four sources of retail power, i.e. low switchability, integration, and differentiation are absent in all three countries of Central Europe. The fourth source, size, is relatively absent in Poland and the Czech Republic. Retail power is still low in these central European counties as compared to Western European countries. It is improving with the increase of foreign retailers and will continue to increase; however, it is unlikely to be significant for another decade.

Ackerman and Tellis (2001) examined whether there are differences in consumer shopping behaviour and product prices in grocery stores due to cultural differences. They compared Chinese shoppers with American shoppers on two occasions, each five years apart. The study found that the two cultural groups have dramatically different shopping practices. Chinese use multiple senses when examining unpackaged food, and do so far more than American shoppers.

They also inspect many more items and take much more time to shop. The authors argue that differences in shopping behaviour correspond to clear differences in prices between grocery stores serving the two cultures. Chinese supermarkets have substantially lower prices across a range of products as compared to American supermarkets. These price differences range from 37 percent to 100 percent. The authors propose that differences in culture provide the most probable explanation for the differences in prices between the two types of supermarkets.

Many retailers have depended on low pricing to bring in customers; however, this alone will not be effective in the future. Nearly all retailers have reached low price levels in order to compete. Instead, retailers who will be successful and survive the fierce competition within markets will be those who service their customers better than others. A recent study of the UK retail clothing sector evaluated the impact of personal characteristics of the customer on the approach to buying decisions based on product attribute criteria (Silva *et al.*, 2002). Research indicates that customers' needs should be made a high priority and that the proper product selection of merchandise should be available to customers when they are ready to purchase (Shuster, 1996).

A pilot study by Millar and Restall (1992) measured the beliefs and values of Eastern Europe's embryonic consumers, specifically women 18 to 30 in Eastern Germany, Poland, and Hungary. These women had grown up entirely under the Communist system. Millar and Restall also ran the study in Western Germany, Britain, and France to represent major West European cultures for comparative purposes. They found significant differences with the West and East. They advise that marketers should beware when doing their marketing planning and not assume that the Eastern market is a reflection of Western markets.

The preceding literature review provides evidence that significant differences in retail store decision criteria should exist between EU founding member state customers and CEE accession state customers. The international retailing literature provides a number of salient points for retail managers to consider when extending operations into the CEE states. Based on the literature review we theorize that significant differences will exist between these two major customer groups and that retailers should pursue an adaptation retail mix strategy when entering these new countries. That no research has specifically explored the similarities and differences of CEE accession state customers and the customers of EU founder member states is surprising. In light of the previous literature review, it would be foolish for retail companies to enter the new EU markets without first having a thorough knowledge of customer retail store decision criterion. The next section outlines an exploratory study that was conducted to examine eastern and western EU retail store preferences.

Methodology

Research questions

The primary research questions were defined as follows: Do the preferred attributes in a customer's selection of retail stores differ between the founder member states of the European Union and the CEE accession states? Retail managers must have a clear understanding of the differences and similarities between the two regions if they are going to create successful retail strategies.

The secondary research questions were defined as follows: Can a retailer pursue a standardized retailing mix strategy when entering CEE countries or is it necessary to make significant adaptations to the strategy? What factors differ significantly between the compared western and eastern EU cultural groups? What similarities exist between the compared western and eastern EU cultural groups? What are the salient attributes in selecting retail stores in the CEE accession states? What are the non-salient attributes in selecting retail stories in the CEE accession states?

Data collection and sample frame

The sample consisted of 1,221 individuals (40.8 percent male and 59.2 percent female) between the ages of 18 to 71 who were surveyed regarding their retail shopping habits. The researchers utilized a 22-item survey instrument developed by Swinyard and Rinne (1994) to measure attributes important to customers in the selection of a large, general merchandise retail store. Respondents were asked to rate the importance of key shopping decision criteria on a scale from 1 to 5, where 1 equalled "not at all important" and 5 equalled "extremely important". General merchandise retail stores were selected for study since this retailing segment accounts for a large share of retail sales, and due to its familiarity among both founder member state customers and CEE accession state customers.

Trained marketing researchers collected data via the survey instrument in various locations around Europe using the mall-intercept method (Nowell and Stanley, 1991; Keillor *et al.*, 2004). A number of current, adult university students from various European countries were employed to collect the data over a four-week period. Initially, an English-version survey was created and pre-tested among international students at a major US university, including natives from the regions of Europe to be sampled. After minor improvements, the foreign-language versions of the survey were developed with the translation-back-translation method to ensure that the English and foreign language versions were equivalent (Douglas and Craig, 2000).

Utilizing the mall-intercept approach, a trained interviewer selected a convenience sample of people to participate in the study, with the objective of gathering responses from culturally diverse customers in each location. Resource constraints made it impossible to obtain data from every country within the European Union. Thus, for this exploratory study, the researchers felt it was more important to collect matched samples of country groups rather than weight by proportions of the overall population. The sample design employed was somewhat unusual; however, valid for exploratory purposes.

Researchers collected data from Polish, Hungarian, Czechoslovakian, Slovakian, and Slovenian retail customers to represent the CEE accession state customers. Implementing a similar methodology as Millar and Restall (1992), data was also collected from British, French, Dutch, Belgian, and German customers to represent major Western European cultures for comparative purposes. Using location, observation and language cues, researchers sought at least 75 interviews from respondents in each country, with more completed in some cases.

The purpose of the exploratory study demanded that a representative sample of customers be acquired from the founder member states and CEE accession states. Thus, the previously described convenience sample approach was deemed appropriate. Data was collected at major shopping hubs within large cities to maximize the potential for a more regional sample pool. A total sample size of 821 customers from founder member states, and 400 customers from CEE accession states were combined to form the complete data set.

Analytical procedures

In an initial procedure, the researchers implemented analysis of variance tests (ANOVA) in order to examine the mean differences between founder member state customers and CEE accession state customers on each of the 22 questionnaire items. In a second procedure, the questionnaire responses were factor-analyzed using principal components analysis. Two factor analyses were performed, one for each EU group. A varimax rotation along with the Kaiser normalization (eigenvalue greater than 1.0) was used to extract the factors. In each analysis, five factors were identified that met the criteria for extraction. Finally, the factor results for both EU groups were compared in order to identify commonalities and differences between the two.

Results

Table I displays the results from the ANOVA tests run on the various single-item variables. According to Swinyard and Rinne (1994), the 22 key shopping decision criteria can generally be grouped into eight categories, including pricing, style and quality of clothing, store layout, merchandise assortment, advertising, salespeople, customer service, and location. The highest mean rankings for the founder member state customers related to convenience, with five of the six top decision criteria all involving some aspect of shopping convenience. CEE accession state customers rated style and quality of clothing/merchandise aspects most important. This is particularly interesting given that founder member state customers rated these attributes at the bottom of their decision criteria.

Surprisingly, those attributes related to price were not ranked among the top attributes for the CEE accession state customers. It was theorized that price would be extremely important given the pervasive economic struggles of this customer group. Also of interest was the disparity between the two groups on the store location attribute. Founder member state customers rate store location as their second most important decision criteria; however, CEE accession state customers rate it next to the bottom. The store location was the only dimension where founder member state customers' mean importance was larger than CEE accession state customers

Table I.
Statistics for shopping decision criteria dimensions with EU groups

Key decision criteria attributes	Mean ranking for founder member state customers	Mean ranking for CEE Accession State customers	F	Significance
(1) Has what I want	4.47	4.68	24.34	0.001
(2) Location is convenient	4.41	3.38	289.29	0.0001
(3) Prices are well marked	4.13	4.39	24.14	0.001
(4) Fast check-out, even when busy	4.04	4.44	69.12	0.001
(5) Everyday low prices	3.98	4.47	75.85	0.001
(6) Easy to find merchandise	3.89	4.21	36.18	0.001

Key decision criteria attributes	Mean ranking for founder member state customers	Mean ranking for CEE Accession State customers	F	Significance
(7) Large merchandise selection	3.81	4.42	160.43	0.0001
(8) Sales are real bargains	3.78	4.11	28.52	0.001
(9) Merchandise breadth in all departments	3.77	3.90	5.36	Not significant
(10) High quality merchandise	3.75	4.66	320.27	0.0001
(11) Advertised items are in-stock	3.72	4.18	73.20	0.001
(12) Excellent return policy	3.71	3.81	2.84	Not significant
(13) Neat and clean environment	3.69	4.20	81.88	0.001
(14) Advertisements offer good savings	3.51	3.55	0.404	Not significant
(15) Available and helpful staff members	3.50	3.73	14.02	0.01
(16) Friendly staff members	3.46	4.30	183.49	0.001
(17) Store is aesthetically pleasing	3.46	3.52	0.98	Not significant
(18) Find what I want on sale	3.31	4.10	153.03	0.001
(19) Has clothing styles I like	3.08	4.57	576.79	0.0001
(20) Has high quality clothing	3.05	4.76	815.82	0.0001
(21) Has frequent advertising	3.00	3.37	28.29	0.001
(22) Has latest style clothing	2.97	3.95	194.33	0.0001

Table I identifies 18 shopping decision criteria where statistically significant differences exist between the two EU groups. Higher means for CEE accession state customers for 21 of the 22 survey items show that CEE accession state customers clearly view most of the attributes as being more important than founder member state customers do. These results answer our primary research question by demonstrating that there are significant differences between these two EU groups in terms of how appealing shopping decision criteria are to them when choosing a general merchandise store at which to shop.

Factor analysis

In order to provide a more rigorous analysis and comparison of the shopping decision criterion between the two EU groups, a factor analysis was conducted. The results of the factor analysis of the 22 items, along with the factor loadings for the founder member state customers, are presented in Table II. Similar results for the CEE accession state customers are presented in Table III.

Table II.
Factor loadings for founder member state customers

Key decision criteria attributes	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Has what I want	0.041	20.085	20.039	0.051	0.759
Excellent return policy	0.134	0.298	20.100	0.691	0.113
Large merchandise selection	0.174	0.051	0.154	0.676	20.123
Location is convenient	20.076	20.095	0.184	20.034	0.715
Easy to find merchandise	20.008	20.014	0.344	0.589	0.216
Neat and clean environment	0.118	0.206	0.153	0.654	20.005
Everyday low prices	0.146	20.129	0.571	0.284	0.144
Prices are well marked	20.128	0.168	0.011	0.049	0.682
Fast check 2 out, even when busy	20.117	20.003	0.612	0.140	0.256
Merchandise breadth in all departments	0.047	0.256	0.576	0.239	20.065

Key decision criteria attributes	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
High quality merchandise	0.100	0.355	0.499	0.174	20.158
Friendly staff members	0.137	0.603	0.180	0.234	0.027
Sales are real bargains	0.203	0.269	0.633	20.070	0.035
Advertised items are in 2 stock	0.242	0.491	0.415	0.046	0.018
Available and helpful staff members	0.174	0.750	0.148	0.098	20.105
Store is aesthetically pleasing	0.156	0.720	0.003	0.166	0.022
Advertisements offer good savings	0.249	0.370	0.180	0.312	0.172
Find what I want on sale	0.618	0.137	0.324	0.160	20.092
Has clothing styles I like	0.812	0.193	0.045	0.130	20.163
Has high quality clothing	0.819	0.151	0.072	0.131	20.054
Has frequent advertising	0.473	0.340	20.044	0.108	0.305
Has latest style clothing	0.838	0.123	0.032	0.121	20.048
Eigenvalue	5.508	2.340	1.530	1.264	1.225
Percent of variance explained	13.7	11.3	10.3	9.9	8.7

Table III.
Factor loadings for CEE accession state customers

Key decision criteria attributes	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Has what I want	0.096	0.100	20.041	0.021	0.656
Excellent return policy	20.174	0.302	0.519	20.236	0.005
Large merchandise selection	0.087	0.173	20.055	0.347	0.495
Location is convenient	0.416	0.102	20.131	0.631	0.014
Easy to find merchandise	0.256	0.229	0.077	0.553	0.249
Neat and clean environment	0.216	0.098	0.059	0.807	0.112
Everyday low prices	20.262	0.021	0.789	0.044	20.124
Prices are well marked	0.127	0.649	0.140	20.056	0.205
Fast check 2 out, even when busy	0.149	0.530	20.032	0.371	0.289
Merchandise breadth in all departments	0.502	0.114	20.152	0.435	0.353
High quality merchandise	0.063	0.097	20.023	0.560	0.455
Friendly staff members	20.073	0.707	20.062	0.437	0.008
Sales are real bargains	0.004	0.025	0.851	0.055	20.097
Advertised items are in stock	0.416	0.310	0.207	20.044	0.296
Available and helpful staff members	0.269	0.651	0.007	0.070	0.004
Store is aesthetically pleasing	0.670	0.046	20.203	0.282	0.299
Advertisements offer good savings	0.707	0.214	20.018	0.286	0.002
Find what I want on sale	0.155	20.085	0.799	0.014	0.132
Has clothing styles I like	0.322	0.024	0.082	0.083	0.660
Has high quality clothing	0.511	0.218	20.139	0.350	0.207
Has frequent advertising	0.758	0.272	20.112	0.217	0.003
Has latest style clothing	0.710	0.101	20.031	0.133	0.346
Eigenvalue	6.192	2.513	1.541	1.291	1.169
Percent of variance explained	15.6	12.5	11.1	9.6	9.0

An examination of factor 1 revealed basic similarities for both EU groups on attributes dealing with the following issues: "has latest clothing style", "has high quality clothing", and "has the clothing styles I like". Thus, factor 1 is labelled "quality and style of clothing". Additional attributes associated with factor 1 by each of the two EU groups were noted.

Only one additional attribute was associated with factor 1 for founder member state customers, "find what I want on sale". This indicates that founder member state customers desire retailers to provide stylish, high quality clothing at a good price. Three additional attributes were associated with factor 1 for CEE accession state customers, all related to information and presentation. CEE accession state customers favour retail establishments that inform customers regarding the quality, style, and value of clothing they carry and display it effectively within the store.

Factor 2 was related to the following survey items: "available and helpful staff members" and "friendly staff members". This factor was labelled "customer service". Founder member state customers identified "the aesthetics of the store" with the two customer service items. Thus, founder member state customers' expectations of service increase proportionally in relation to the perceived quality of the retail environment. Two additional attributes were associated with factor 2 for CEE accession state customers, "fast check-out even when busy" and "prices are well marked". Thus, a more appropriate label for factor 2 for this group might be "convenient customer service."

The core attributes of factor 3 were: "everyday low prices" and "sales are real bargains". Thus, factor 3 is labelled "bargain hunting." Additional attributes associated with factor 3 were discovered for each group. Two additional attributes were correlated with factor 3 for founder member state customers, dealing with selection and convenience. Thus, founder member state customers seem to desire hassle-free bargain hunting with plenty of selection. The two additional items associated with factor 3 for the CEE accession state customers indicate that they want to have the ability to purchase merchandise which they perceived to be priced "low" and have the ability to return it later if they so desire.

Factor 4, labelled "convenience in the shopping process", was associated with attributes that reflect easy to find merchandise in a neat, clean environment. Founder member state customers desired a large selection of merchandise and liberal return policies while not sacrificing convenience in their manner of shopping. CEE accession state customers reported no additional attributes associated with factor 4.

The key attribute of the final factor relates to retailers' ability to develop product mixes that meet the needs of their customer bases. It is clear from the ANOVA analysis presented earlier that this is the single most important factor for retailer success with both EU customer groups. Founder member state customers indicate that an accurate product mix alone is not sufficient to satisfy them. They demand retailers not only have the right product, but also at the right place and at the right time. With the inclusion of the item "has clothing styles I like" on this final factor, it is clear that CEE accession state customers put a premium on a retailer having an accurate clothing product mix. By reflecting on what we learned in the first analysis, we ascertain that a general merchandise store that wishes to be successful in the CEE accession states absolutely must have a clear understanding of the precise clothing desires of its target audience.

Discussion

The CEE accession state customers rated "style and quality of clothing/merchandise" as the most important variable in their selection of a retail store. This was an unexpected finding on the part of the researchers; however, exploration of other research uncovered a study by Colavita and Kaiser (2003) that may help explain the results. That study identified Russian women as being very conscious of style and quality of clothing/merchandise. Estimates from the European Fashion and Textile Export Council indicated that Russian women were one of the biggest evolving consumer markets for high-end fashion and accessories. These customers were also found to be very label-conscious. There may be some similarities between the Russian women and the women of the CEE accession states. These similarities could be a factor of psychic distance (Evans and Mavondo, 2002) or the past political connections between Russia and the CEE accession states. In either case, this lends credibility to the findings of this study.

There are also some indications that consumers in emerging countries get some symbolic value from foreign products (Zhou and Hui, 2003). This could be an explanation for the CEE accession states preferences for style and quality of clothing and merchandise. Typically, highly visible items are chosen to be "status symbols" of wealth, sophistication, or success. Therefore, as emerging countries, the symbols of fashion and high quality could be perceived as being very important. East Germany could perhaps be used as a laboratory to test this hypothesis. It was thrown directly into the European Union and provides us with a preview of customer expectations by newcomers into the EU. The East Germans were found to generally have a "desire to own and buy Western goods and luxury items" (Millar and Restall, 1992).

There are several factors to consider regarding why more "value for the dollar" variables were not ranked among the top attributes in the shopping criteria for the respondents from the CEE Accession States. A number of studies point to an increase in wealth in the CEE accession states. According to Verburg (2004), between now and 2010, the CEE accession states are expected to experience strong *GDP* growth rates ranging from 3.5 percent to 4 percent. By contrast, the founder member states of the EU are only projected to grow by 2.5 percent per annum. These forecasts for growth in the GDP of the CEE accession states provide an optimistic view regarding future disposable income. With increases in jobs and household income in the CEE accession states, individuals may not be feeling the need to be conservative when it comes to price.

The only "value for the dollar" item to be ranked in the top five for CEE accession state customers was "everyday low

prices." It is possible that consumers from this part of the EU have already been exposed to enough competition to be aware of price concessions on the part of retailers to gain or keep market share. With the influx of new companies coming into the region, particularly the large super stores from the USA, Great Britain, and Germany, retailers are forced to be price-oriented in order to survive. Advertising by companies like Wal-Mart and Tesco reminds these consumers that they should expect "low prices", so in a sense they have been "conditioned" to view "everyday low prices" as an important consideration in their shopping decisions.

Store location was a much more important criterion in retail store selection for the EU founder member states than it was for the CEE accession states. Store location has been a political issue in Western Europe for some time, with restrictions being placed on off-centre retailing by governments in the region (Guy, 1998). This may be a top-of-mind issue for Western European consumers, causing it to have a higher level of importance in this study. It is also possible that the more developed countries in the EU have come to expect convenient store locations due to the rapidly increasing number of stores opening in every neighbourhood.

Perhaps the most interesting finding from our study was that the CEE accession states rated the importance of 21 of the 22 attributes higher, and 17 of the 22 attributes significantly higher, than the respondents from the FMS-EU. Perhaps the high level of significance placed on these attributes by the CEE accession states is a function of shopping enjoyment. Griffin *et al.* (2000) found that there was no significant difference in the level of shopping enjoyment placed on shoppers from a developing economy (Russia) than there was from a developed economy (USA). Therefore, we should not expect the levels of significance for the retail attributes to be lower for the CEE accession states than they are for the FMS-EU.

Having a store where "location is convenient" was ranked significantly higher by the FMS-EU than the CEE accession states, who ranked this attribute next to the lowest in their responses. A possible explanation for the low ranking by the accession states is that the limited retail stores in their region have made them more accustomed to giving up convenience. They do not have the same high expectations about having a variety of retail choices within a close proximity of their home.

It appears that in the absence of competition, which would bring about lower prices and more locations, individuals from the CEE accession states focus on other attributes such as quality and selection. The top three ranking attributes include, in order of importance: "has high quality clothing", "has what I want", and "high quality merchandise". The focus of CEE accession states on quality and selection could be a function of frustration of the utilitarian factors of shopping in developing economies. Griffin *et al.* (2000) found that shoppers in developing economies like Russia were more likely to be dissatisfied with their ability to be able to complete their shopping tasks with appropriate products. This provides a plausible explanation for the CEE accession states' focus on "high quality clothing", "has what I want", and "high quality merchandise".

The members of the CEE accession states have been consuming media from Western Europe for many years and have learned a lot about Western European goods and retailing. We can theorize that CEE accession states may have built unrealistic expectations regarding the expansion of Western retailers in their region; perhaps viewing it as a panacea for achieving both economic growth and competitive retail markets. These high expectations might be difficult to meet and maintain by most retail managers, making it imperative for successful retailers in the CEE accession states to focus on the more salient attributes desired by consumers when making shopping decisions.

Conclusions

Many business leaders and researchers have argued that converging government policies, technology and disappearing income differences in the EU would result in homogenized consumer behaviour. If this were the case, a strategy predicated on the standardization of product offerings, price, promotional mix, and channel structure would be recommended. However, the vast majority of international retailing research has concluded that standardization of the retail mix across various countries is problematic. Indeed, it now appears that the manifestation of strong cultural values is increasing and thus driving consumer behaviour in many countries (de Mooij and Hofstede, 2002).

The findings of the current study certainly support the notion that national culture plays a major role in impacting the consumer behaviour in CEE accession states. Our results lead us to conclude that retailers should pursue country-adapted strategies when entering the new CEE accession states. A standardized retailing mix which has been successful in Western EU countries cannot be extended to the new countries without significant adaptation.

The managerial implications of this research are quite evident. It is very apparent that marketers must thoroughly evaluate new target markets, especially when they are distant and unfamiliar. This is demonstrated by the fact that CEE accession state customers view retailing substantially different than founder member state customers in all but four of the 22 retail decision criteria in our study.

The CEE accession states shoppers in this study rated the importance of 21 of the 22 attributes higher, and 17 of

the 22 attributes significantly higher, than the respondents from the FMS-EU. The high importance of these attributes means that marketing managers should not move into the CEE accession states with the belief that they will be able to have successful retail stores with less attributes than they offer in their stores in developed economies. The CEE shoppers have very high expectations on what they expect from a retail store. Their expectations appear to be significantly higher on more attributes than the FMS-EU.

Given the complex nature of international retail research, it is important that potential limitations of this study be noted in order to place its implications in an appropriate light. First, because of the convenience nature of the mall-intercept data-collection method that was utilized, samples were not entirely representative of the two EU groups researchers sought to understand through this study. Future research that examines these two groups might want to employee a more stratified sampling approach across all the countries. Other limitations that may provide fertile ground for future studies include specific explorations of the retail decision criteria with more complex measurement scales, which tap each sub construct more thoroughly. Another avenue to pursue would be the role of gender, age, and other demographic variables in CEE accession state customer preferences.

Understanding CEE accession state customers is a significant field of interest for academicians and practitioners alike. Clearly, marketers are faced with a daunting challenge as the European Union continues to expand and becomes the world's largest single market for trade. There are complex strategic issues that must be properly addressed with a move into these new markets. Findings from this and similar studies may contribute information to assist both retail strategists and general marketers as they consider an expansion into central and eastern portions of the European Union.

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The Impact of Perceived Leader Integrity on Subordinates in a Work Team Environment

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Introduction

Over the past decade, the ethical practices of corporations have received increased attention. Through mass media, the public has consistently learned about the far-reaching effects of corporate scandal in organizations like Enron, Adelphia Communications, WorldCom, and Tyco International (cf. Merritt, 2004). Increased public awareness of corporate fraud has resulted in an outcry for stiffer penalties and greater responsibility from business leaders (Carter and Borrus, 2005). Due to consumers' concerns related to these dishonorable practices, the study of corrupt behavior in organizations remains an area of great interest among academic researchers (Loe et al., 2000). Associated with much of the differences in the observed unethical behavior among corporations is the integrity of the organization's leaders, both at the upper management level and at the lower work team level (Sims and Brinkmann, 2002). It is our contention that, irrespective of the level at which work is done, the ethical atmosphere that a leader sets has a major impact on the ethical behavior of his or her followers. Specifically, the moral reputation of an organization may be influenced at many levels by its work team leaders. As the use of teams has grown and become one of the most influential and far-reaching trends to shape the business world, the ethical influence of team leaders has increased respectively.

The term "team" refers to a working unit composed of more than two members, with at least one being a leader. Team members stress interdependence and cooperation with each other, pursue common goals, and take responsibility for the success or failure of the work (Jessup, 1990; Katzenbach and Smith, 1993; Lewis, 1993). Teamwork has become the basic working arrangement of most enterprises (Drucker, 1998). Approximately 68% of the 1,000 largest U.S. companies have adopted the system of teamwork design (Lawler et al., 1995). Teamwork design offers numerous benefits, such as the improvement of performance, productivity, cost reduction, and employee satisfaction (Cohen et al., 1996). One of the essential components of projectrelated teamwork is the team's leadership. The leadership of a team impacts everything from the successful accomplishment of team goals to various behavioral determinants of team members (George and Bettenhausen, 1990).

To be most effective, leaders should be perceived by followers as displaying a level of integrity consistent with followers' expectations and implicit leadership theories (Craig and Gustafson, 1998). According to Cheng (2000) and Shea (2000), a leader's fairness in giving rewards and punishments has a positive impact on organizational commitment, team effectiveness, and team and organizational performance. Research has also shown that an individual's ethical definitions are learned through socialization and are acquired from peers and managers (Zey-Ferrell et al., 1979). Thus, any explanation of unethical behavior must take into account that individuals do not learn values from "society" but rather from members of their immediate social networks such as leaders of their work teams. Few studies have looked at how members learn values from their work teams.

Previous approaches to the study of ethical decision-making processes in organizations tend to address either the individual role or the situational variables resulting in unethical behavior. Further, there is little empirical or theoretical research on developmental aspects of employee ethical decision-making in a team environment, and our knowledge of how employee behavior is influenced by a team leader is limited. The present study is unique in that it extends the business ethics literature by examining the important interaction between a team leader and the team members. Specifically, we evaluate the degree to which a team leader affects team members' ethical intentions in an organizational setting. By seeking to understand the degree to which employees' perceptions of their team leader influence their individual ethical decision-making, we seek to enrich our knowledge of how employee ethical behavior is developed.

In the following sections, we discuss some of the factors that may account for the impact of perceived leader integrity in a team-management environment and outline the hypotheses tested in this study.

Literature review and hypothesis development

Over the last decade, virtually all organizations, from production to commercial retailing to customer service firms, have begun utilizing the work team structure to some degree within their operations. Due to this, the work team has emerged as a key business concept, and unified team performance is now regarded as crucial to corporate success (Wil-

liams, 2002). With this newfound influence on team performance and unity, one might hope that ethical behavior within corporations would improve since increased accountability is inherent in team environments. However, based on the constant stream of corporate scandal stories saturating our media, this obviously is not the case.

Kohlberg's model suggests that individuals define what is ethically appropriate based on the expectations of good behavior by others within their circle of influence. Other scholars have suggested that the intentions of individuals who do not believe in universal moral rules are influenced by referent others (Peterson, 2004), such as their organizational team leaders. While researchers have questioned exactly how much leaders influence the ethical attitudes of their subordinates (Minkes et al., 1999), most propose that the authority and power bestowed on leaders in organizations provide them with the means of setting the tone and ethical atmosphere of the organization (Trevino, 1986). Results from Peterson's (2002) study clearly demonstrated that deviant workplace behavior could be partially predicted from the ethical climate of an organization. Similarly, Schminke et al. (2005) found results indicating that the correlation between leader moral development and ethical climate is moderated by the degree to which the leader uses his or her moral development as well as by the age of the organization. They further found that the leader's moral development and the consistency between the leader's moral development and actions interacted to affect ethical climate. Team leaders influence their organizational environment through their management techniques and their leadership abilities; organizing assignments, tracking progress, and rewarding performance are all under the control of the work team leader (Thamhain, 2004). It is through this control that team leaders define the environment through their own actions and, thus, build either a favorable, highly moral, team-friendly environment, or one based on selfish, unethical actions designed to achieve individual goals, even in the face of conflicting team or organizational goals.

Numerous scholars have contributed to the development of the ethical leadership literature. Vitell and Davis (1990) found strong positive correlations D. W. White and E. Lean between employee perception of the manager's integrity and employee job satisfaction in a study that linked perceptions of leader ethics with subordinate outcomes. In their 2003 paper, VanSandt and Neck examined the possible causes of ethical gaps between the worker's sense of right and wrong and the organization's ethical code. The findings of Weeks et al. (2004) suggest that the ethical climate of an organization has either a direct or indirect effect on its sales force. Trevino and Brown (2004) recommended that the ethical conduct be managed proactively via explicit ethical leadership and conscious management of the organization's ethical culture. One implication from Forte's (2004) study on moral reasoning was that managers or executive level employees should keep in mind that gender and the industry experience of a new employee might have an impact on his or her moral reasoning. Sunderland's theory of differential association states that whether or not the learning process results in unethical behavior is contingent upon the ratio of contacts with unethical patterns to ethical patterns. Ferrell and Gresham (1985) proposed referent others as a determinant of whether an individual's behavior is ethical. Although both peers and managers fit the role of referent others, managers have been deemed more influential due to their greater authority (Baumhart, 1961; Brenner and Molander, 1977; Hunt et al., 1984). Similarly, Zey-Ferrell et al. (1979) found that while an employee may hold a fairly high standard of ethics individually, he or she may still adapt his or her moral behavior to imitate that of the primary group and/or that group's leader. In addition, association with co-workers who participate in and condone unethical behavior, as well as the opportunity to be involved in such behavior, are thought to be major predictors of an individual's behavior.

A highly cited survey from *Harvard Business Review* (Baumhart, 1961), updated by Brenner and Molander (1977) and Vitell et al. (2000), found that between the years 1960 and 2000, respondents became significantly more skeptical regarding the ethical conduct of their co-workers. Four-fifths of those surveyed by Brenner and Molander (1977) agreed that business managers should try to live up to absolute ethical standards, and most felt that sound ethics is good business. Approximately one-half of the respondents, however, reported that supervisors rarely if ever apply these ethical standards of good business. Vitell et al. (2000) found that most employees believe that the ethical behavior of corporate leadership has the most impact on decisions in ethical situations. Respondents offered explanations for the decline in ethical standards as being management's preoccupation with increased profit, lack of reinforcement of ethical behavior, competition, and a sense that only "results" are important.

Several authors have shown a positive relationship between different dimensions of leadership and citizenship-type behavior. Farh et al. (1990) reported that, beyond the variance explained by satisfaction, leader fairness accounted for 9% of variance in altruism among individuals. Williams et al. (2002) reported that leader fairness was associated with subordinate intentions to engage in organizational citizenship behavior. Different types of leadership have also been found to be positively related to citizenship-type behaviors (Pearce and Herbik, 2004). One method of categorizing ethical issues is to classify them according to those directly affected by the unethical behavior itself. Soutar et al. (1994) reported that most unethical behavior in business environments involve acts that adversely affect one of three entities: the organization, co-workers, or the customers. In addition, Vitell et al. (2000) found that respondents held differing ethical responsibility levels for these same three entities. Although managers have begun increasing their ethical awareness and, in turn, making more ethical decisions, Premeaux (2004) reported that this is mainly due to managers' risk aversion.

In the current study, we theorize that three internal entities would be impacted by potential unethical behavior that occurs within a work team environment: work team members, the team as a cohesive unit, and the organization as a whole. Our reasoning for choosing these three entities is outlined below.

Teammates

Why unethical activity is common in some companies but not in others has been a highly debated topic among researchers (Sims and Brinkmann, 2002). The unethical behaviors found in these organizations could be from many sources: poor The Impact of Perceived Leader Integrity on Subordinates hiring practices, societal ethical shifts, unclear goals, etc. Numerous studies (Deluga, 1995; Schnake et al., 1993; Wayne and Green, 1993) have shown corporate leadership to be strongly associated with employee behavior at the individual level. Researchers have speculated that the integrity of leaders may be the primary driving influence on subordinates' behaviors with regard to ethical issues involving other individuals. Based on this theory, managers develop into role models and, thus, are responsible for establishing the norms for how other individuals, such as teammates, are to be treated (Paine, 1997; Sims and Brinkmann, 2002).

When team members perceive that their leader has low integrity the atmosphere within the team will become one of independent gain as opposed to unity and progress. In this environment, we propose that team members will be more willing to engage in unethical behaviors regardless of the negative outcomes to their teammates. Similarly, if a team leader is perceived as having high integrity, his or her subordinate team members will be less willing to behave in a manner that would hurt individual team members. Following this reasoning, we posit:

Hypothesis 1 As perceptions of team leader integrity increase, team members' intentions to engage in unethical activity adversely affecting other team members will decrease.

The team as a cohesive unit

A work team's success on a project depends to a large degree on effective interactions among the team members responsible for the project. If team members have positive emotional attachments to the team and its leaders, it seems likely that they would engage in behaviors that would be beneficial to the team (Pearce and Herbik, 2004). Conversely, if the situational environment is such that the emotional attachments to the team are negative or very weak due to poor or unethical leadership practices, it is more likely that individuals would engage in behaviors harmful to the team.

As previously mentioned, Williams et al. (2002) found that leader fairness was associated with subordinate intentions to engage in organizational citizenship behavior. Team citizenship behavior is defined as encompassing the following behaviors: altruism, civic virtue, conscientiousness, courtesy, teamwork, and team mindedness (Pearce and Herbik, 2004). If the team leader exhibits unfair and unethical behaviors, subordinates will, we theorize, be less likely to engage in team citizenship behaviors such as civic virtue, courtesy, teamwork, and team mindedness.

Based upon this line of reasoning, we propose that the leader, through his or her own unethical behavior and the resulting harmful environment, will reduce the level of personal attachment between the individual and the team as a cohesive unit. This will result in individual team members being more likely to engage in activities having adverse outcomes to their team. If however, the manager engages in behaviors that create positive subordinate perceptions of his or her integrity, these subordinates will be less likely to engage in behaviors that would have a negative impact on the team. Accordingly, we propose:

Hypothesis 2 As perceptions of team leader integrity increase, team members' intentions to engage in unethical behavior adversely affecting the team as a whole will decrease.

The organization

Many key functions within organizations exist in teams of individuals. Both Hunt and Vitell (1986) and Trevino (1986) speculated that organizational norms are a determinant of ethical or unethical behavior. Stated differently, organizational norms identify what is and what is not appropriate behavior, thus determining the ethical environment of the organization itself. Theorists assert that leaders have the ability to establish and communicate these organizational norms as well as to offer rewards and impose sanctions in order to ensure compliance with these norms (Paine, 1997; Sims, 2000; Sims and Brinkmann, 2002).

The social exchange theory (Settoon et al., 1996; Wayne et al., 1997) suggests that when team members perceive that they are being treated ethically, they will feel an obligation to reciprocate this positive behavior to the organization. Therefore, if D. W. White and E. Lean the leader, who is perceived as an agent of the organization, creates an

atmosphere of trust and loyalty through positive, personal integrity, the team member will replicate the leader's behavior by not acting in ways that would cause harm to or create negative attention for the organization. Conversely, a team leader that is perceived as having poor integrity implicitly communicates that the organization approves of an unethical environment. In this situation, it is likely that team members will take no heed of whether their actions cause adverse affects to the organization. Therefore, we posit the following:

Hypothesis 3 As perceptions of team leader integrity increase, team members' intentions to engage in unethical behavior adversely affecting the organization that the team is a part of will decrease.

Research design and methodology

Pretest

A self-report survey was used for the current study. A pretest was conducted with 41 undergraduate college students to assure that respondents would properly interpret the wording in the various scenarios and items. Based on their feedback a few slight revisions were made to the instrument. At this point, the survey instrument was deemed ready to be administered to the chosen sample frame.

Sample frame

The questionnaires were administered to MBA students from two southeastern universities over several months. The students completed the survey instrument in class when they were within 2 months of finishing the MBA program or via e-mail sometime after they had completed the program. Each student had been part of a work team that consisted of the same five to seven individuals for two consecutive years. The teams had met twice per week during the entire program to work together on projects, cases, and papers. Each team had a leader who was responsible for scheduling meetings, developing agendas, and keeping the team on track. These teams were designed by the MBA director to closely reflect work teams in real organizations.

During the 8 weeks leading up to the time when the students completed the survey instrument, the teams were engaged in an intensive business simulation game. Teams were required to function in an environment very similar to that of the real business world with extreme workloads, pressures, and responsibilities. Course participants were expected to allocate at least 8 h per week to outside-of-class activities during which time they would meet with their MBA work teams to make informed, strategic business decisions for their companies. The competitive nature of the simulation game, the feedback that it provided, and the wide open challenge it presented the students were the primary driving forces that determined the extent of their efforts. Thus, extreme pressure existed within each team for each member to pull his or her own weight. Due to the required workload, it was virtually impossible for a team to be successful unless everyone in the group significantly participated. Team leaders were given complete control of their groups with both reward power and the authority to fire poor performing members. At the end of the 8 weeks, team leaders were responsible for determining grade assignments for each member of the team based on individual and team performance measures. Team members who received a "C" or lower or were fired had to repeat the class. Insights into the culture of the class are perhaps best provided by the following quotations, which have been taken from course evaluations of previous course participants:

> This is the real world, fraught with real world workloads, satisfactions, and frustrations. A course offering a lot of fun but little sleep... the most challenging course I've taken.

> I found the job interviewers were fascinated, by the way, with the kinds of problems we were asked to solve – especially the organizational problems. What do you do with the free loader? How do you handle the good friend who tries hard but really doesn't perform? The study group is the most real world thing you will do here.

The scenarios

A total of 12 scenarios were written to be directly relevant to the MBA work team groups. The ethical dilemmas involved realistic situations that a MBA The Impact of Perceived Leader Integrity on Subordinates work team might potentially face while in the program. In two of the scenarios, the respondents were required to project their MBA work team group into a different environment.

There were four scenarios that involved acts impacting other team members. These scenarios described a hypothetical teammate who either engaged in financial misconduct; went into the team leader's office when they were not there, opened a file marked "private" and read damaging information about teammates (Conger et al., 1995); violated the team charter in a way that impacted other team members; or pretended to be sick resulting in more work for other team members (Zey-Ferrell and Ferrell, 1982).

Four scenarios involved actions negatively impacting the team as a whole. These four scenarios described a team member who abruptly resigned without advance notice (Abratt and Penman, 2002); a team member who used group equipment without obtaining approval from the team leader (Zey-Ferrell and Ferrell, 1982); a team member who took a trip and then lied on the reimbursement documentation, thus leaving the team less budget money for the year (Zey-Ferrell and Ferrell, 1982); and a team member who decided to lie to an external party, thus negatively impacting the team.

The remaining four scenarios involved acts affecting an organization of which the team is a part. These scenarios described a team member who frequently made derogatory comments about the organization to friends and acquaintances (Peterson, 2004); a team member who drove away potential customers from the organization through unsavory conduct; a team member who falsely reported information to a regulatory agency, resulting in potential negative consequences for the organization; and a team member who hired an employee with a reputation of poor integrity, resulting in negative media coverage for the organization.

The ordering of the 12 scenarios on the survey instrument was random. Following Peterson's (2004) example, three questions followed each scenario to access (1) the extent to which society in general is perceived to agree that the act in question was morally repugnant; (2) the degree of damage caused by the act; and (3) the behavioral intentions of the respondent ("I might take the same action" as the individual in the scenario). As a result of the pretest, a few of the scenarios were slightly changed to ensure respondents would view the acts as "causing damage" and "morally wrong." Each of the questions was answered using a Likert scale (1 = strongly agree and 7 = strongly disagree). For each participant, three average behavioral intention scores were calculated relating to intended ethical behavior in teammate situations, team situations, and organizational situations. Higher values indicated lower intentions to engage in unethical behavior.

Additional measures

In addition to the scenarios and various demographic questions, the survey instrument included two wellestablished, highly reliable and valid measurement scales: Craig and Gustafson's (1998) 31-item perceived leader integrity scale (PLIS) and Andrews and Meyer's (2003) MC Form C social desirability scale (MCSD) originally developed by Crowne and Marlowe (1960). According to Reynolds (1982), the shortened version of the MCSD is comparable to the full version with only a slight reduction in internal consistency. For both scales, a seven point, strongly agree/strongly disagree, Likert scale was used, and responses were averaged across all items to create a mean value for each participant. Higher values indicate higher perceived leader integrity and a higher social desirability response bias (SDRB). To minimize the effect of common rater bias, we undertook numerous precautions.

On the survey instrument, we strongly assured participants of the anonymity of their responses, promised them that no identifying marks were on the survey, assured them that there was no right or wrong answer, and encouraged them to be honest with their responses. According to Podsakoff et al. (2003) these procedures can greatly reduce or even eliminate common rater effects. Second, we included the MCSD scale on our survey instrument and utilized it to control for SDRB. Social desirability response bias is the tendency of respondents to answer questions in the perceived socially acceptable way rather than with their true feelings. It is one of the most prevalent common rater effects impacting ethics research. To determine if SDRB was a problem, we utilized a Harman's one-factor test as well as a partial correlation procedure D. W. White and E. Lean described below. Finally, we physically distanced the MBA work team leaders from the respondents by asking them to leave the room while the survey was being completed. According to Scott (1982), this procedure has been shown to reduce social desirability bias in some situations. Respondents who completed the survey instrument via e-mail were assumed to be in a similar condition. Indeed, Booth- Kewley et al. (1992) found no SDRB difference between computer-administered and paper and pencil modes when precautions were taken with the face-to-face group.

Analysis and results

Demographics and response rate

About 249 MBA students completed the survey over the course of several months. A final sample of 245 was established after rejecting four unusable, partially completed responses. Of the respondents, 58.8% were male and 41.2% were female. The average age was 24 with a standard deviation of 2.41. Ages ranged from 21 years to 34 years old. The majority of the respondents (96%) was from the United States and was currently employed on a full-time basis (93%). The primary industries of employment included healthcare, manufacturing, services, sales, transportation, and consumer

products. The total sample frame for the in-class condition was 174, of which 169 provided us with completed usable surveys (one was incomplete and four declined to participate). This resulted in a response rate of 97.1%. Team leaders were asked to leave the class (before we announced what was going to happen) and were not included in the sample. This was done to ensure honest responses and to guard against potential unwanted leader influence regarding the leader integrity scale.

The total sample frame for the e-mail condition was 138, of which 76 provided us with completed usable surveys (three were incomplete). A total of three e-mails were sent out to each respondent over the course of 10 days. This resulted in a response rate of 55.1%. The excellent response rate was due in part to a strong relationship with the professor, high levels of involvement in the simulation course, and a general interest in the topic.

To test for possible difference between the two conditions, the 169 questionnaires received from the in-class respondents were compared to the 76 questionnaires received from the e-mail respondents. A total of 11 separate t-tests were conducted to compare the mean values of every scale for the two conditions. The 11 scales included three average behavioral intention scores for teammate, team, and organizational situations, three agreement with society scores, three degree of damage caused scores, perceived leader integrity scores, and the social desirability scores. None of the constructs were different between the two groups at the $p < 0.05$ level.

Scale reliabilities

The general psychometric characteristics of the constructs used to evaluate the hypothesized relationships are described in this section. For the 12 ethical scenario scales, we followed a traditional scale development procedure. The first step was to investigate the internal consistency of the construct items by calculating a Cronbach's alpha. The next step involved an analysis of the correlation matrix and the item-to-total correlations. This was done to identify potential scale contaminants. Items with low item-to-total correlations (below 0.3) were deleted from the scales as the low correlations suggested that the items might not fit the construct or might tap into another dimension of the construct (Churchill, 1979). The third step involved an analysis of the factor structure of each scale by carrying out a principal component analysis. An eigenvalue of one was used as a criterion for creating the dimensions (cf. Green, 1978; Hair et al., 1992). Emergence of a single factor indicates the unidimensionality of a scale (Churchill, 1979). Items that loaded on more than one factor were deleted. After all split loading items were deleted, a final principal components factor analysis was conducted to assure scale unidimensionality. Items with communality of 0.4 or greater remained in the factor solution (cf. Green, 1978). The final step was to calculate a concluding Cronbach's alpha. Ideally, the coefficient alpha for a purified scale should exceed 0.7 (Nunnally, 1978).

For the ethical scenarios, we utilized the behavioral intention of the respondent question for scaling purposes. In the literature review section, it was The Impact of Perceived Leader Integrity on Subordinates predicted that a three-factor solution would result. We theorized that respondents would view situations involving teammates, the team, and the organization differently. Three scenarios, one from each group, had to be deleted because of cross loadings. The deleted teammate scenario dealt with a violation of the team charter in a way that impacted other team members. The deleted team scenario concerned a team member who decided to lie to an external party thus negatively impacting the team. The deleted organization scenario dealt with a team member who frequently made derogatory comments about the organization to friends and acquaintances. The remaining nine scenarios loaded on their predicted factor. As Table I demonstrates, the coefficient alpha of two of the scales was above the 0.70 threshold recommended by Nunnally (1978). The organization ethical scenario scale fell just shy with a coefficient alpha of 0.65.

Following Parry and Proctor-Thomson (2002), a principal component analysis was conducted on the PLIS to verify dimensionality. It found that a fourfactor solution best fit the data. These four factors accounted for 55.89% of the variance. Similar to Craig and Gustafson (1998) and Parry and Proctor- Thomson (2002), the first factor produced an eigenvalue five times larger than the second eigenvalue, indicating a latent one-factor construct. In addition, the high Cronbach's alpha (0.97) for the complete scale supports the finding of a latent onefactor construct.

As noted by Parry and Proctor-Thomson (2002), the potential negative effect of heteroscedasticity caused by highly skewed means is a weakness of the PLIS scale. However, they recognized that the scale is useful for measuring "a level of global perceived integrity" but that a ceiling effect on the positive end of the scale limits its usefulness to other types of analyses. In line with Parry and Proctor-Thomson's suggestion, we utilized the PLIS in the current study as a global measure of perceived integrity. By converting the data from Likert scale data into nominal categorical data, we minimized the impact of the ceiling effect. Individuals who rated their leader above the PLIS mean of 6.09 were placed into the high-perceived leader integrity group. Individuals who rated their leader below the mean but still within one standard deviation of the mean were placed into the medium perceived leader integrity group. Those who rated their leader more than one standard deviation below the mean were placed into the low perceived leader integrity group. This approach is logical given the characteristics of PLIS. Since the PLIS utilizes items that describe clear, unambiguous unethical acts, the presence of unethical behavior is detected when respondents rate their leader lower than the highest end of the

scale. However, if all unethical behavior is completely absent, then the leader is said to act ethically and posses integrity (Parry and Proctor-Thomson, 2002).

Factor analysis was not conducted on the ten-item social desirability response scale (MCSD) because its factor structure has been confirmed many times in the literature. Similar to Andrews and Meyer's (2003), the scale produced a final Cronbach's alpha of 0.88.

Table I
Summary Statistics, Correlation Coefficients, & Scale Reliabilities

Variable	Mean	S	1	2	3	4	5
1. MCSD	4.821	1.432	(0.880)				
2. PLIS	6.091	1.114	0.146	(0.970)			
Dependent Measures							
3. Teammates	5.090	1.192	0.389**	0.201*	(0.764)		
4. Team	5.559	1.279	-0.122*	0.318**	0.073	(0.757)	
5. rganization	5.137	1.419	-0.134*	0.194*	0.278**	0.207*	(0.653)

Note: Cronbach's alpha coefficients are in parentheses
*$p < 0.10$; **$p < 0.05$

Preliminary analyses

Before hypothesis testing could begin, two series of tests were conducted to assure that respondents believed the situations described in the scenarios would be viewed as (1) unethical by society in general and (2) harmful to the affected individual or group. Three means were calculated for the social consensus items relating to teammates (2.22), the team (2.41), and the organization (2.40). All three were below the neutral value of four, which indicates that respondents believe the situations would be viewed as unethical by society in general. In addition, three means were calculated for the magnitude of consequence items – teammates (5.39), the team (4.92), and the organization (5.16). The mean values were all above 4 indicating that respondents viewed the situations as harmful to the affected individual or group.

Hypotheses testing

The three hypotheses predicted a positive relationship would exist between a team members' perception of his leader's integrity and his own ethical intentions. To test these hypotheses, it was first necessary to identify those team members who were characterized as having very high perceptions of the team leader's integrity and those team members who were characterized as having low perceptions of the team leader's integrity. As was described above, a frequency distribution of all respondents was conducted on the mean scores of the PLIS. We then divided the respondents into one of three groups based on the PLIS mean and standard deviation: low perceived team leader integrity (PLIS-LG) – more than one standard deviation below the mean; moderate perceived team leader integrity (PLIS-MG) – less than one standard deviation below the mean yet not above the mean; and high perceived team leader integrity (PLIS-HG) – above the mean. The 128 respondents in the high group had a mean PLIS of 6.98. The 77 respondents in the middle group (PLISMG) had a mean PLIS of 6.41, and the 40 respondents in the low group (PLIS–LG) had a mean PLIS of 5.10.

To test the hypotheses we needed to determine whether or not each population (PLIS-HG, PLISMG, and PLIS-LG) had a statistically different ethical intention mean in the three different situations. To achieve this, we conducted an ANOVA test for each of the three situational scenarios. An ANOVA test was used to find out if there was a significant difference between the three group means. The ANOVA analysis, however, simply indicated there was a difference between two or more group means; it did not indicate which means were significantly different. Thus, we performed a post hoc pairwise multiple comparison Scheffe's test to determine which means differed. Scheffe's test was selected since we had unequal group sizes.

For H1 (ethical situations impacting specific teammates), the overall relationship was significant ($F = 14.12$, $p < .001$). The PLIS-HG exhibited a stronger tendency toward ethical behavior with a mean of 4.94 than did the PLIS-LG with a mean of 3.71. The PLIS-MG also had a statistically lower ethical intention score of 4.49 from that of PLISHG. The PLIS-LG and PLIS-MG ethical intention means were not statistically different. Overall these findings lend support for H1.

For H2 (ethical situations impacting the overall team), the overall relationship was again significant ($F = 21.44$, $p < .001$). The PLIS-HG exhibited a stronger tendency toward ethical behavior with a mean of 6.38 than did the PLIS-LG with a mean of 4.94. The PLIS-MG had a statistically lower ethical intention score of 5.11 from that of PLIS-HG. The

PLIS-LG and PLIS-MG ethical intention means were not statistically different. Overall these findings lend support for H2.

For H3 (ethical situations impacting the organization of which the team is a part), the overall relationship was significant ($F = 12.94$, $p < .001$). The PLIS-HG exhibited a stronger tendency toward ethical behavior with a mean of 5.69 than did the PLIS-LG with a mean of 4.46. The PLIS-MG also had a statistically lower ethical intention score of 5.23 from that of PLIS-HG. The PLIS-LG and PLIS-MG ethical intention means were also statistically different. Overall these findings lend support for H3.

Social desirability response bias

Previous research that has sought to study the relationship between the ethical attitudes of leaders and The Impact of Perceived Leader Integrity on Subordinates subordinates has produced confusing results (Akaah and Riordan, 1989; Murphy et al. 1992; Trevino et al., 1999; Zey-Ferrell et al., 1979). Peterson (2004) suggests that SDRB could be partially to blame. To test for SDRB in the present study, we first performed a Harman's single-factor test. We loaded all of the variables in the study into an exploratory factor analysis and examined the unrotated factor solution. The first factor explained 45.34% of the variance which seemed to indicate the presence of one general factor that accounted for the majority of the covariance among the measures (Iverson and Maguire, 2000). Next we calculated partial correlations between the PLIS and respondent ethical intentions while controlling for MCSD. These scores were 0.186, 0.289, and 0.186 for teammates, team, and the organization scenarios respectively. We then compared these scores to the Pearson correlations of the same variables found in Table I. MCSD was not controlled for when calculating the Pearson correlations in Table I. These scores were 0.201, 0.318, and 0.194 for teammates, team, and the organization scenarios respectively. When not controlling for MCSD, the correlations were larger for all three scenario conditions. From this comparison, it appeared that SDRB might have inflated the simple correlations, which is indicative of the potential spurious impact of the SDRB (Peterson, 2004).

Discussion and conclusions

As Trevino (1986) noted in her manuscript, understanding the ethical decision-making process in organizations is significant to the development of organizational science. With the structure of traditional organizations shifting in reaction to changes in the local and global economy, it is becoming increasingly important to understand the determinants of ethics within corporations and, more importantly, in the work team environment. The contingent thesis that is proposed by this study is perceived leader integrity will influence subordinate ethical intentions in a work team environment. More specifically, it was theorized that team members who serve under a leader who is perceived as having strong integrity would be less likely to engage in unethical conduct than would team members who serve under a leader who is perceived as having weak integrity. It was also thought that ethical intentions of team members might vary depending on who was being impacted by the unethical behavior. Three salient, internal entities were identified in the literature as: (1) team members, (2) the team as a cohesive unit, and (3) the organization as a whole.

The findings confirm that perceived leader integrity does indeed have an impact on the ethical intentions of team members in all three situations. The relationship was strongest in ethical situations impacting the team itself and the organization as a whole. This is significant in light of current events in the business world. As corporations are searching for ways to decrease unethical employee activity, it is important to note that team members who perceived their team leader to have high integrity were less likely to commit unethical acts that impact the team itself and the organization.

Most of the previous work researching the effects of leadership on subordinate behavior looked at the effects of CEO or top management ethical behavior rather than at the team level, as in the present study. By increasing the use of work teams, corporations can create a stronger sense of identity within their employees and foster an environment where employees feel they are part of something larger than themselves. In addition, work teams tend to produce accountability between team members which may help to improve ethical conduct. It was found that respondents who perceived their team leader to have high integrity reported lower intentions of committing unethical acts directed at other team members. Interestingly, however, the relationship was not as strong as it was in situations impacting the team and the organization. Only leaders who were perceived as having extremely high integrity were found to positively impact the ethical intentions of team members toward each other. This seems to lend support to Robinson and Bennett's (1995) argument that unethical acts that affect co-workers may be more explicable in terms of individual, personal factors rather than in terms of situational factors such as leader influence.

As with all empirical research, there were several limitations associated with this study. First and foremost was that a team leader's integrity was assessed strictly through a single participant's perceptions. In order to obtain the most accurate moral reading of a team leader, it would be preferable to survey an entire team. However, in such a case, the anonymity perceived by participants may begin to diminish. Further, the actual integrity of a team leader may not be properly assessed by surveys of his or her immediate subordinates. A related issue would be that leaders are not likely to allow their integrity to be directly observed or measured. The purpose in our study, however, was to assess the relation-

ship between the team member's ethical intentions and that member's perception of his leader's integrity as opposed to his leader's actual integrity. Thus, it is the team member's perception of his leader that is expected to influence his behavioral intentions (Vidaver-Cohen, 1998). Since all research designs contain limitations, we must caution against potential implications of this study until further inquiries can confirm our results.

No attempt was made to determine the impact that leaders external to the work team have on group members. It is likely that other leaders (spiritual, work, athletic, etc.) have significant impact as well. In the future, it would be valuable to determine the degree of influence external leaders have as compared to the internal group leader.

Another potential limitation of our study relates to the fact that the respondents provided the measure for both the PLIS and their own ethical intentions. According to Podsakoff et al. (2003), a common rater effect bias can be produced when the predictor and criterion variable measures are provided by the same individual. This type of self-report bias or "artificial covariance between the predictor and criterion variable" is a potential weakness of the current study. In an effort to reduce the possibility of these types of method biases, we followed procedures recommended by Podsakoff et al. (2003). They state that by following two procedural remedies, researchers can greatly minimize, if not totally eliminate, the potential effects of common rater variance on the findings of their studies. First, we promised the respondents that their answers would be completely anonymous multiple times throughout the survey instrument. Second, we assured respondents that there were no wrong or right answers and encouraged them to answer the items as honestly as possible. Finally, we pointed out that no markings were used to identify the respondents on the survey instrument. According to Podsakoff et al. (2003), these procedures "should reduce people's evaluation apprehension and make them less likely to edit their responses." In addition, we physically distanced the respondents from the work team leaders (Scott, 1982).

The findings that emerged from this study, though consistent with previous studies regarding the relationship between the ethical attitudes of leaders and their subordinates, raise several questions worthy of additional research. Future research should investigate how a belief in universal moral rules by team members impacts the perceived leader integrity/ethical intentions relationship. Individuals join organizations with an individual level of cognitive moral development as well as other personal characteristics. A personal characteristic likely to moderate the influence of situational variables, such as perceived leader integrity, is the degree to which an individual believes in universal moral rules. For example, one team member may believe that certain behaviors are always unethical regardless of the situation while another team member may reject the idea of universal moral rules and believe that morality depends on situational variables or the outcome. Assessing a subordinate's level of universal moral rules may help researchers to understand exactly how much of an impact the team leader has on the subordinate's ethical intentions.

As was stated earlier, the PLIS has a tendency to produce extremely high means due to the fact that it only uses negative items. This limits the potential usefulness and the analyses it can provide. In the future, researchers should seek to deal with the potential effects of heteroscedasticity caused by the highly skewed means (Parry and Proctor-Thomson, 2002).

An implication of these results, as Craig and Gustafson (1998) studied, is that researchers do not yet fully understand how a follower's impressions of leader integrity develop, how those impressions change over time, or even which leader behaviors are most influential in the perception formation process. Studying each of these issues would greatly expand the literature with regard to team members' ethical intentions as a result of their perceived leader integrity.

In summary, the present study provides needed research on the relationship between perceived leader integrity and its effect on employee behavior. The Impact of Perceived Leader Integrity on Subordinates Rather than focusing on the impact of the ethical influences of top management and CEOs, as much of the previous literature has done, the present study examined how leaders of work teams affect the ethical intentions of their subordinates. It is hoped that the findings from this study can add to the conceptual base needed to develop a research agenda for future investigations of the integrity of team leaders and its effect on work team groups.

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Does Customer Engagement with Internet Based Services Influence Adoption of Other New Products

by Darin W. White, Joe Harrison, & Sam Turner

The power of the Internet to help businesses establish a relationship with customers has become increasingly strong and one that must not be overlooked in their marketing strategies (Bakos, 1997). Companies are recognizing the importance of using clicks & mortar to bridge the physical and virtual worlds (Georgia, 2001). By the end of 2006, over 120 million people will have Internet access via cell phones and Internet based commerce will likely grow to 5 trillion dollars (Evans, 2004). In 2004, the Internet contained over 500 billion web pages, served over 160 million people in the US, and over 700 million worldwide (Brandt, 2004). The Internet has been identified as a key enabler in customer interaction (Rayport & Sviokla, 1995). Indeed, the Internet is now recognized by most business leaders as the ultimate tool in relationship marketing (Zindldin, 1998).

A growing body of academic literature is beginning to show that the Internet has dramatic and positive effects on customers in a myriad of ways. Early studies of Internet markets took a "simplistic view of consumers as economic agents whose behavior was guided by a search for the lowest cost transactions" (Strader & Hendrickson, 1990). More recently, researchers have begun focusing on the complex psychological and sociological effects of the Internet on customer satisfaction (cf. Ding, Rohit, Zafar, 2007) and brand loyalty (Cristobal & Flavian, 2007). Such research is in its infancy and presents researchers with more questions than answers. With many questions about how technology-based services influence customer behavior still unanswered, additional study is warranted. Rangaswamy & Gupta (2000) believe that one of the most critical questions that the rapid growth of the Internet raises involves the impact on how individuals decide whether and when to adopt new products and how it influences the product diffusion process in general. Thus, the purpose of this research is to examine the linkage between Internet use and the adoption of a new product or service through the examination of a very large, detailed Internet usage dataset.

Literature Review

Researchers are just beginning to unravel the complicated relationship that the Internet has on consumer behavior (Haughton, 2006). Perceived ease of use has emerged in many studies as a key determinant of e-service consumer behavior. For instance, Kamis & Davern (2005) sought to determine what consumer behavior factors influence consumer perception of ease of use. They discovered that consumer learning and memory related to the desired product category influence perceptions of ease of use and perceived usefulness of retail Internet sites. In a subsequent study, Lin, Shih, & Sher (2007), building on the technology acceptance model (Kulviwat *et al.*, 2007) found that consumer technology readiness plays a significant role in both ease of use and perceptions of usefulness. Henely (2007) found that ease of use and trust are critical determinants of e-service adoption. Also, Cheng, Lam, Yeung (2006) found perceived ease of use was a critical driver of customer adoption of Internet banking services.

Many researchers are seeking to reexamine classic consumer behavior theories in the e-service environment. Indeed, Schibrowsky, Peltier, & Nill (2007) conducted a content analysis of 1,400 Internet marketing articles and found that the most researched topic over the past two years related to traditional consumer behavior theories. For example, Castaneda *et al.* (2007) recently tested extrinsic and intrinsic motivation theory as an explanatory variable towards the use of the Internet in the information phase of the consumer decision purchase process.

Much of the current e-service consumer behavior research has its foundations in McGowan & Durkin's (2002) e-commerce consumer perception model. Their model has four parts containing the variables of vision, value recognition, technical ability and control. It can be used to quantitatively evaluate how customers perceive a firm in relation to its competitors and explains one reason for businesses to have a presence on the web. This model indicates that there are risks associated with a firm being perceived by its customers as lagging the rest of the industry in the adoption of new technology-based services. Another study conducted by Shao & Lin (2002) presents strong statistical evidence to confirm that the introduction of information technologies exert a significant favorable impact on consumers' technical efficiency.

Through Keeney's (1992, 1994, & 1999) research concerning value drivers for Internet commerce and Torkzadeh & Dhillon's (2002) research, four variables were identified which indicate the attributes of an online shopping experience that are most essential to customer success and establish successful design constructs for firms to apply during the development of their online services. These four components are: product choice, online payment, shopping convenience, and Internet ecology (a lessening of human - environmental impact as a result of Internet usage). As recently noted,

marketing philosophies concerning product choice, online payment, and shopping convenience must be reexamined due to the increasing influence of the Internet.

The Internet can also influence the ways in which marketers conduct activities and foster valued customer relationships (Wilcocks, 2001). A consumer's Internet adoption behavior is thought to mirror other important consumer behavior habits. Internet access is the first of the decision choices in the 1990 adaptation of Rogers's (1962) model (Mahajan, 1990). Obviously, a lack of access excludes customers from this marketing channel. Lee (2003) found that Internet adoption rates are affected by a number of critical issues: consumer awareness and general sense of advantages offered through the Internet, the value attributed to the use of the Internet to conduct business, the technical ability required to navigate the site and the degree of allowed control of firm/customer related activities.

In their 2000 work, Bitner, Brown, & Mathew identified a correlation between the firm's use of Internet technology and customer satisfaction as defined in Berry's (1988 & 1991) work. Satisfaction of the customer is an essential part of the customer relationship (Babakus, 1992). A customer's perception of how well a service meets or exceeds their expectations is the basis for service quality (SERVQUAL) research. The satisfaction factors described in Berry's SERVQUAL research can easily be adapted from the traditional bricks and mortar business to online extensions of the business due to the fact that customer contact in any form continues to create or reinforce the customer relationship. This research also contributes to the small existing pool of data on E-SERVQUAL, an area which must be addressed separately in future research. The relationship between customer loyalty and satisfaction is non-linear in nature. When customer satisfaction reaches certain levels, the loyalty increases exponentially and when customer satisfaction decreases below a certain level, their loyalty drops exponentially (Olivia, Oliver & MacMillan, 1992). Li (2002) found that the introduction of technology-based services presented value-added propositions to the customer. Thus, the addition of these services will bring a higher level of satisfaction to the customer relationship (Feinberg, 2002).

It is Gronroos' (1997) contention that mutual fulfillment must occur in order to maximize the positive impact of Internet customer satisfaction effects. To achieve mutual fulfillment, businesses need to take steps to insure that barriers to Internet benefits are removed. One of the barriers that technology-based services can remove is limited hours of operation. For example, Electronic Bill Presentation and Payment (EBPP) uses the Internet to eliminate billing /payment barriers and allows businesses to be open 24 hours a day 7 days a week (24/7). EBPP is a growing service delivered over the web. In addition to customer value, this growth has been spurred on by several other factors that are beneficial to the business, namely; reduced cost in paper, postage and processing as well as decreased float time on funds (Borths & Young 2000). According to Lee (2003), the availability of EBPP is viewed as a significant value enhancing service for customers who chose to use it.

The Internet also has the ability to remove geographical and cultural barriers between customers. Previous research has shown that Internet chat rooms and blogs have dramatically increased the global nature of customer-to-customer interaction commonly referred to as word of mouth advertising (Dwyer, 2007). The Internet has also greatly enhanced marketer controlled activities such as advertising in the mass media (Havlena, Cardarelli, & Montigny, 2007). As a result, the Internet has significantly altered the quality and quantity of information that potential buyers can obtain when deciding whether and when to buy a new product (Rangaswamy & Gupta, 2000). The widely accepted and studied Bass model (1969) for new product diffusion is founded on the idea that the diffusion of new products is highly dependent on both media and interpersonal channels. Thus, by facilitating word of mouth and marketer controlled communications, the Internet has significantly influenced the new product diffusion processes (Rangaswamy & Gupta, 2000). The growth of the Internet raises numerous new research questions related to modeling the adoption and diffusion of new products. The current paper seeks to add to the overall product diffusion literature stream by examining how the introduction of Internet based services impacts the product diffusion process.

Hypotheses Development

As the previous section demonstrates, Internet based commerce has dramatic impacts on both business operations and existing consumer habits (Kalakota & Whinston, 1997). As has often been observed, on the Internet, barriers of time, distance and business type are broken down. It is even possible to convert a physical good into a virtual good, i.e. delivering software, music, and print media as a computer file instead of a hard copy. E-commerce applications help businesses attract potential buyers, transact business and build customer loyalty. Companies can also use Internet technology to monitor customer opinion and directly communicate with customers (Hoque, 2000).

The Internet offers additional marketing opportunities for those who listen to their customers, carefully gather information and use it to craft Internet offerings to achieve a superior marketing mix. Effective use of Internet technology is considered a major determinant of competitive advantage, market penetration, innovation, technology transfer and even management competency (Torkzadeh & Dhillon, 2002). According to Chang (2004), the dynamically expanding environment of Internet technology yields new opportunities to market services and build deeper customer relationships. Some researchers have even suggested that the adoption of a company's Internet services heightens customer's

brand loyalty with the company (Merisavo & Raulas, 2004). Others have suggested that the Internet impacts the new product adoption process by providing consumers the ability to "overcome geographic boundaries and to communicate based on mutual interests" (Mayzlin, 2006). Through "promotional chat" marketers are able to accelerate the new product adoption process by positively influencing consumers' evaluations of their new products

Classic product adoption literature identifies a number of variables that explain the behavior of consumers in regard to new product introduction (Rogers, 1962, 1976; Oslund, 1974; Tornatzky & Klein, 1982). In 1990, Moore & Benbasat's research consolidates this stream of work to seven factors that predict the adoption of an innovative product or service. They are compatibility, complexity, trial ability, relative advantage, result demons ratability, visibility and image. The introduction of technology-based services allows companies to fulfill many of these factors. As a result, Olivia (1992) suggests that a direct linkage exists between customer habits, Internet service adoption and the purchase of new products and services of the company. It is reasoned that early adopters of a company's technology-based services should be more likely to purchase new products and services offered by the company. Thus, the following predictive hypothesis is postulated:

H1: *Customers who are early adopters of a company's Internet based services will be more likely to adopt other new products and services offered by the company.*

Long-term customers represent a valuable asset to any business. The management of the relational bond that company's share between themselves and their customer base is of critical importance. Chiu, Hsieh, Li, & Lee (2004) found strong evidence to suggest that the longitude of the relationship influences the customer bonding process. For long-term customers three types of bonds (social, financial, and structural) improve customer hedonic and utilitarian values. However, for new customers that have recently switched to the company's products, the social bond is most critical as it significantly influences hedonic value. These findings help explain why a firm's existing customer base is often more resistant to changes in the marketing mix than new customers. New customers are typically more accepting of shifts in the marketing mix at the beginning of the relationship (Pavia, 1990). During this phase they actively seek to gain an understanding of the hedonic value a company's products and services has to offer (Pavia, 1990). Thus the predictive hypothesis is as follows:

H2: *New customers to the company will be more likely to utilize Internet based services than customers who have a long-term, established relationship with the company.*

Methodology & Results

Our research used the secondary data accumulated by a publicly owned utility in the southern part of the United States as it introduced EBPP for its population. Shortly after this, the firm began offering competitive services (phone, cable, and Internet) to their customers. The service area has approximately 35,000 customers capable of receiving EBPP service (U.S. Department of Commerce, National Telecommunication and Information Administration 2000).

There were 3,794 events recorded during a 365 day period which represented the first year of EBPP being offered by the firm. This individual event data included: date/time stamp, payment amount, customer gender, credit score and various other data. Analysis of the data revealed that 848 customers (52.4% male and 47.6% female) created these 3,794 payments.. The data was divided into two tables or data sets. One data set held all 3,794 events and analysis variables Analysis was performed on them to determine overall trends and percentages. The second data set aggregated payments made by individuals and created a data set that showed habits related to the 848 customers using EBPP. From this data set, detailed information regarding payment habits and service requests was obtained. These data sets were enhanced with a follow-up data set that consisted of a snapshot of the entire population at the end of the twelve month period which contained data related to new service adoption and EBPP users.

Adoption of Other Products and Services

To test hypothesis 1 we utilized data provided to us that consisted of a snapshot of the entire customer population as of the end of the twelve month period studied. Information on 34,731 customers was contained in the dataset, which included new service adoption decisions and EBPP usage. The company began offering cable TV, phone, and Internet services approximately one year hence. Out of the company's total customer population, 7,565 of the customers were unable to receive the additional services due to location or lack of infrastructure. Thus, we only evaluated adoption decisions of the remaining 27,166 customers. 2,181 of these customers had utilized the EBPP service option within the

previous 12 month period. The remaining 24,985 had the capability of utilizing the EBPP service but had chosen to use more conventional payment methods instead.

We next conducted three univariate ANOVA tests where EBPP usage decision (yes vs. no) was the independent variable and adoption decision (yes vs. no) for the three new service offerings (cable, phone, and Internet) were the dependent variables. In all three instances, cable TV ($F = 70.69$, $p < .01$), phone ($F = 165.37$, $p < .01$), and Internet ($F = 232.28$, $p < .01$), our hypothesis was supported. There was a strong correlation between customers that utilized the company's EBPP services and whether or not they were early adopters of additional company service offerings. This trend was strongest with the new Internet services. 29.5% of all customers that had utilized the EBPP service adopted the new Internet services within the first year whereas only 12.9% of non-EBPP usage customers had adopted. In a similar fashion, 22.7% of EBPP usage customers adopted the phone services whereas only 10.2% of non-EBPP usage customers did the same. Finally, 36.7% of EBPP usage customers adopted the cable TV services whereas 25.2% of non-EBPP usage customers followed suit.

The strong correlation between early adopters of the company's technology-based services and their adoption of new products and services offered by the company is a useful finding for business practitioners. But the question of causation remains unanswered. Even though strong predictive power seems to exist between the two variables, it is not reasonable to assume that the act of being an early adopter of Internet based services necessarily causes consumers to be more likely to adopt products and services offered by the company. Logically, then, we would assume that other fundamental causal variables or causal mechanisms underlie the discovered correlation. Affinity to new technology on the part of the consumer (i.e. those with a high technology acceptance, or TAM score) are likely to cause consumers to be both early adopters of the technology based services and also adopters of new products and services offered by the company. Also, willingness to engage in consumption innovation or to accept innovations is another potential causal variable that might be linked to the studied relationship.

Customer Longevity

The same data set utilized in the previous hypothesis test was used to examine hypothesis 2. Customers were divided into one of three customer longevity groups: newly established customers (been with the company 4 years or less), firmly established customers (been with the company from 5 to 8 years) and long-term customers (been with the company 9 years or more). Next we conducted a univariate ANOVA where customer longevity group was the independent variable and EBPP usage decision was the dependent variable. The overall relationship was significant ($F = 73.82$, $p < .01$) In support of our hypothesis, newly established customers and firmly established customers exhibited significantly higher usage rates of 10.1% and 10.3% respectively. The usage rate drops off to 6.0% with long-term customers. The difference between the newly established customers and long-term customers was significant at the 0.05 level. The difference between newly established customers and firmly established customers was not significant. Thus, hypothesis 2 is partially supported.

Similar to H1, we found strong predictive power between the two variables in question, but again, are not necessarily suggesting causation. The fact that a customer is new could be thought of as a filter which indicates that the customer is of the type that opportunistically looks for the best deal, as described by the new product features and price. This is in contrast to customers who maintain established relationships with the company that are likely to be less opportunistic. In this case, one variable predicts the other but does not cause it.

Conclusions

As firms continue to weigh the impact of the Internet on their business, the findings of this study indicate a need for companies to establish services for their customers on the web. The capability to research and analyze an entire population provides invaluable insight into how the introduction of Internet innovative services impacts various consumer behaviors. Some have argued that online services which are not directly related to sales only serve to increase costs for companies Proponents of such services claim the return on investment will be generated via improvements in customer perceptions and overall satisfaction. However, the current study finds that return on investment can also be positively impacted by shifts in several different consumer behaviors. In addition, there are many other examples of real cost savings, such as consolidating orders, reducing employee time per transaction and reducing the float (the time it takes to gain use of funds paid to the company). Many of these benefits are tangible and are not just improvements in customer satisfaction.

Our findings indicate that customers utilizing a company's innovative Internet services are over twice as likely to adopt a company's new product and service offerings. As previously stated, this research neither proves nor disproves causality. To further investigate the issue of causality would require that we identify the reason or reasons that a person was identified as an early adopter of EBPP. An early adopter may simply be prone to embrace new things. It would be particularly useful to be able to control for age in this research. Is there a correlation between age and being an early adopter, between age and having an openness to new things? Additionally, age-in-computing (the number of years a person has been in direct contact with computers) is rarely considered in research. The relationship between age and age-

in-computing can differ by country as well as socioeconomic class. In the USA, most children are exposed to computers at an early age. This is not true in every region and country. The study also indicates that newer customers are much less resistant to adopting a company's technological services than are customers who have a long established relationship with a company. As discussed above, it is possible that unmeasured third variables could affect these relationships.

Limitations and Future Research Directions

Future research is needed to identify why a customer is an early adopter of Internet based services. Is age a significant factor? What is the age-in-computing of early adopters? Is E-SERVQUAL significantly different so as to demand a new research thread? Research is also needed to explore ways to encourage strongly established customer bases to participate in company service improvements. It is believed that it would be of great benefit to follow this group through the product adoption cycle to understand differences in early adopters, early majority, late majority and lagers.

With the knowledge gained from this study, it is now known that the introduction of technology-based services is a good method for firms to identify early adopters of the firm's future products and services. Because of their higher than normal adoption rate, early adopters of technological services should be included in test markets, focus groups and customer surveys related to new product offerings.

As in most empirical work, the current research has several limitations. Care must be exercised when interpreting the results. First, the individuals studied were consumers of a monopolistic company (a public utility) that was beginning to offer competitive products for the first time. Thus, the relationship between the long-term customers and the company might have formed differently than the relationship between the newer customers and the company. Second, the data was provided by a service oriented company. Consumers might differ in their Internet behavioral patterns when purchasing physical products versus services. Third, because of confidentiality concerns, the data obtained had very limited demographic indices. Age of the respondents was not available. Thus, it was not possible to test for demographic moderating effects on the studied relationships. As a result of these limitations, the extent to which the findings can be generalized across multiple sectors of the Internet shopper population could be limited. Nevertheless, the individuals studied should be representative of the Internet shopping population since they all had Internet access and demonstrated the ability to learn and use the new technology service offerings.

Overall, these findings demonstrate that the introduction of innovative technology-based services by a firm will have significant implications on the behavioral patterns of the firm's customer base. Technology-based services give businesses a 24-hour a day exposure in a global environment with the customer only a click away from the sales floor. Repeated exposure to a firm as offered by the Internet relationship has the potential to enhance brand attitudes by allowing customers to process more individually relevant information. As consumers spend time with a firm their emotions, feelings, moods and other perceptual drivers are being stimulated by the experience. This process effects the customer's belief about the company (Dick & Basu, 1994). As the current study shows, the integration of technology-based services into the marketing strategy provides potential for great benefit. Without a solid understanding of the effects that the Internet has on the customers' previous habits, business decision makers cannot successfully predict whether the tools developed will achieve the firms' desired results. Further research along this direction is needed to develop a pool of knowledge that enables businesses to successfully propel themselves into the world of the Internet.

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Hymns And Songs Of Praise

By Randall Bush

The Holy Trinity

God, Triune, Yet Indivisible
Around th' Eternal Throne of God
The Harmony of the Heav'nly Spheres
Let Streams of Light Descend
O Thou from Whose Eternal Mind

God (Creation And Providence)

Creator of Time and Space
The Laws of Nature Bend
Creation in Travail
Jehovah, My Light and My Salvation
Jehovah, Shepherd of My Soul
Lord, God, with Thine All-Seeing Eye
Those Born From God Above

Divine Comfort And Guidance

Together All Things Work for Good
Lord, Keep in Perfect Peace
On Eagle's Wings
Upon the Turning Wheel of Time
Behold, the Weight of Glory Falls
Thy Ways are Not Our Ways, O God
This is the Day that the Lord Hath Made

The Person Of Christ

The Splendor of the Everlasting Word
Thou Son of Man in Light Arrayed

The Work Of Christ And Salvation

How Can It Be that Jesus' Wondrous Cross?
A Cross, Thy Cradle Was, O Lord
Jesus, Font of Paradise
The Crown of Thorns He Wore
The Grace of Jesus Christ Our Lord
The Risen Sun of Righteousness
The King of Kings the Distance Goes
O Lord My Shield

The Holy Spirit

Spirit of Our Risen Lord
Sweet Spirit of Life and Light

The Kingdom Of God And The Church

From Regions Far and Wide
Lord, Thy Kingdom's Battle Rages
With Joyous Songs God's Kingdom Comes
Why Do the Godless Nations Rage?

The Christian Life

Bind Us unto Thy Truth, O Christ
Having Feet with Heav'nly Virtue Shod
Not the Works that I have done
O Christ, Release My Soul
How Blessed is the Righteous Man

Patriotic

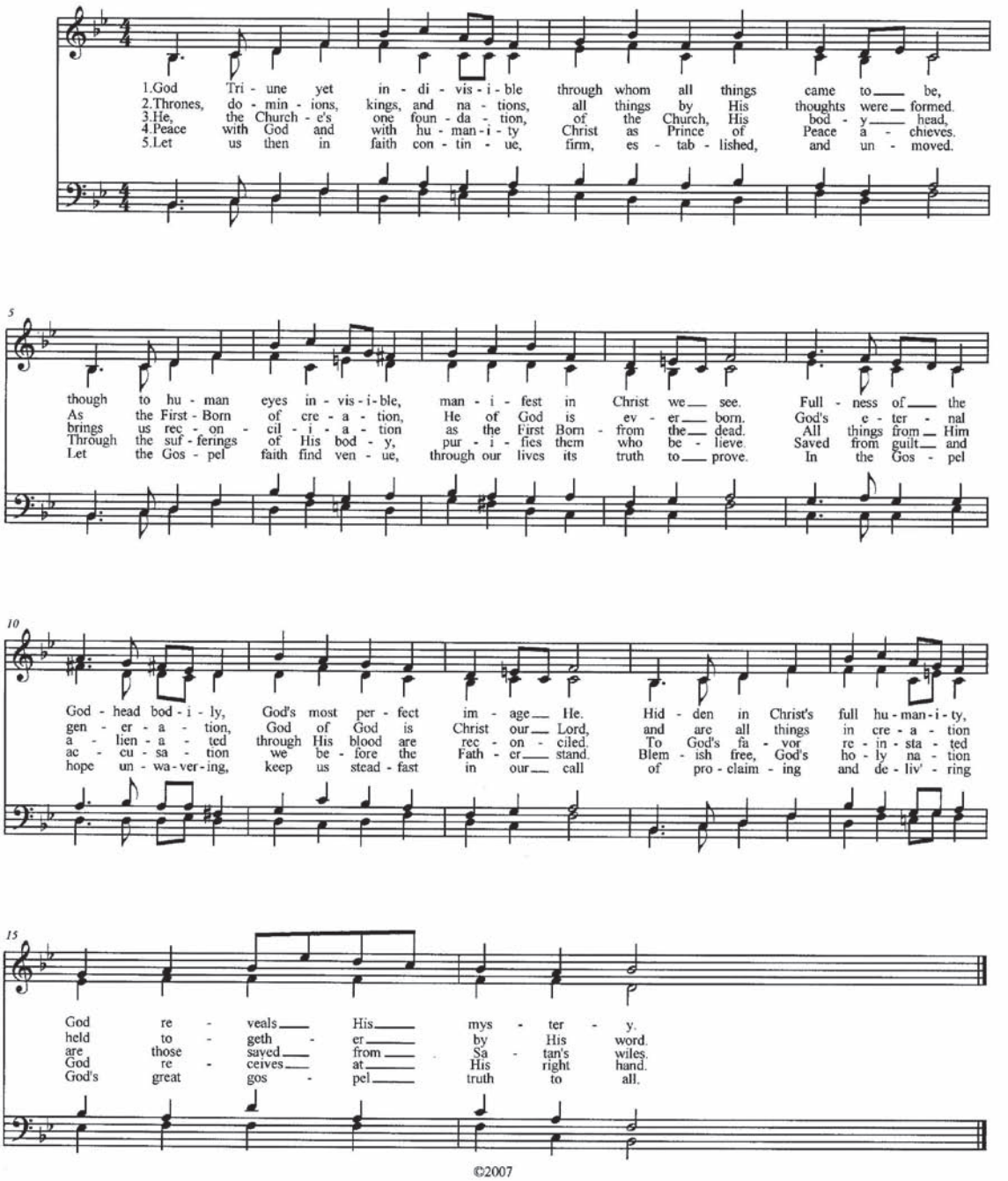
Through Trials and Tribulations Our
Faithful Fathers Came

God, Triune, Yet Indivisible

dedicated to Dr. Todd Brady
Colossians 1:15-23

BRADY

words and music by Randall Bush

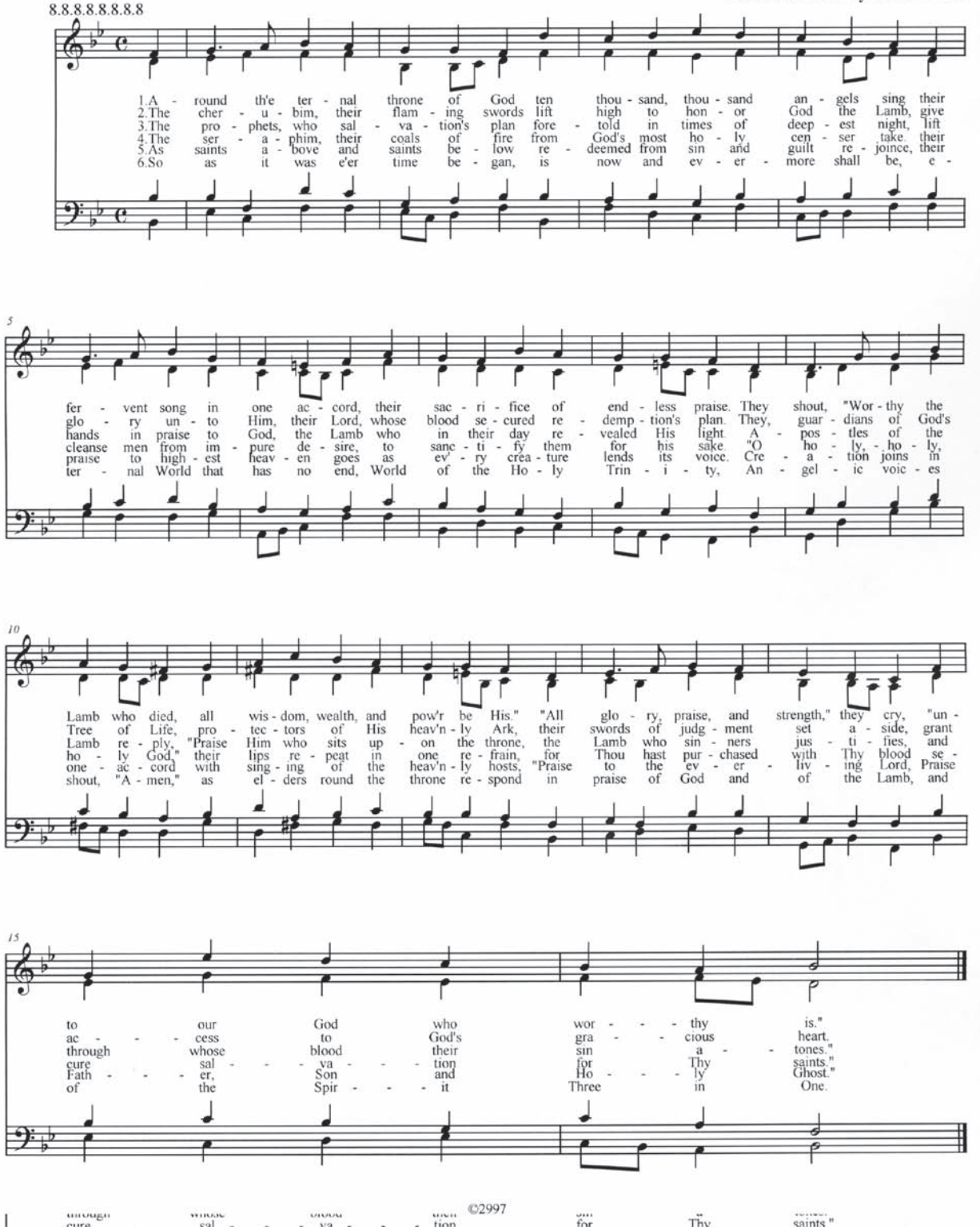


Around the Eternal Throne of God

dedicated to Dr. Kendall Easley
Revelation 5:1-14

EASLEY
8.8.8.8.8.8.8.8

words and music by Randall Bush

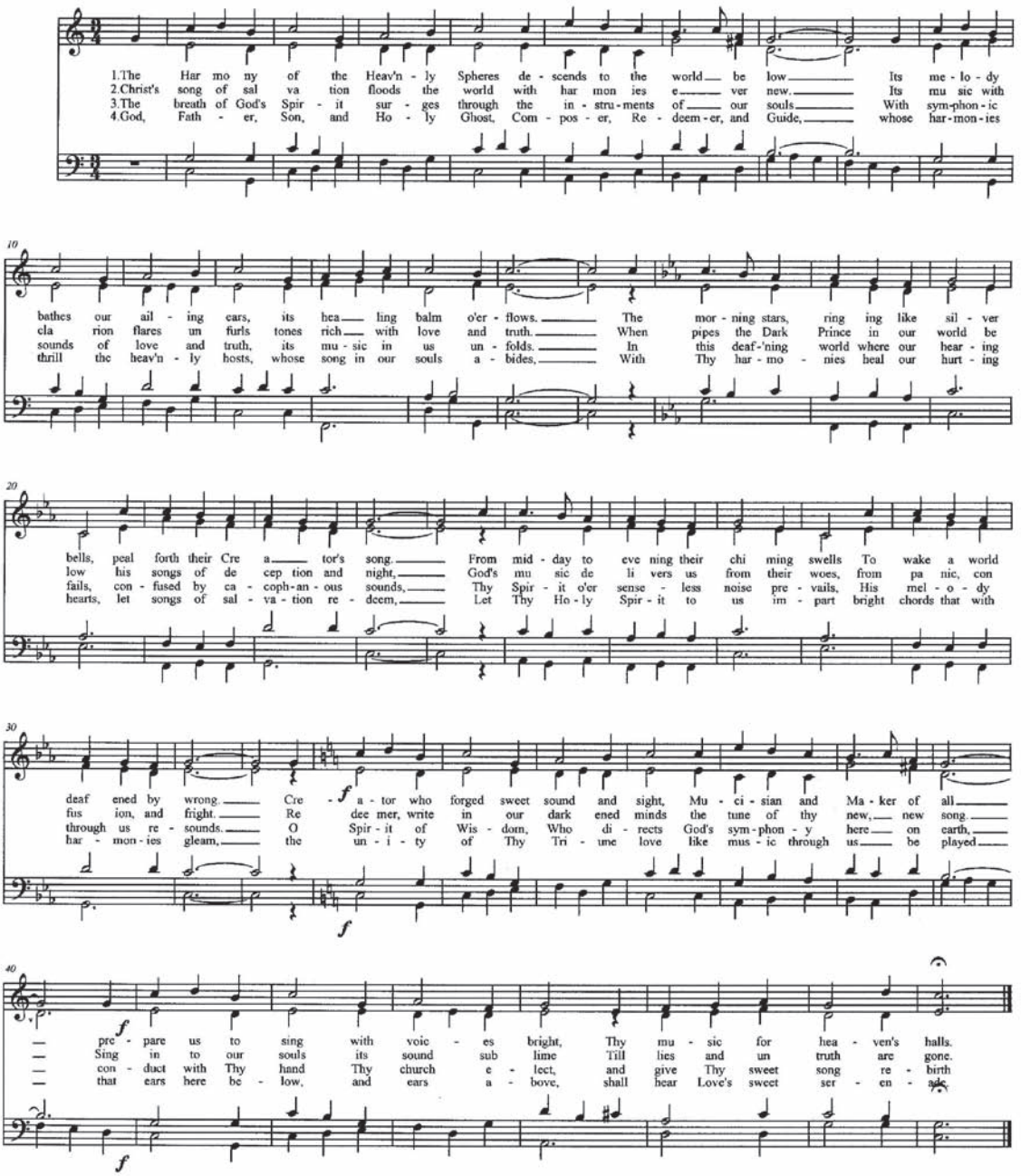


The Harmony of the Heavenly Spheres

Dedicated to Dr. Ron Boud

Words by Randall Bush
Music by Nathaniel Webb

BOUD

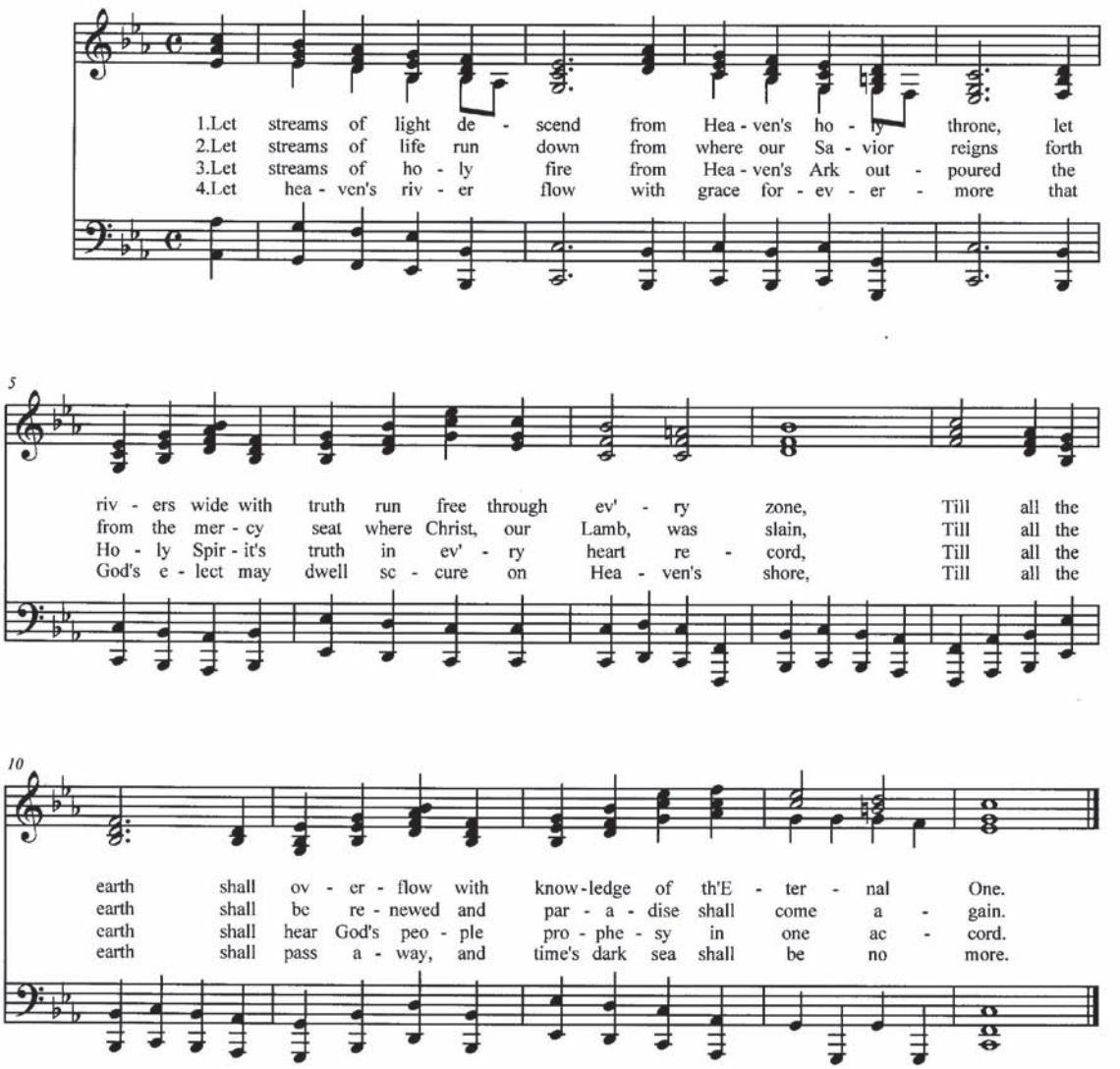


Let Streams of Light Descend

Revelation 22:1, Revelation 21:1

music Ron Boud
arranged Randall Bush
words Randall Bush

JENNINGS

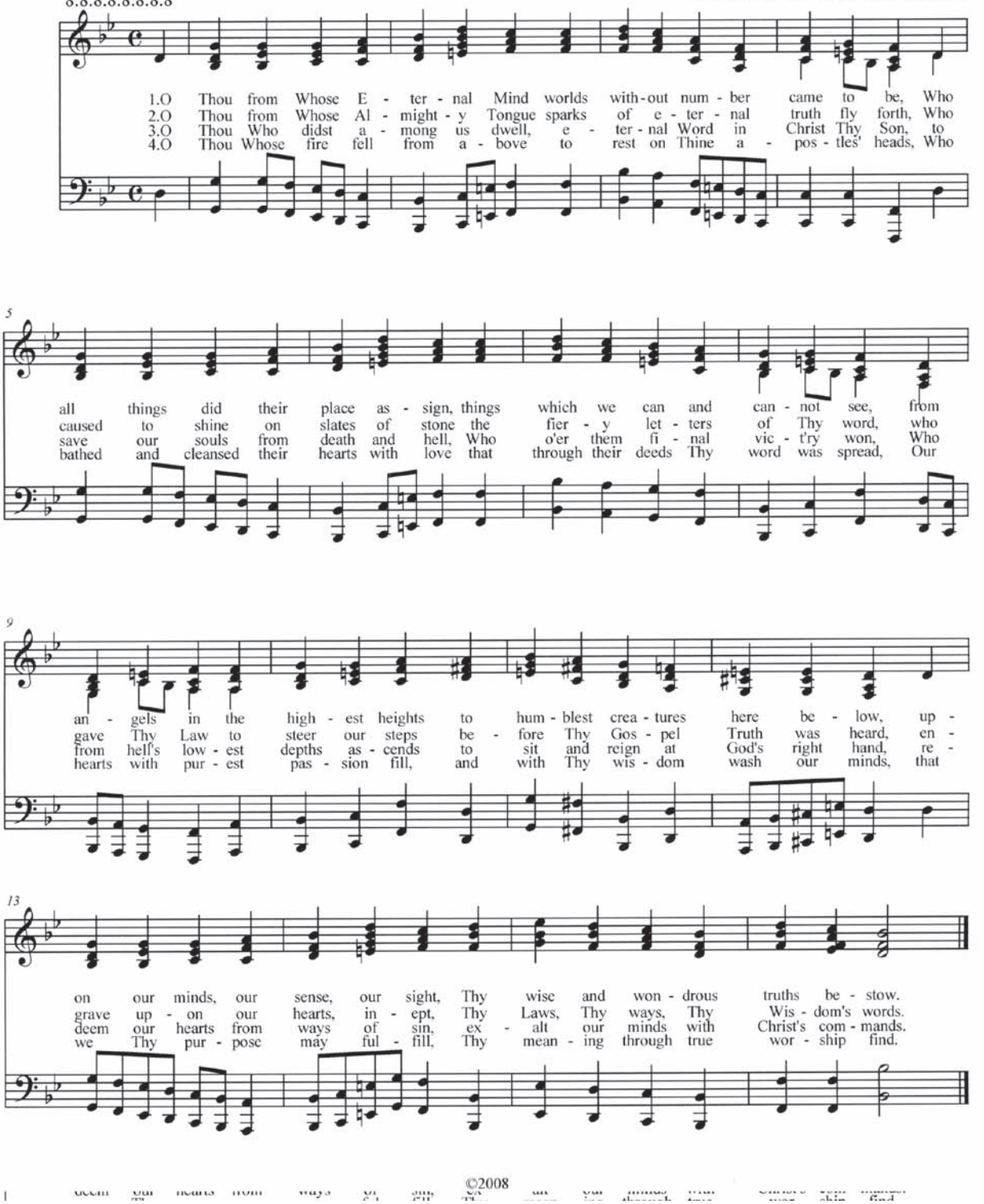


O Thou from Whose Eternal Mind

dedicated to Dr. Carla Sanderson

SANDERSON
8.8.8.8.8.8.8.8

words and music by Randall Bush

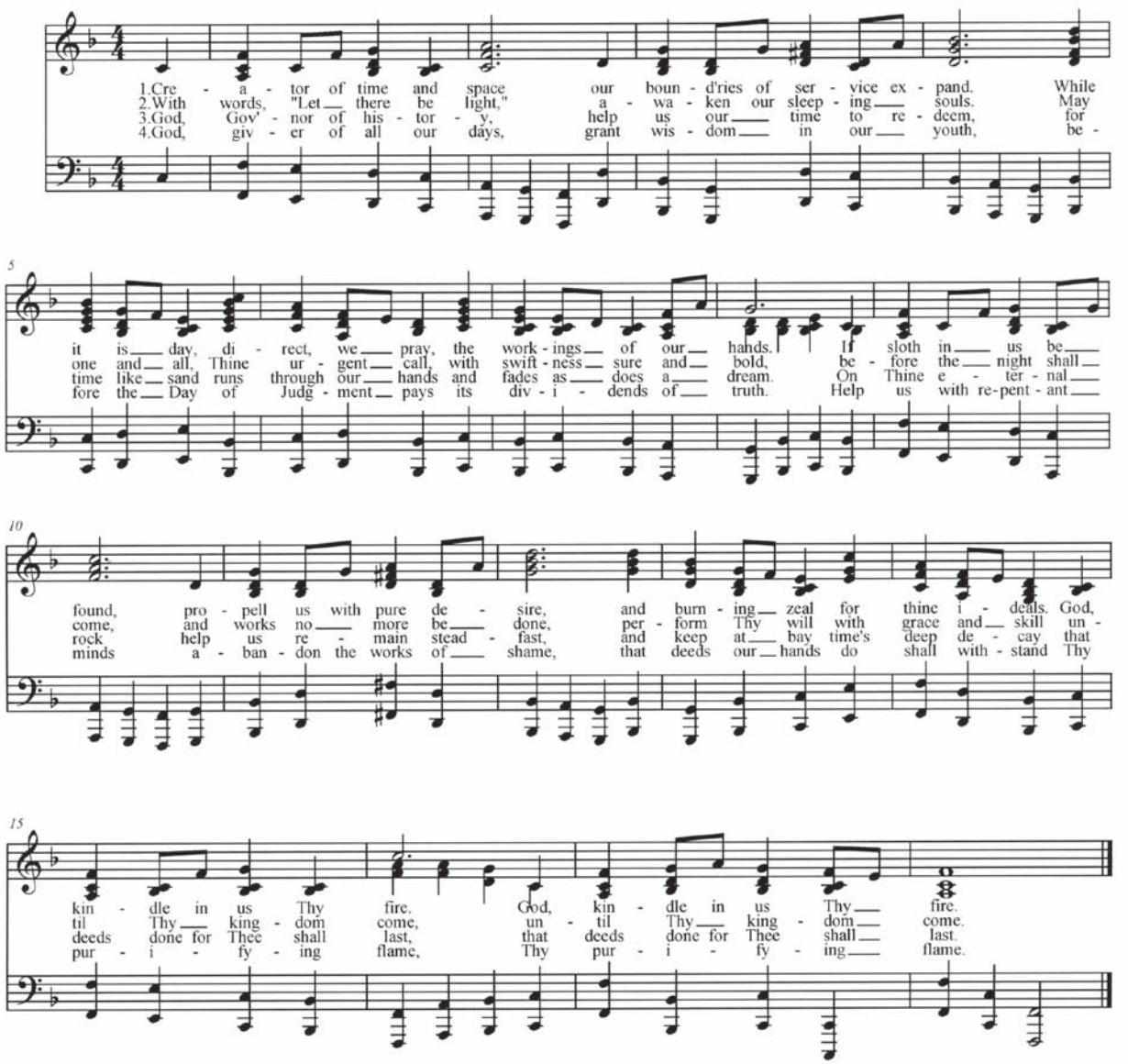


Creator of Time and Space

dedicated to Dr. Gregory Thornbury

THORNBURY

words and music by Randall Bush

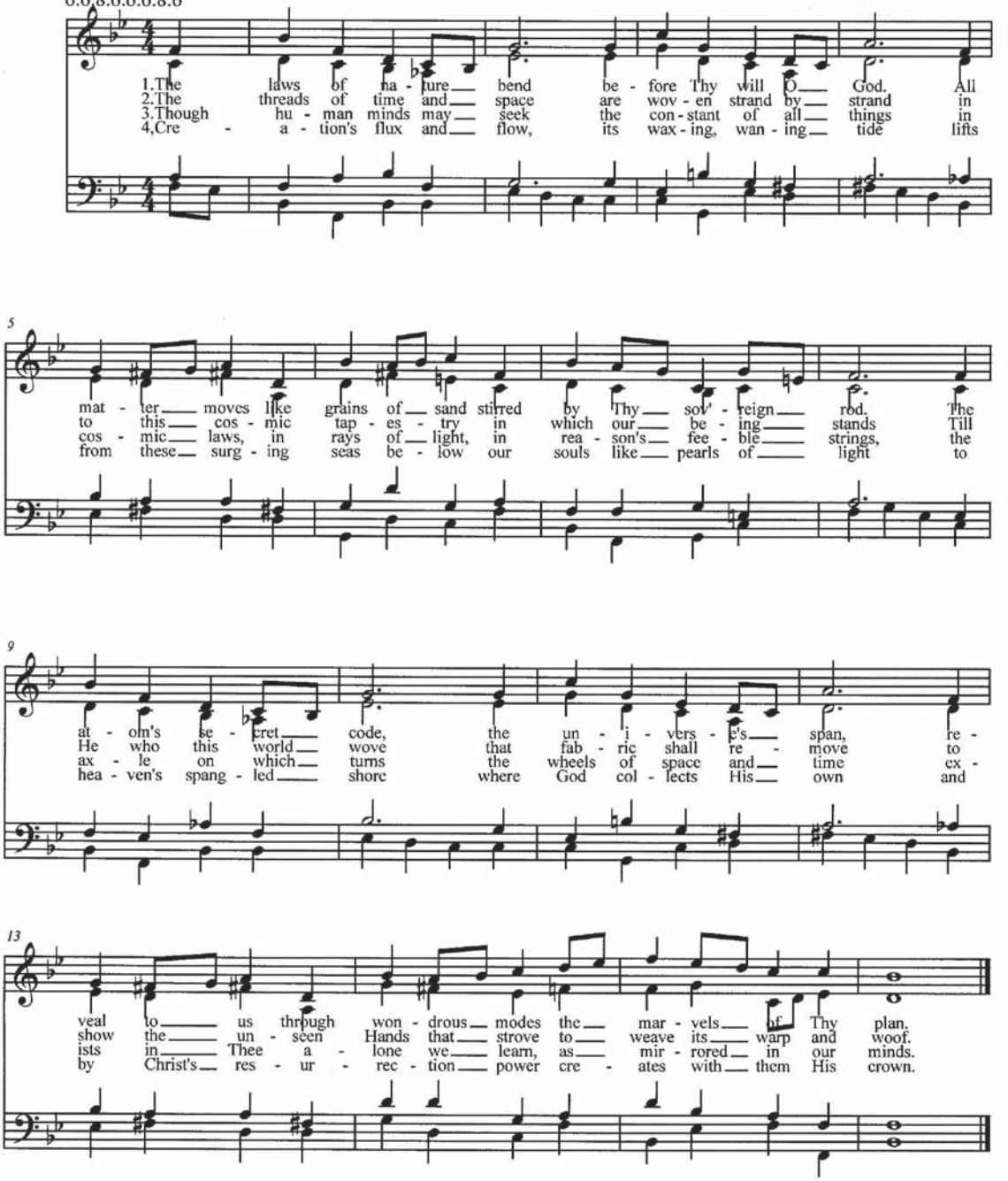


The Laws of Nature Bend before Thy Will O God

dedicated in memory of Dr. Kyle Hathcox

HATHCOX
6.6.8.6.6.6.8.6

words and music by Randall Bush



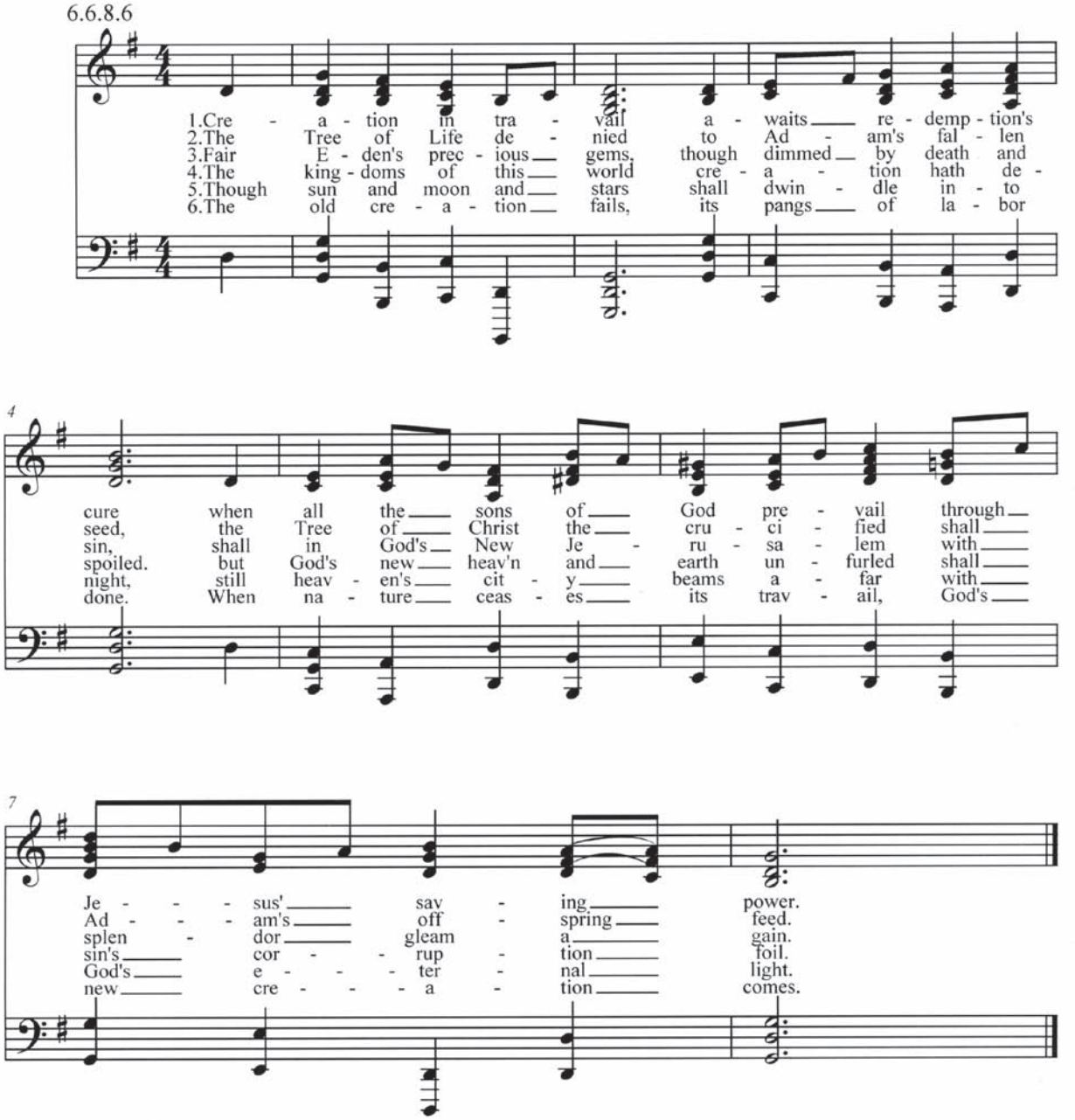
Creation in Travail Awaits Redemption's Cure

dedicated to Dr. Mark Dubis

Romans 8:18-22

words and music by Randall Bush

DUBIS
6.6.8.6

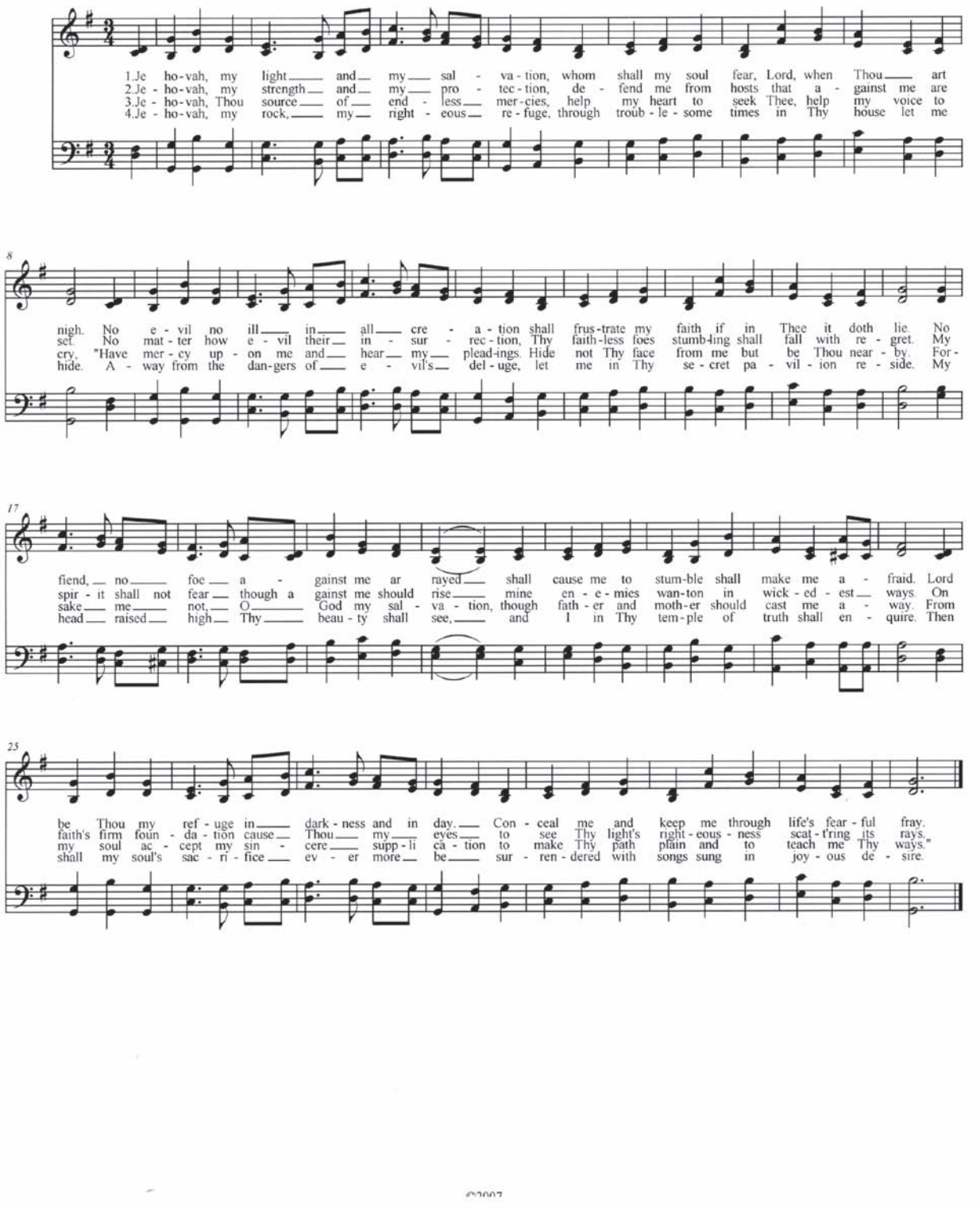


Jehovah, My Light and My Salvation

dedicated to Iris Morris
Psalm 27

Randall Bush

MORRIS

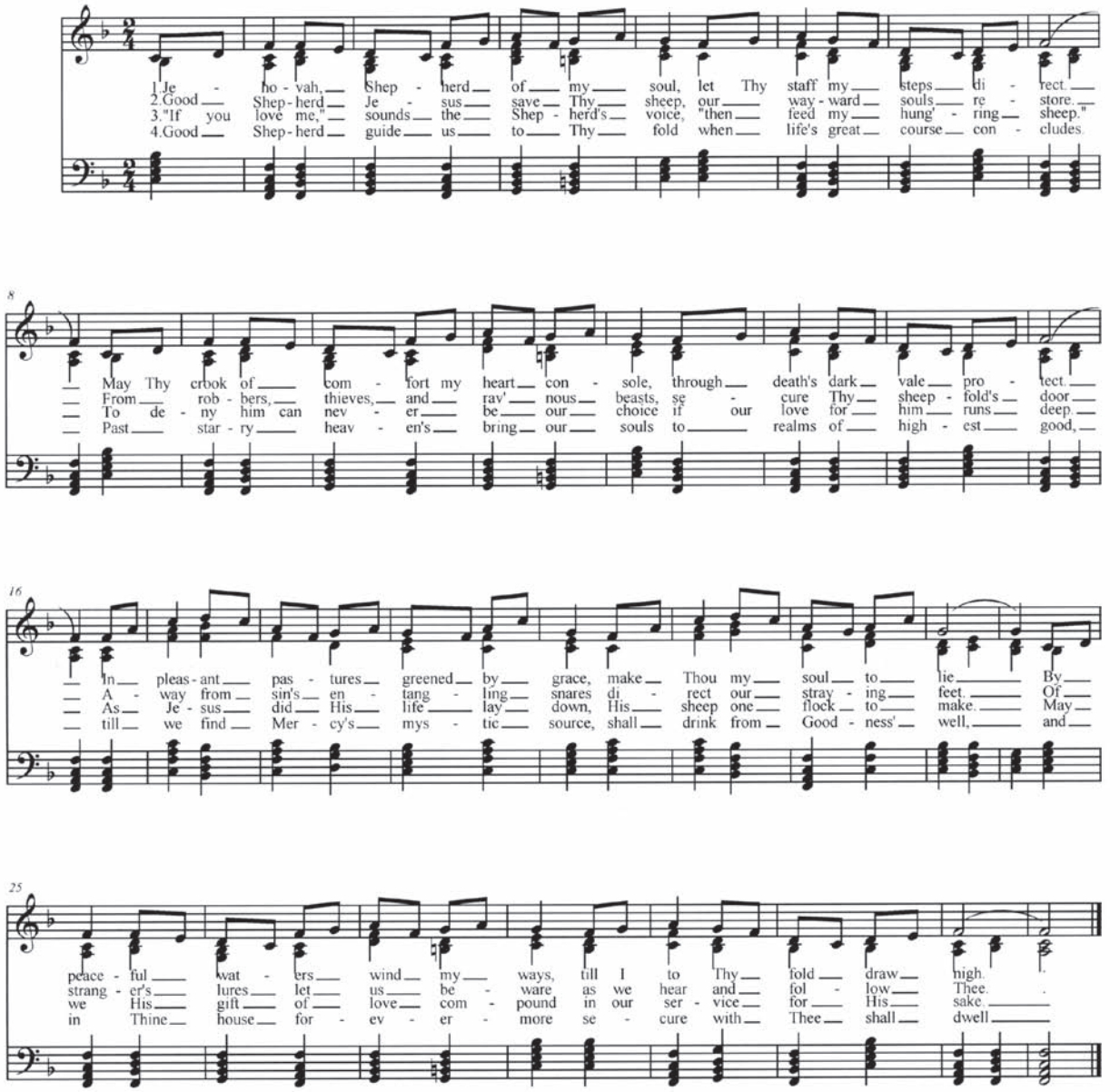


Jehovah, Shepherd of My Soul

dedicated to Dr. Ray Van Neste
John 10:1-14

VAN NESTE

words and music by Randall Bush

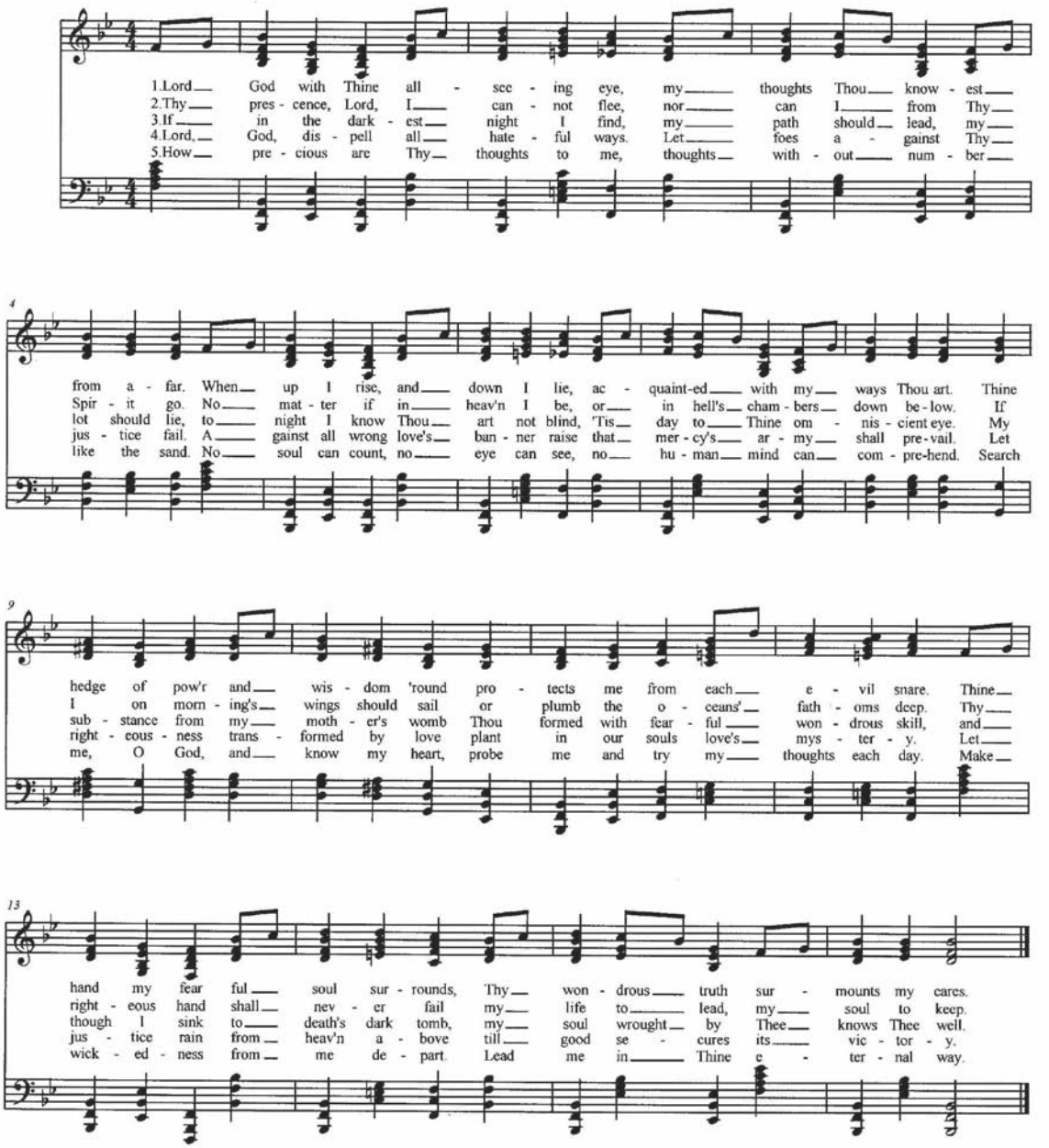


Lord, God, with Thine All-Seeing Eye

Dedicated to
Theresa Blakley
and Leonard Diffey

Psalm 139

Randall Bush

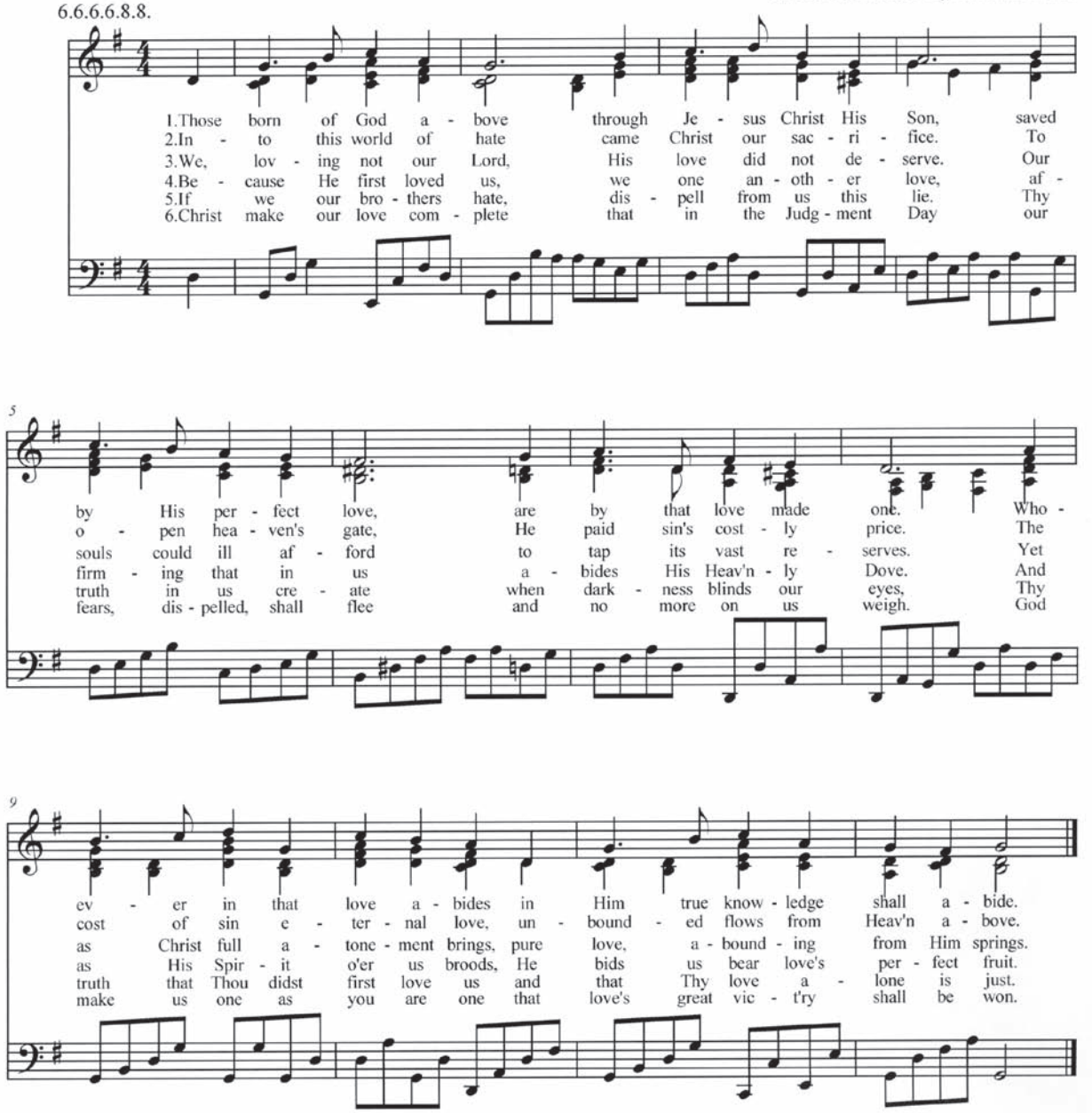


Those Born from God Above

dedicated to Dr. Gene Fant
1 John 4:7-21

FANT
6.6.6.6.8.8.

words and music by Randall Bush

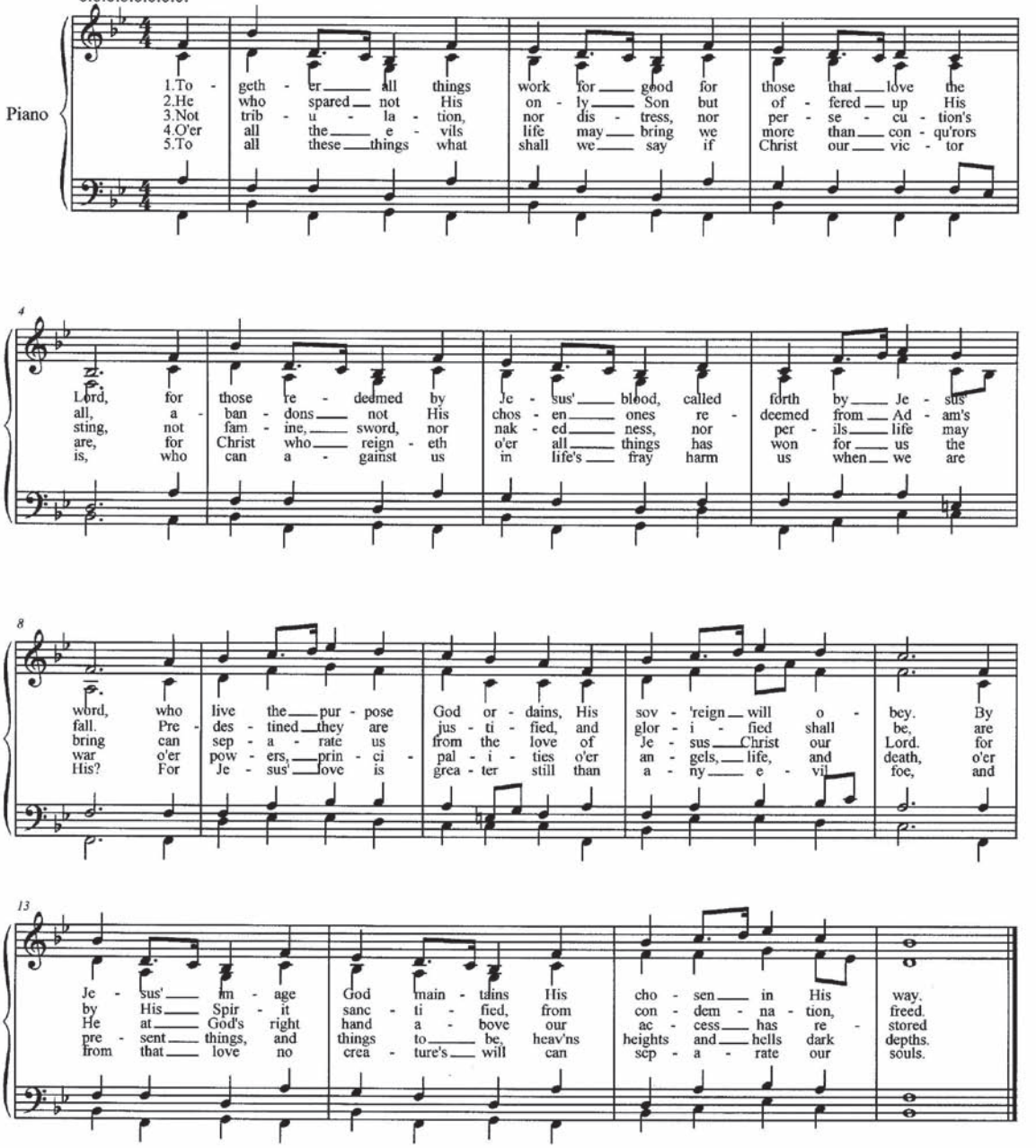


Together All Things Work for Good

dedicated to Rev. Curtis Crofton
Romans 8:28-39

CROFTON
8.6.8.6.8.6.8.6.

words and music by Randall Bush

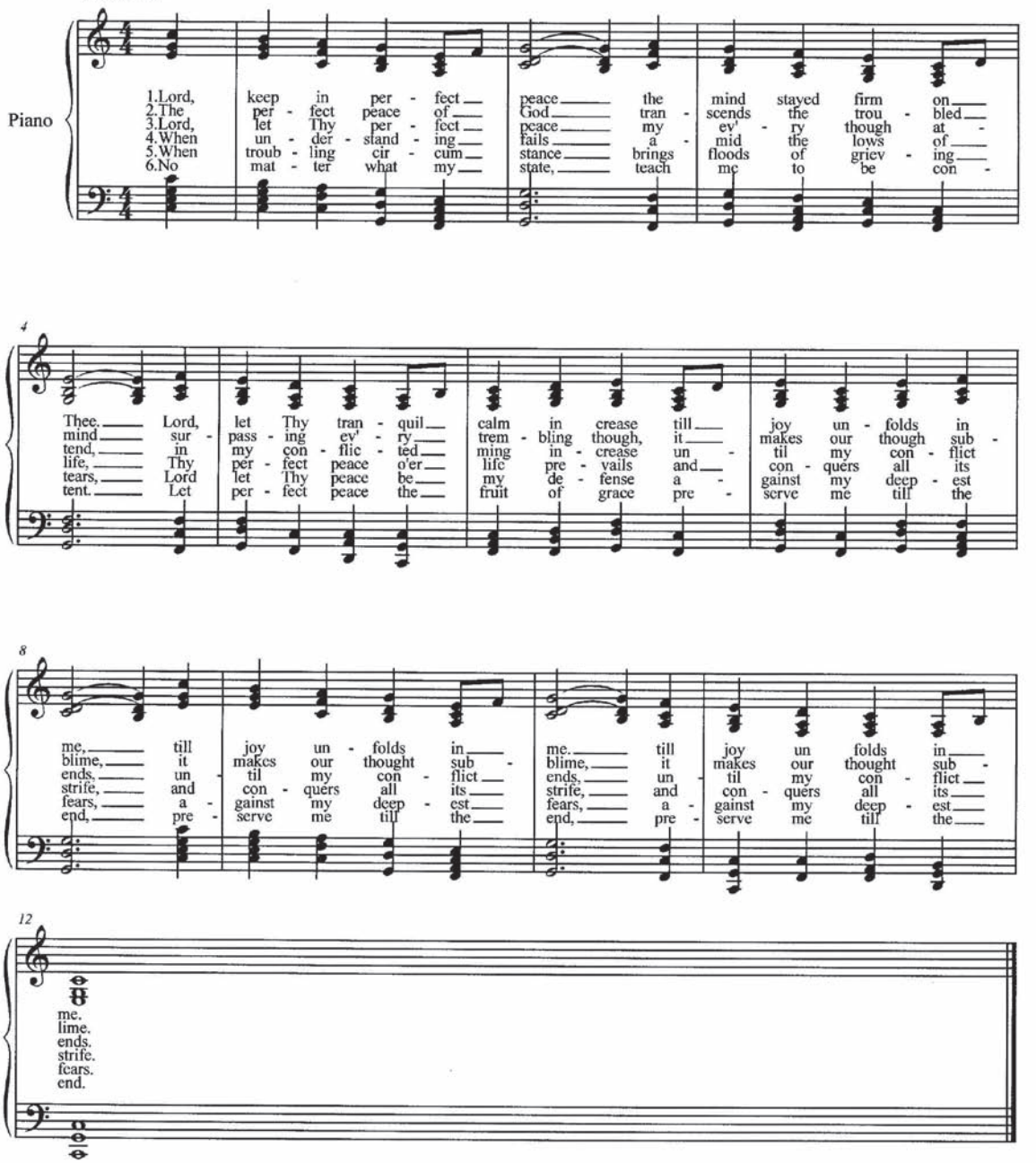


Lord, Keep in Perfect Peace

Dedicated to Dr. Paul Jackson
Isaiah 26:3, Philippians 4:7

JACKSON [Union]
6.6.8.6.6.6

words and music by Randall Bush

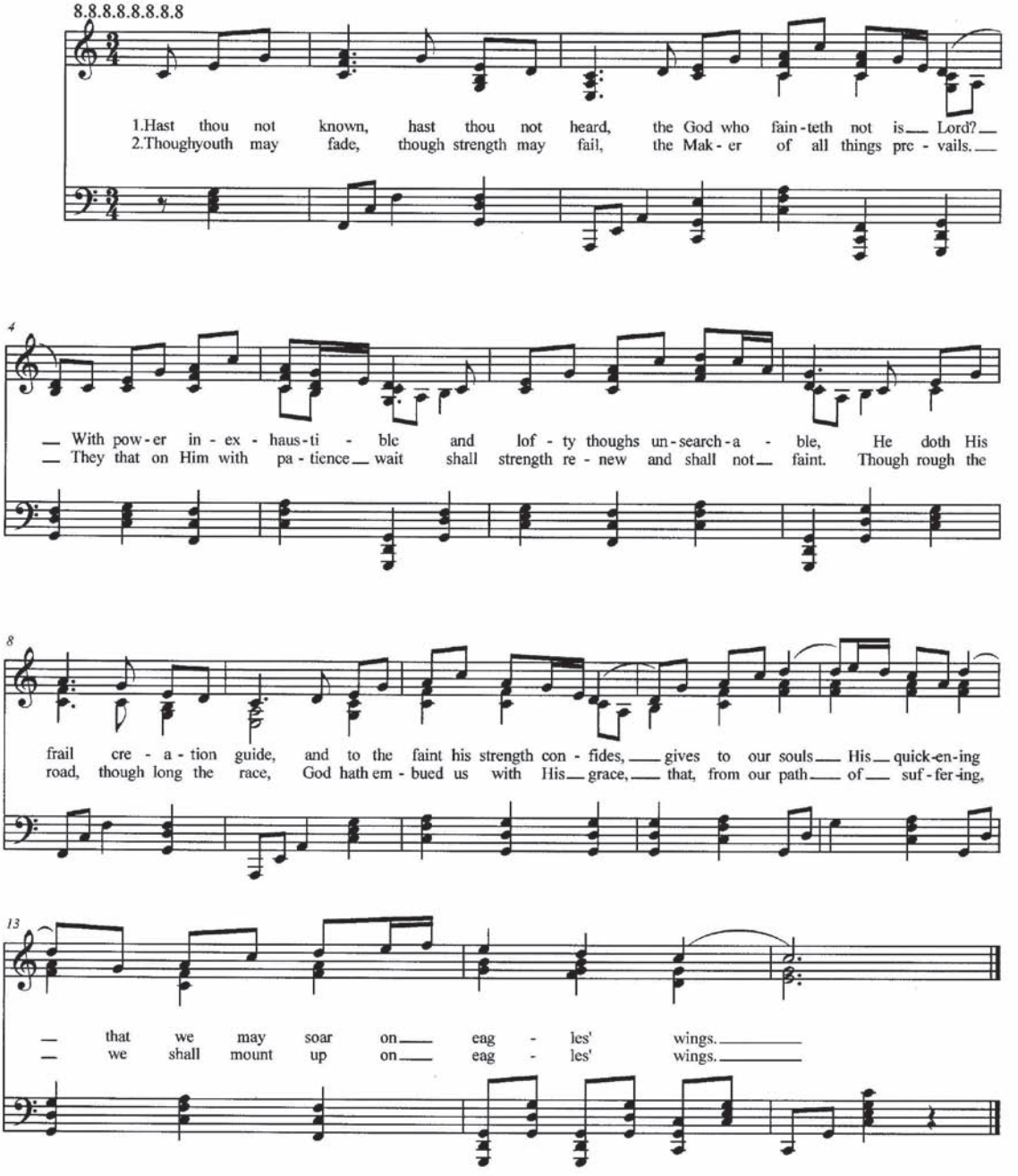


On Eagles' Wings

dedicated to Rev. Dr. Henry Adrion III
Isaiah 40:28-31

words and music by Randall Bush

ADRION
8.8.8.8.8.8.8.8

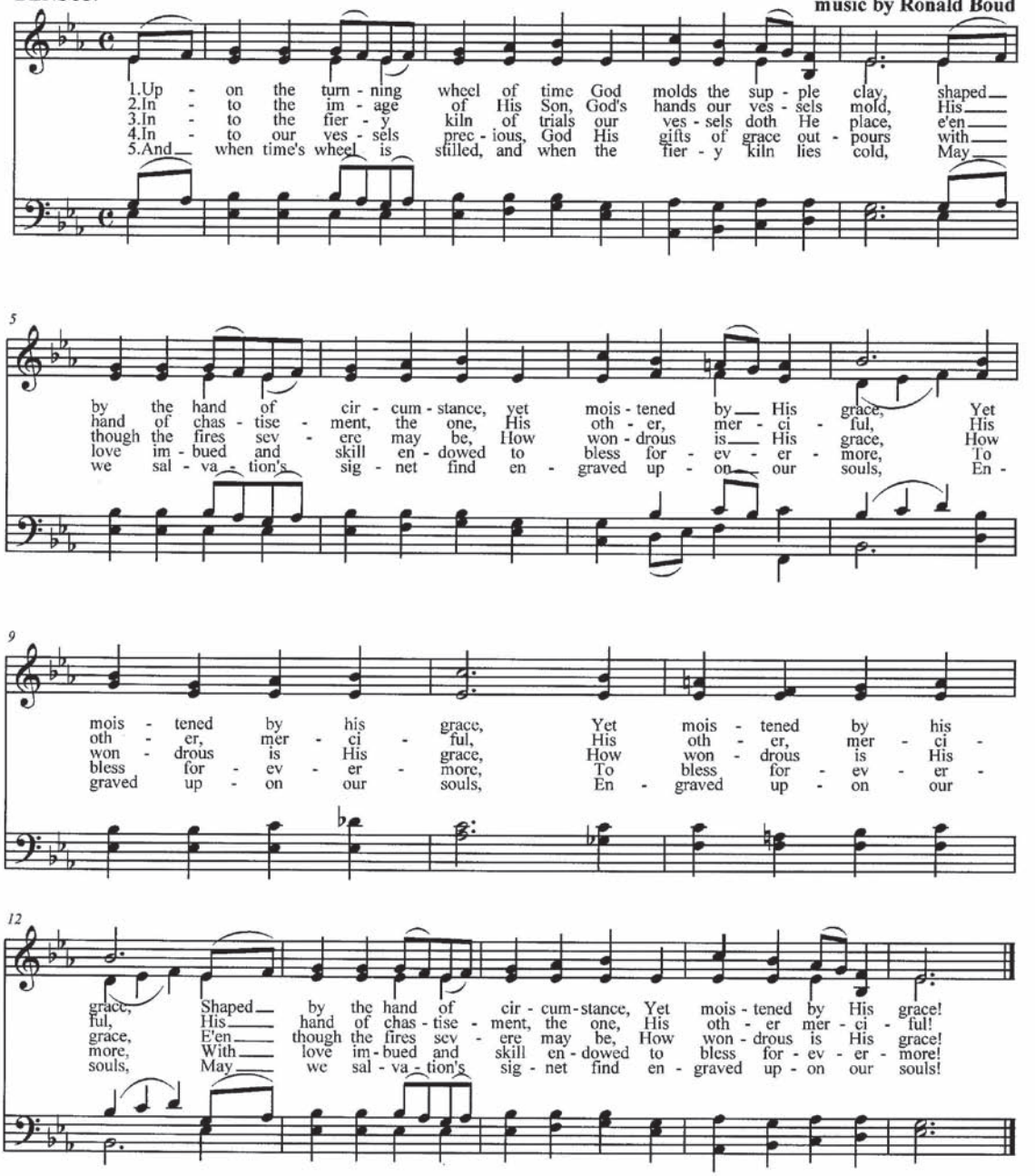


Upon the Turning Wheel of Time

BENSON

dedicated to Mr. Lee Benson

words by Randall Bush
music by Ronald Boud



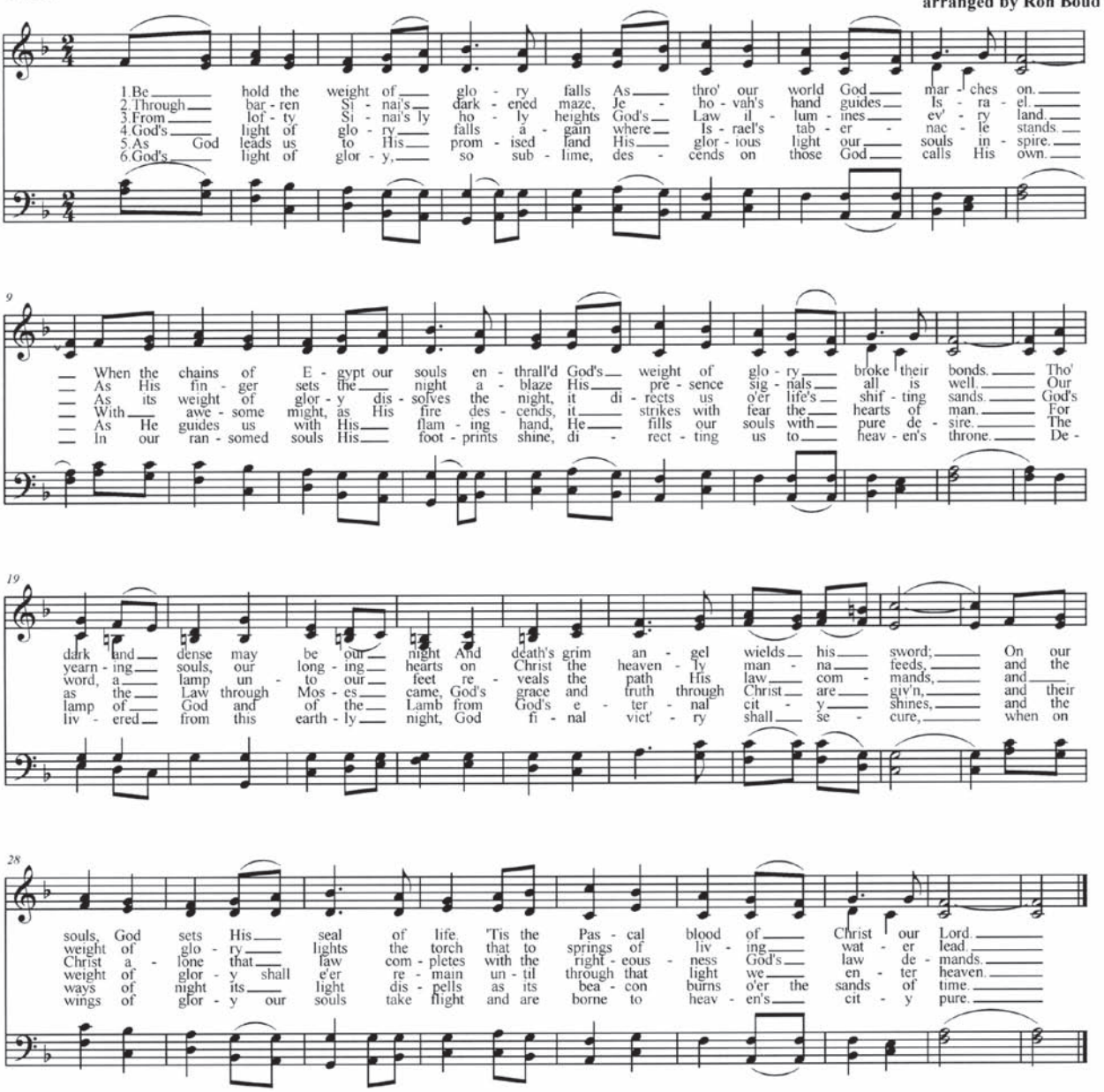
Behold the Weight of Glory Falls

dedicated to Dr. Hal Poe

Exodus 13:20-22, 1 Corinthians 10:1-4

POE

words and music by Randall Bush
arranged by Ron Boud



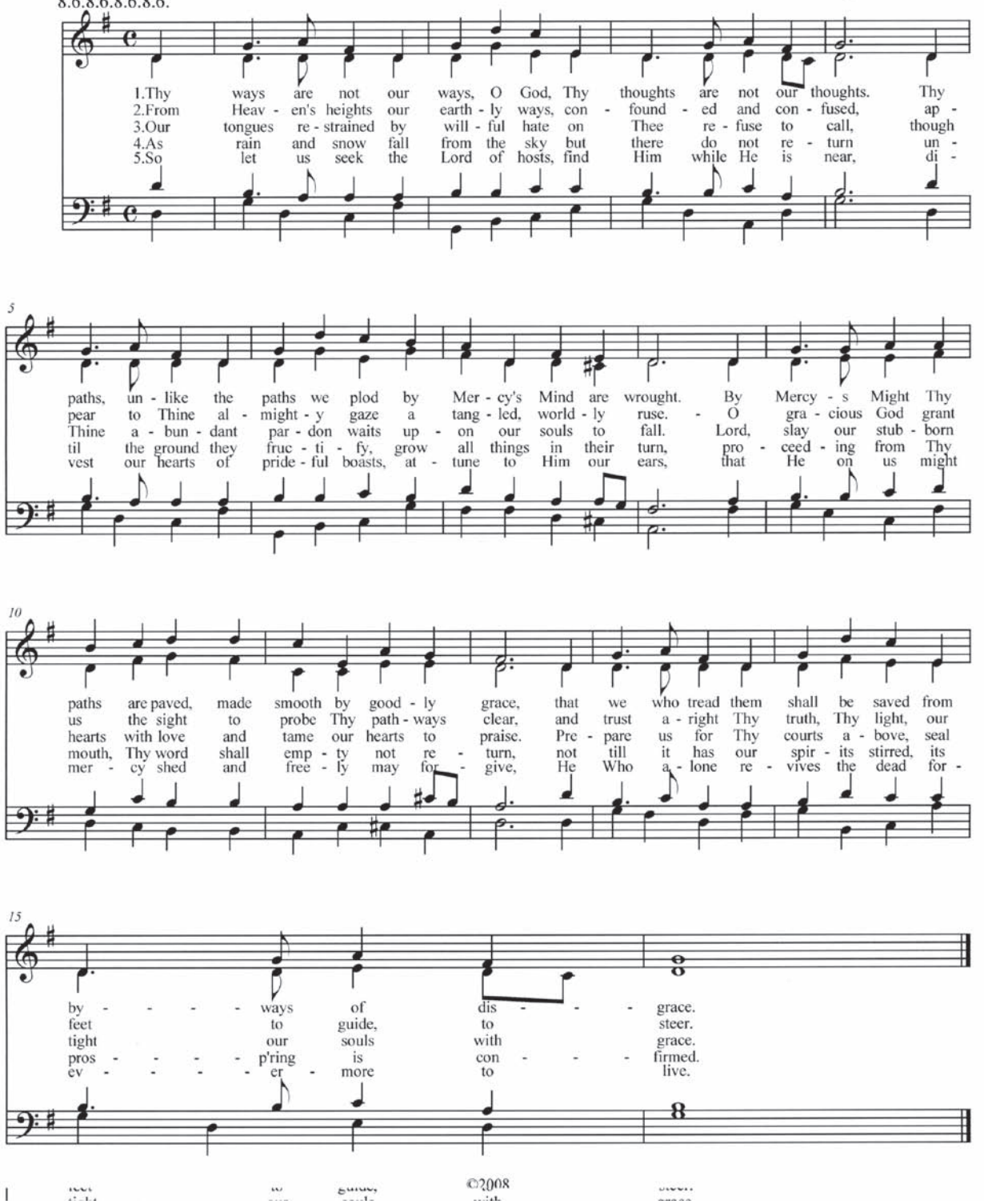
2007

Thy Ways Are Not Our Ways, O God

dedicated to Dr. Michael Penny
Isaiah 55:6-11

PENNY
8.6.8.6.8.6.8.6.

words and music by Randall Bush

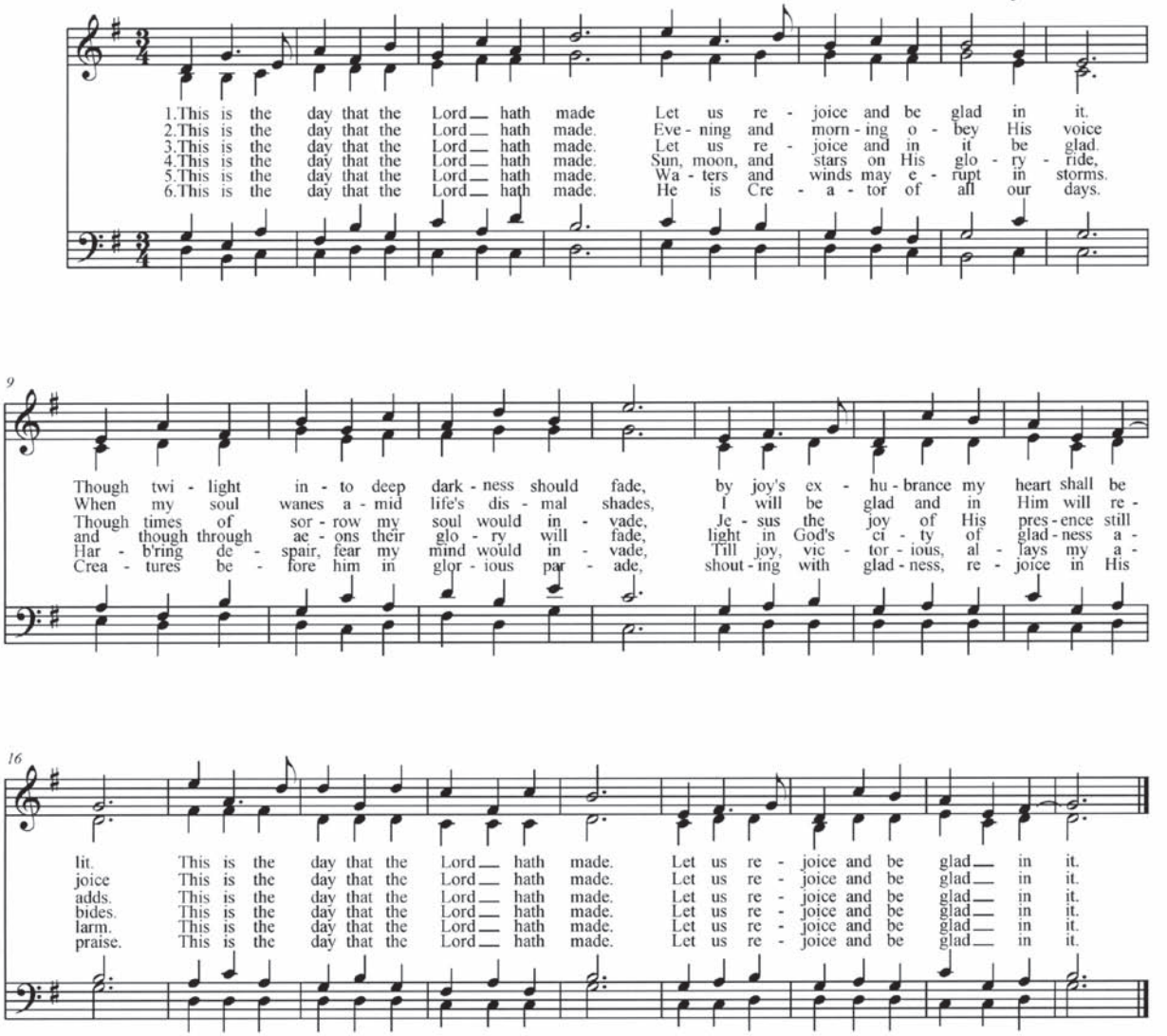


This is the Day that the Lord Hath Made

dedicated to Mrs. Marilyn Joiner

JOINER

words and music by Randall Bush

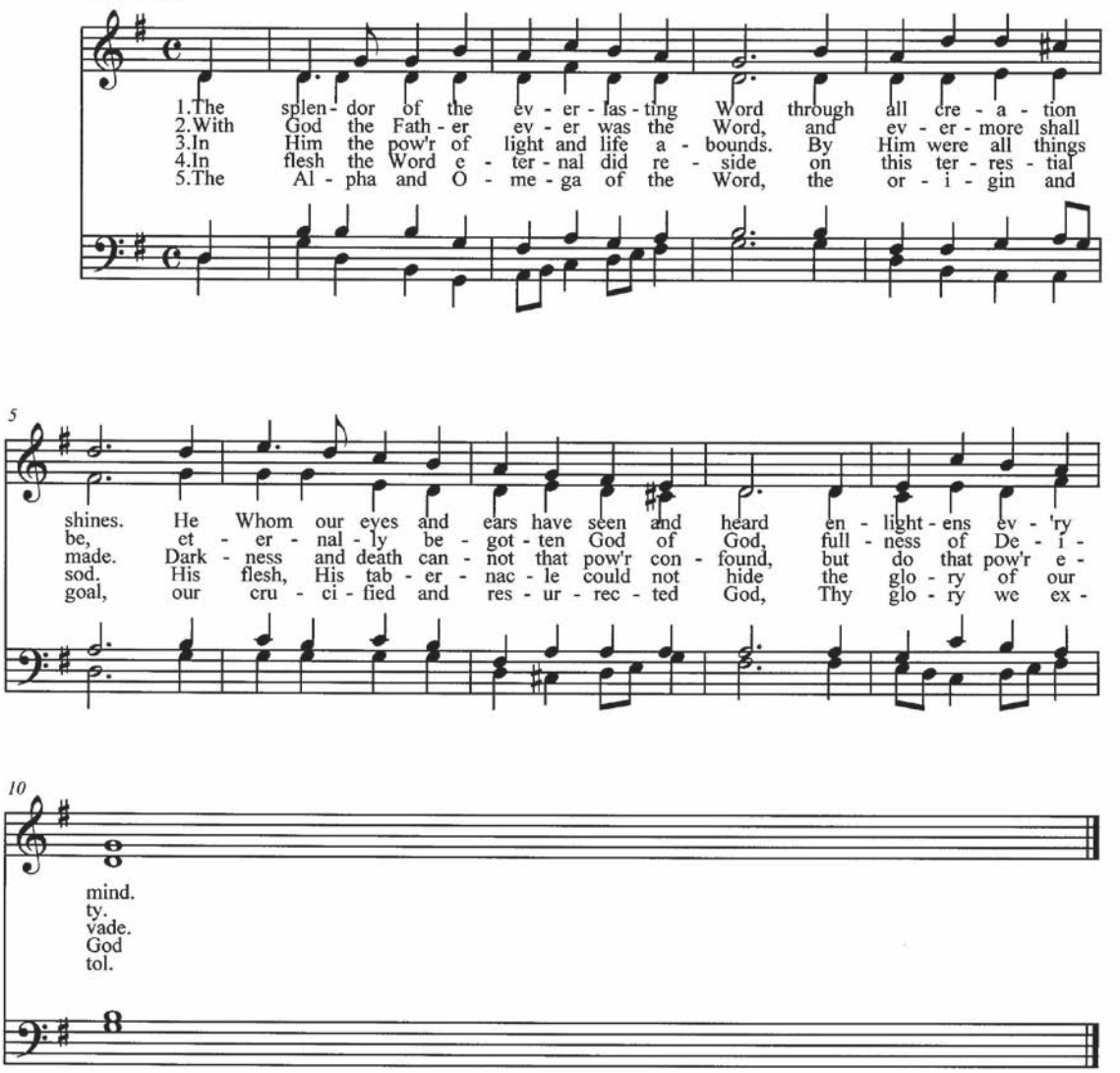


The Splendor of the Everlasting Word

dedicated to Dr. Brad Green
John 1:1-14

GREEN
10.6.10.6

Randall Bush



Thou Son of Man in Light Arrayed

dedicated to President David Dockery

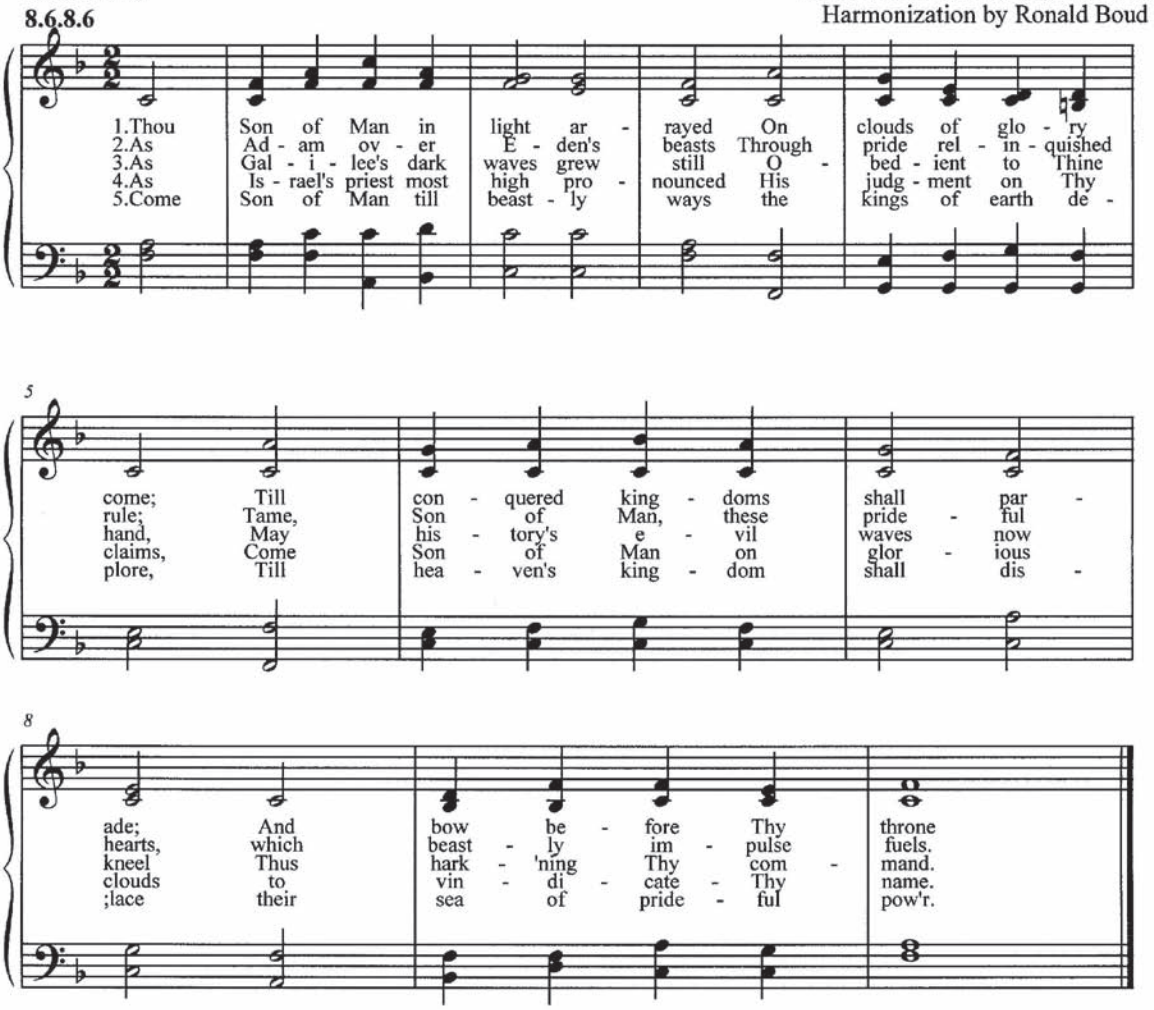
Daniel 7:11-14

DOCKERY

8.6.8.6

Words and Music by Randall Bush

Harmonization by Ronald Boud

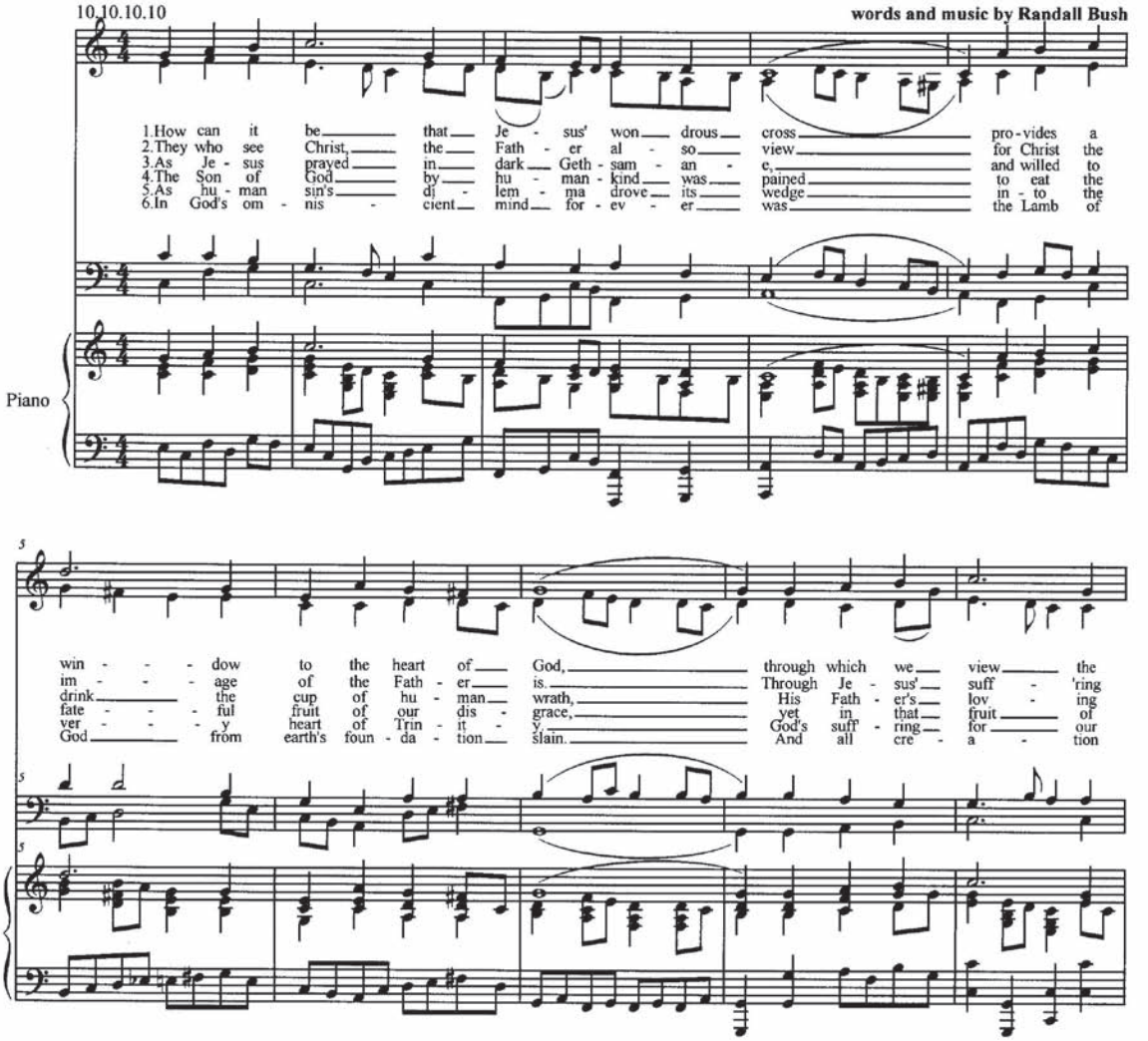


How Can it Be that Jesus' Wondrous Cross

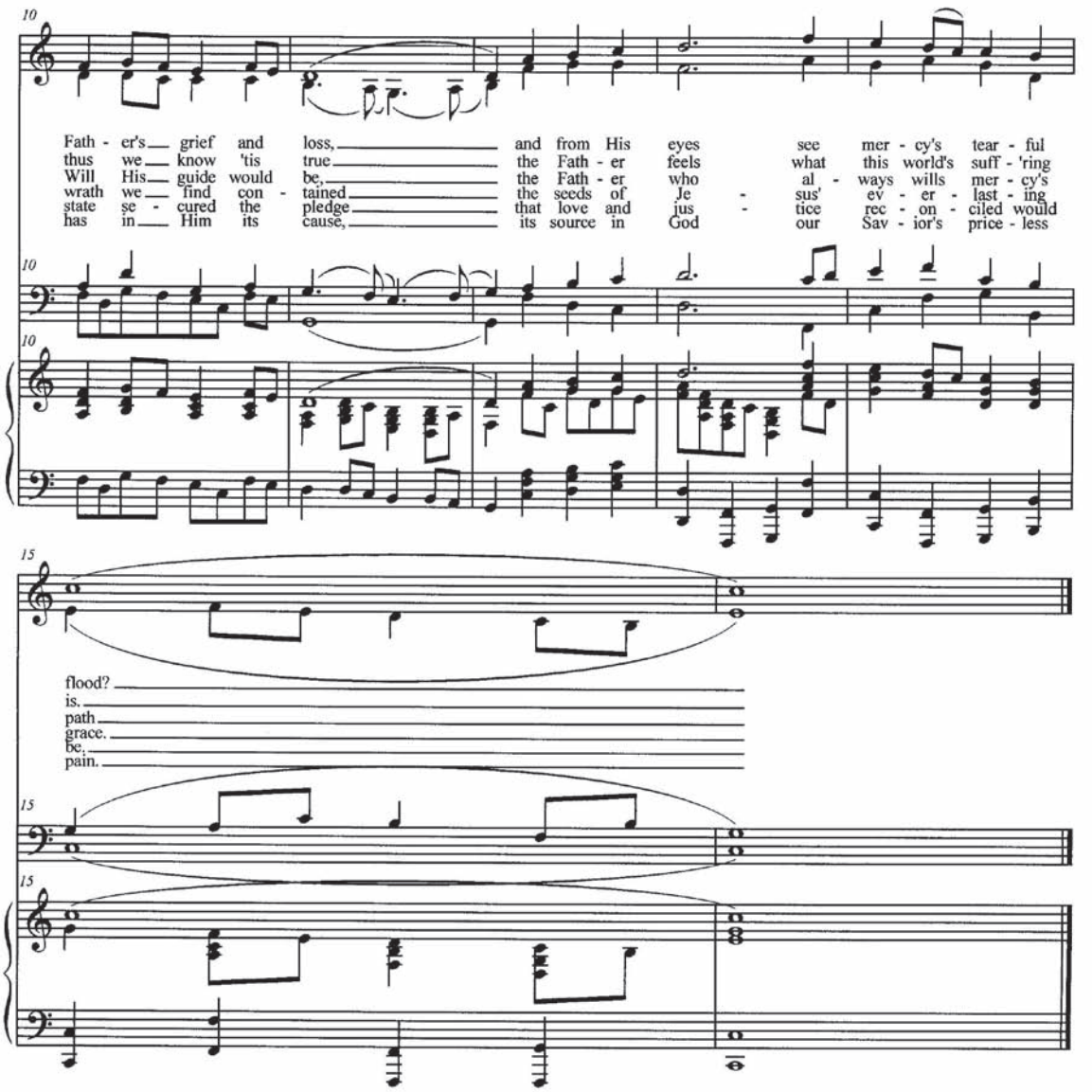
dedicated to Revd. Paul Fiddes, D.Phil, D.D. (Oxon)

FIDDES
10.10.10.10

words and music by Randall Bush



How Can it Be that Jesus' Wondrous Cross

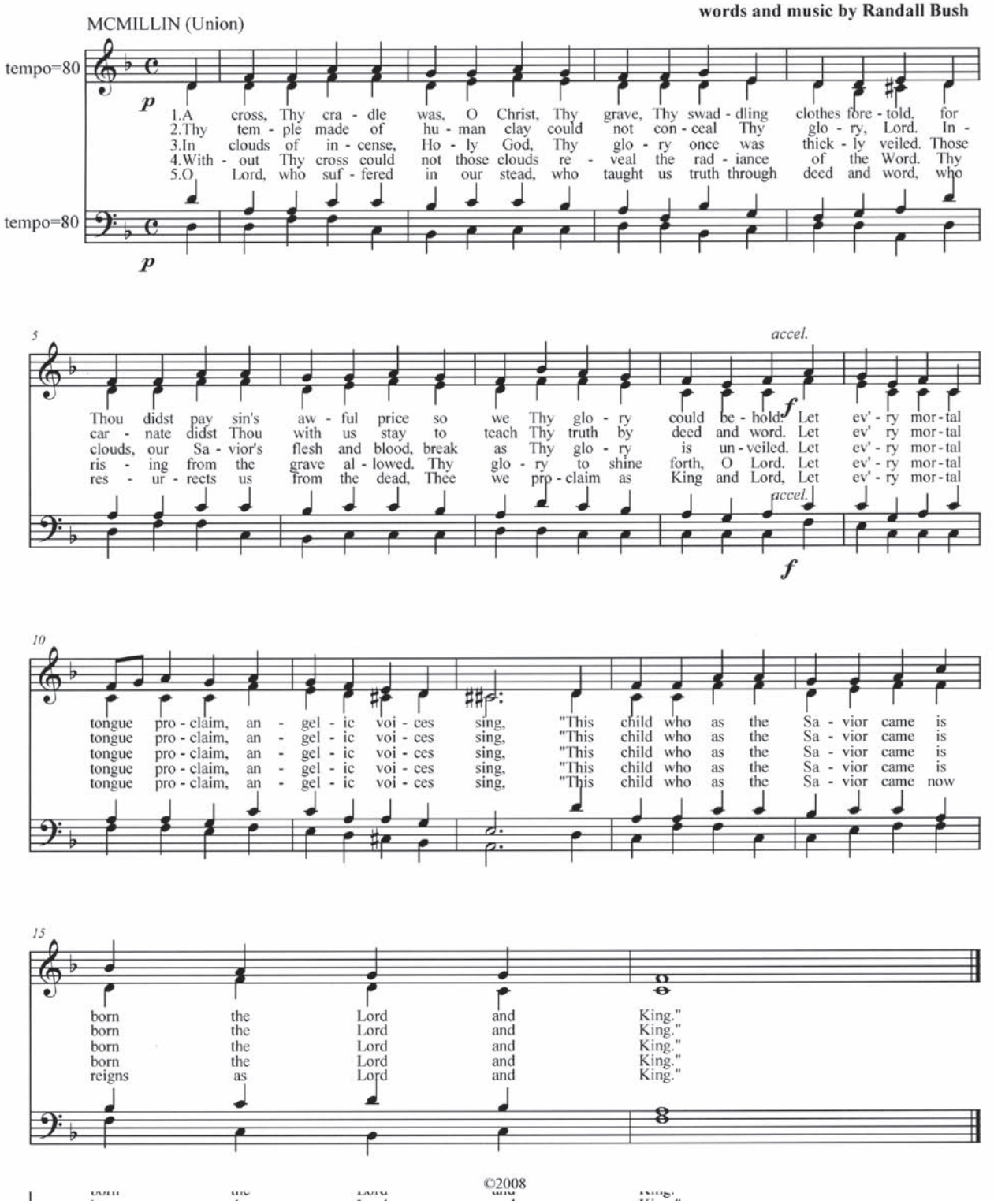


A Cross, Thy Cradle Was, O Christ

dedicated to Dr. Barbara McMillin

"These are the tokens ye shall mark--
The swaddling clothes and manger dark." Martin Luther

words and music by Randall Bush

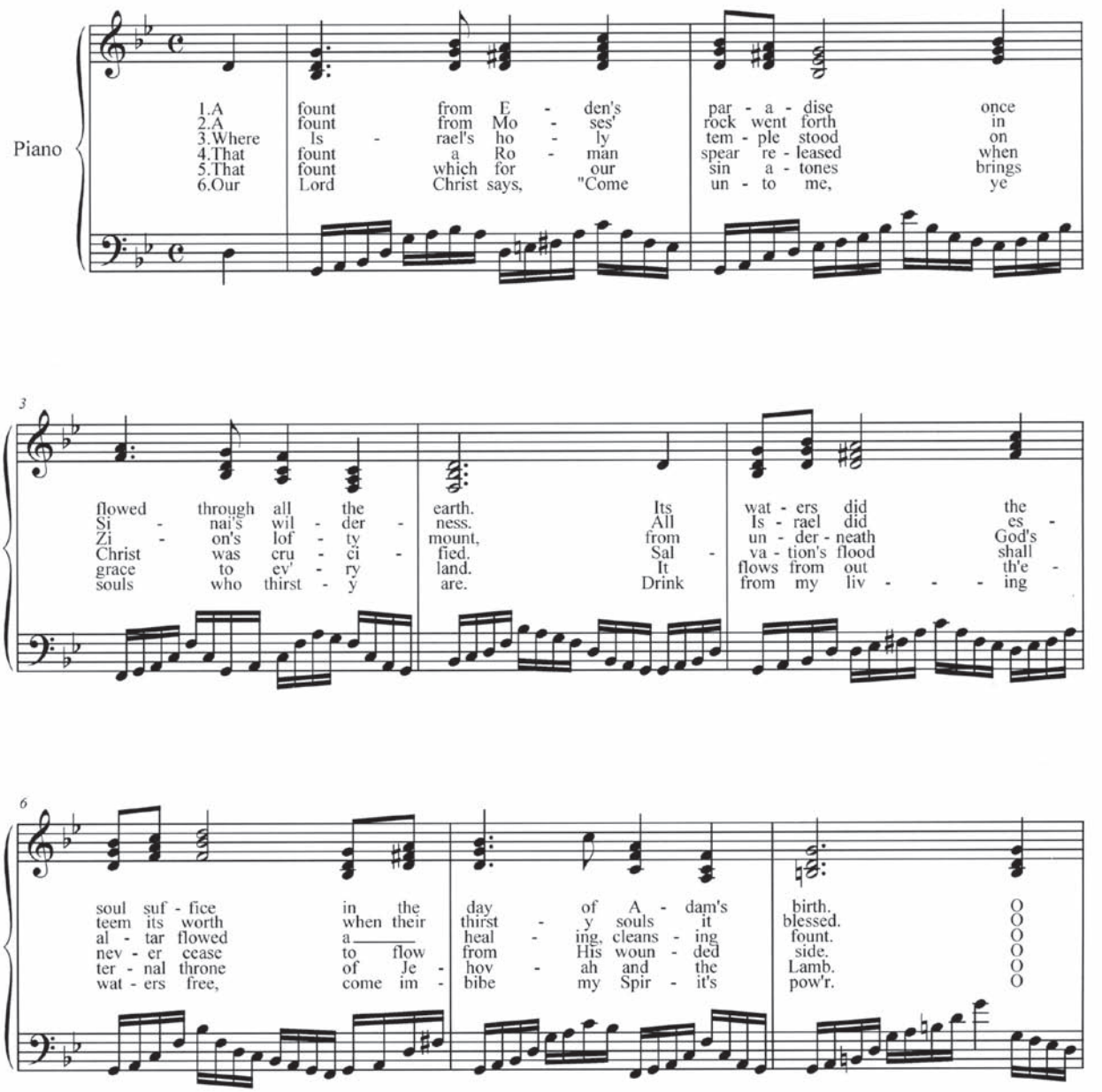


Jesus, Font of Paradise

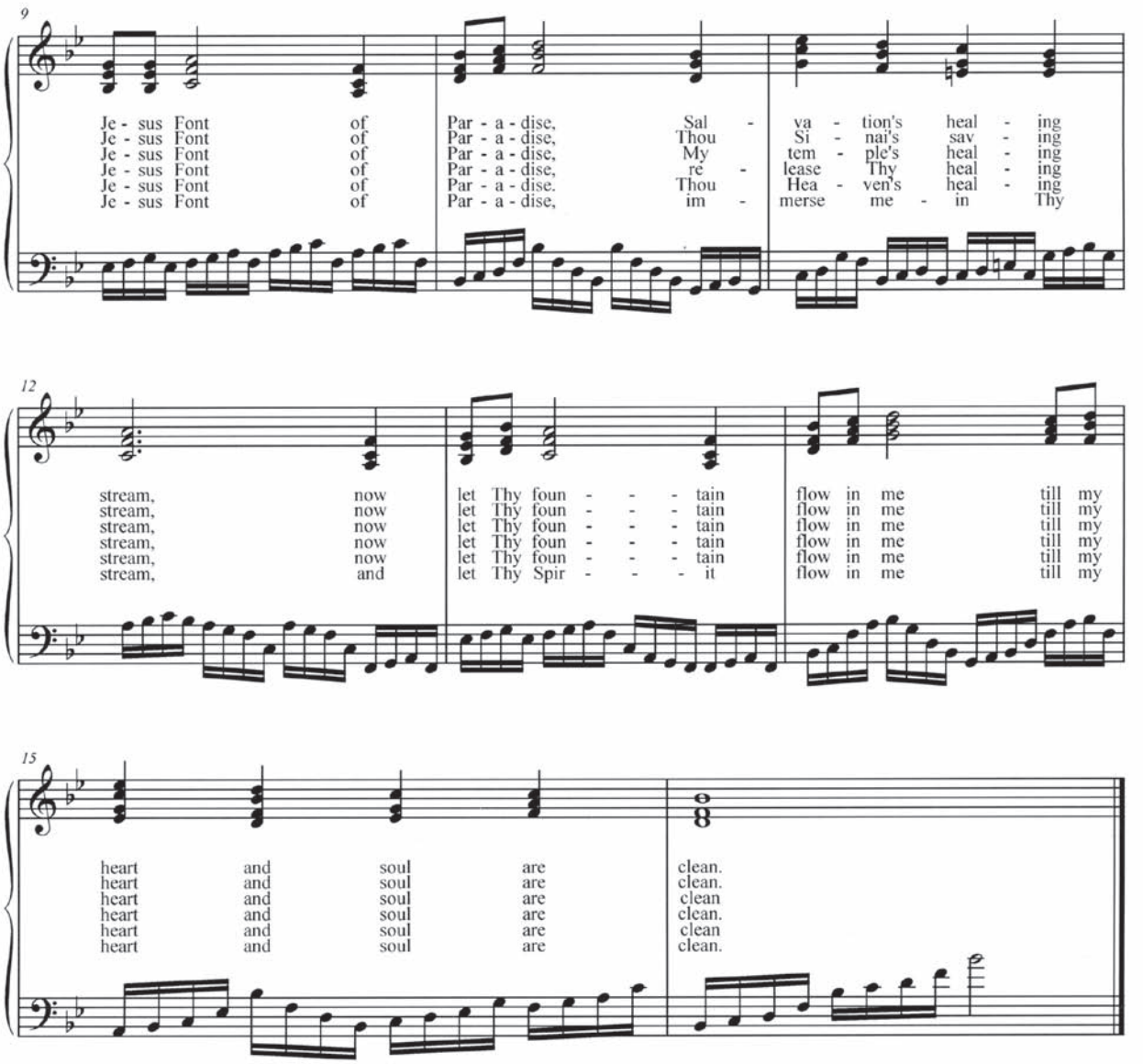
Dedicated to Dr. Gary Smith
John 7:37-38

words and music by Randall Bush

SMITH (Union)



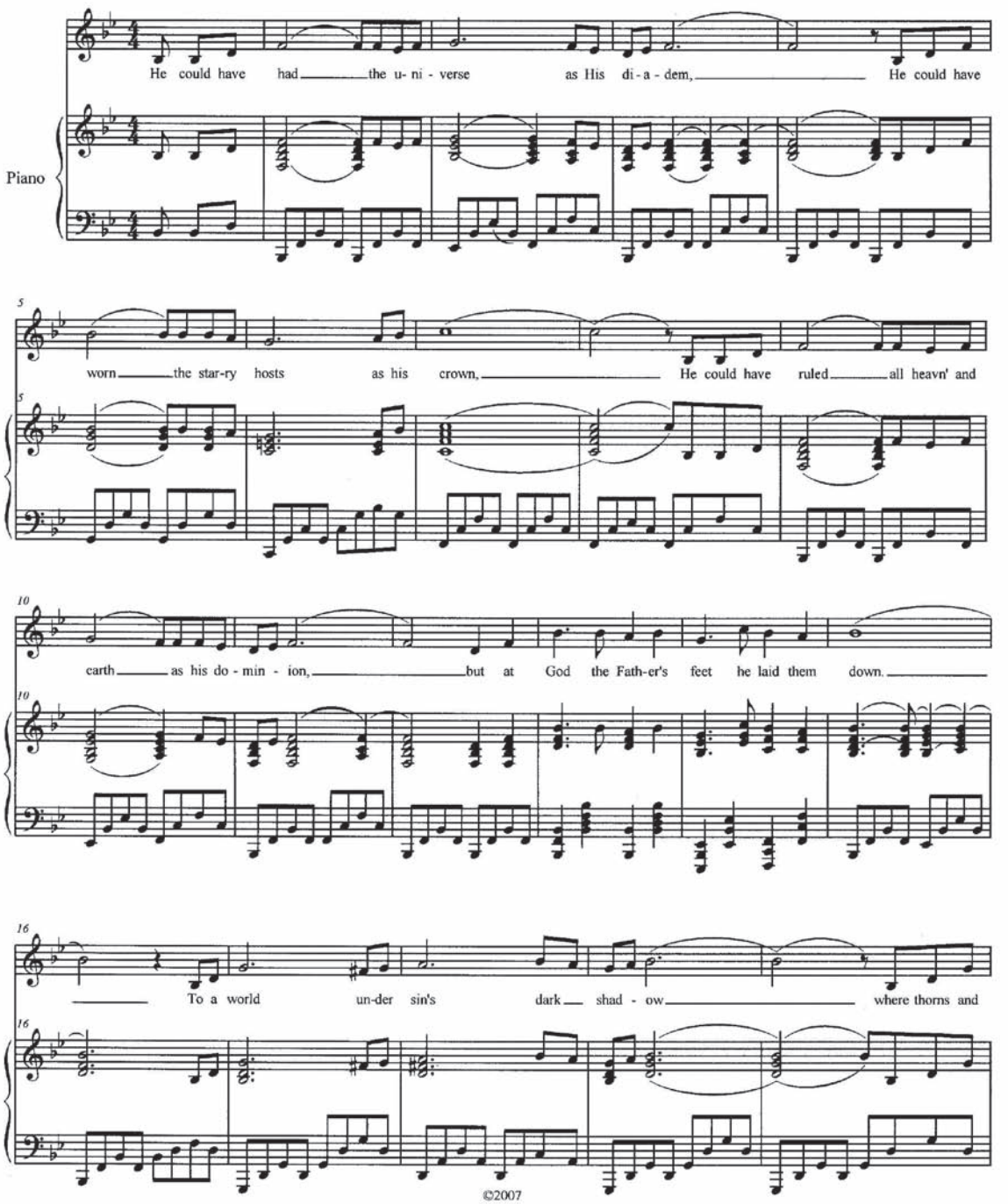
2

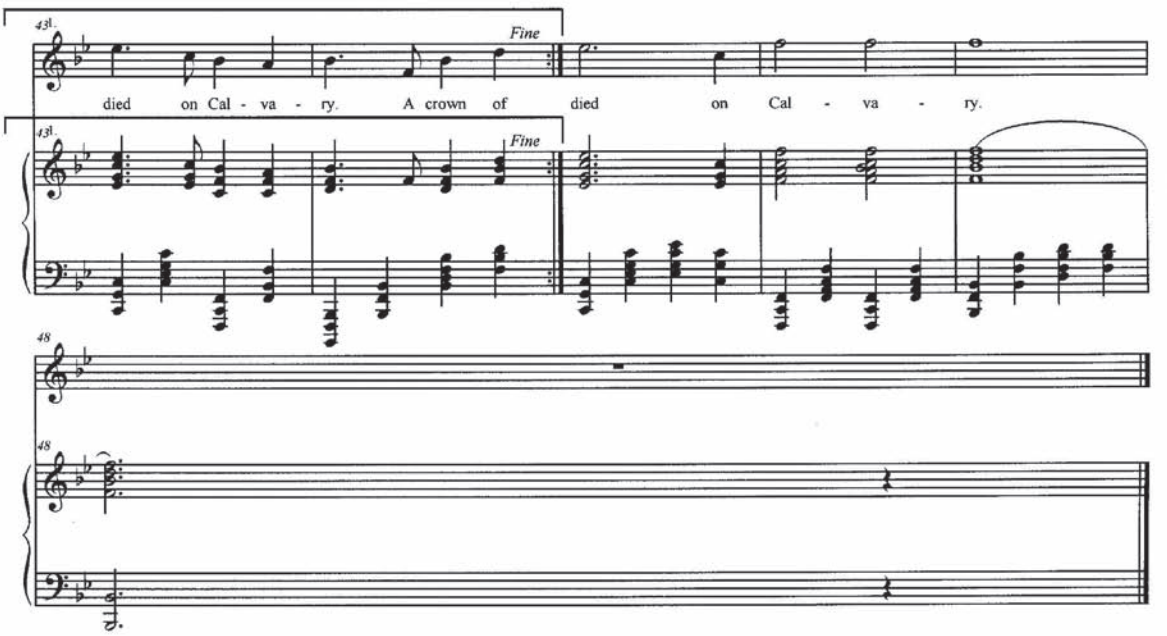

9
Je - sus Font of Par - a - dise, Sal - va - tion's heal - ing
Je - sus Font of Par - a - dise, Thou Si - nai's sav - ing
Je - sus Font of Par - a - dise, My tem - ple's heal - ing
Je - sus Font of Par - a - dise, re - lease Thy heal - ing
Je - sus Font of Par - a - dise. Thou Hea - ven's heal - ing
Je - sus Font of Par - a - dise, im - merse me - in Thy
12
stream, now let Thy foun - - - tain flow in me till my
stream, now let Thy foun - - - tain flow in me till my
stream, now let Thy foun - - - tain flow in me till my
stream, now let Thy foun - - - tain flow in me till my
stream, now let Thy foun - - - tain flow in me till my
stream, and let Thy Spir - - - it flow in me till my
15
heart and soul are clean.
heart and soul are clean.
heart and soul are clean
heart and soul are clean.
heart and soul are clean
heart and soul are clean.

The Crown of Thorns He Wore

Dedicated to
Chuck Williams

Randall Bush



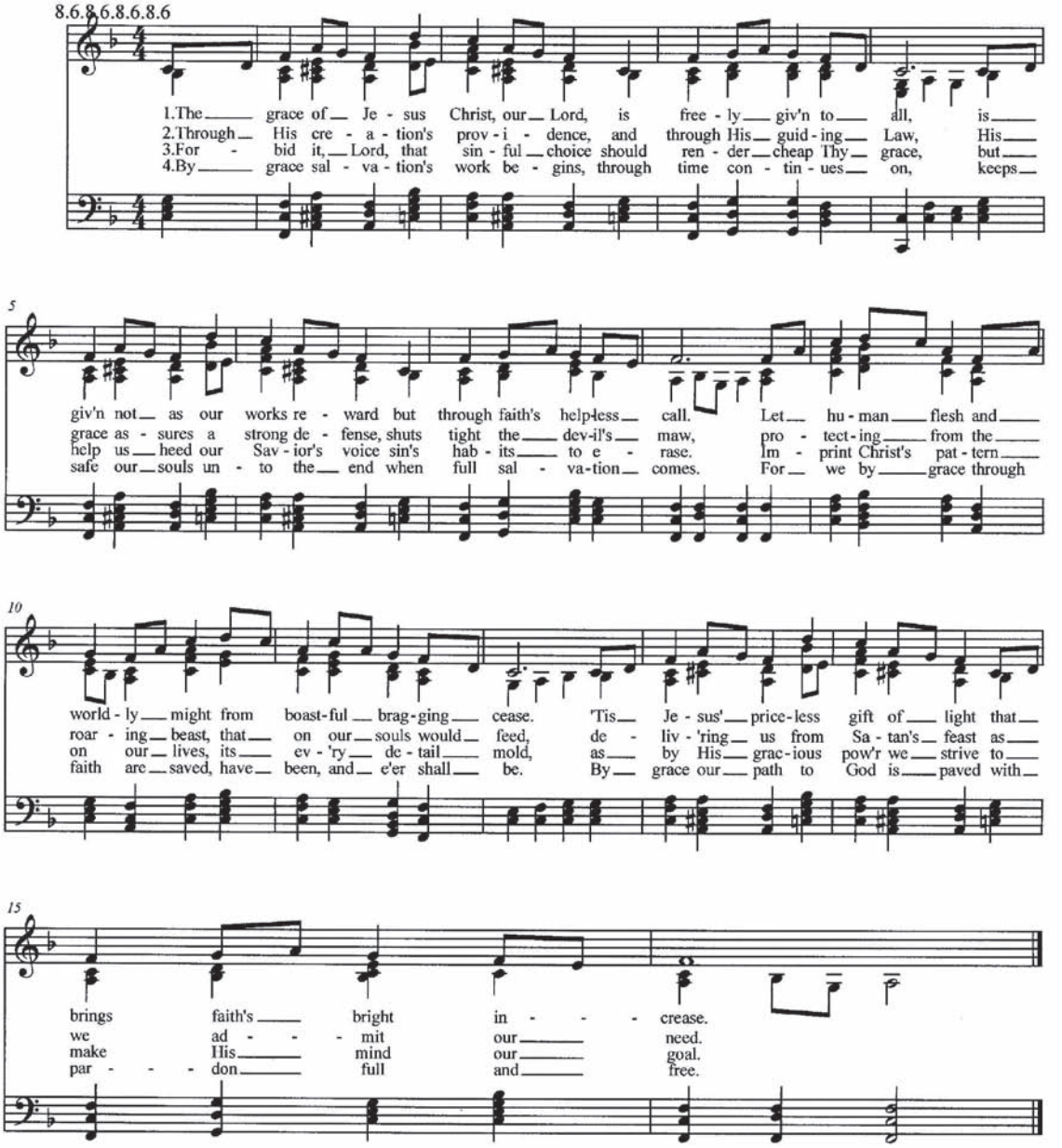

43.
Fine
died on Cal - va - ry. A crown of died on Cal - va - ry.
43.
Fine
48
48

The Grace of Jesus Christ, Our Lord

dediated to Dr. Hyran Barefoot
Ephesians 2:8-9

words and music by Randall Bush

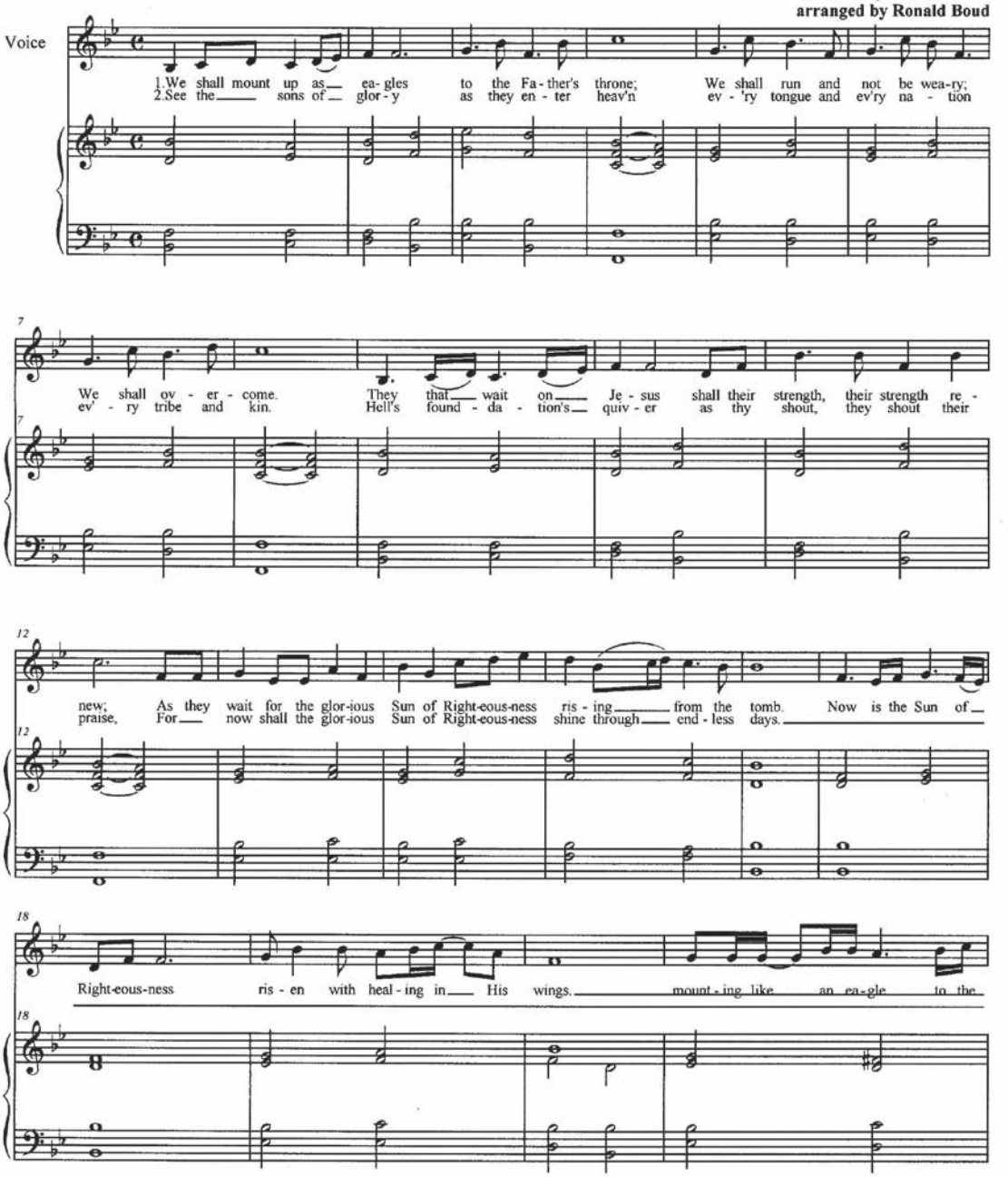
BAREFOOT
8.6.8.6.8.6.8.6



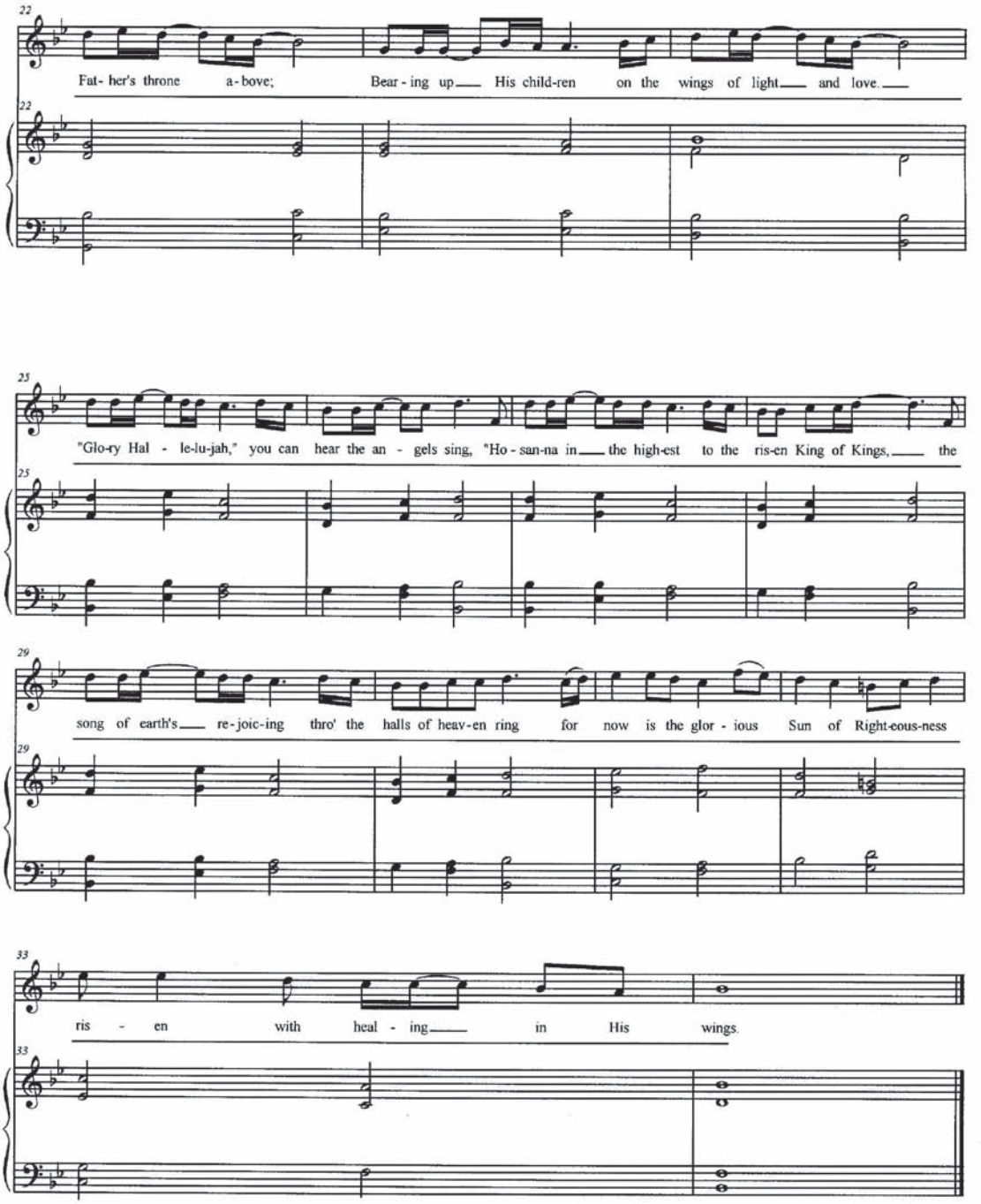
The Risen Sun of Righteousness

dedicated to Kelvin Moore

words and music by Randall Bush
arranged by Ronald Boud



The Risen Sun of Righteousness
REFRAIN



The King of Kings the Distance Goes

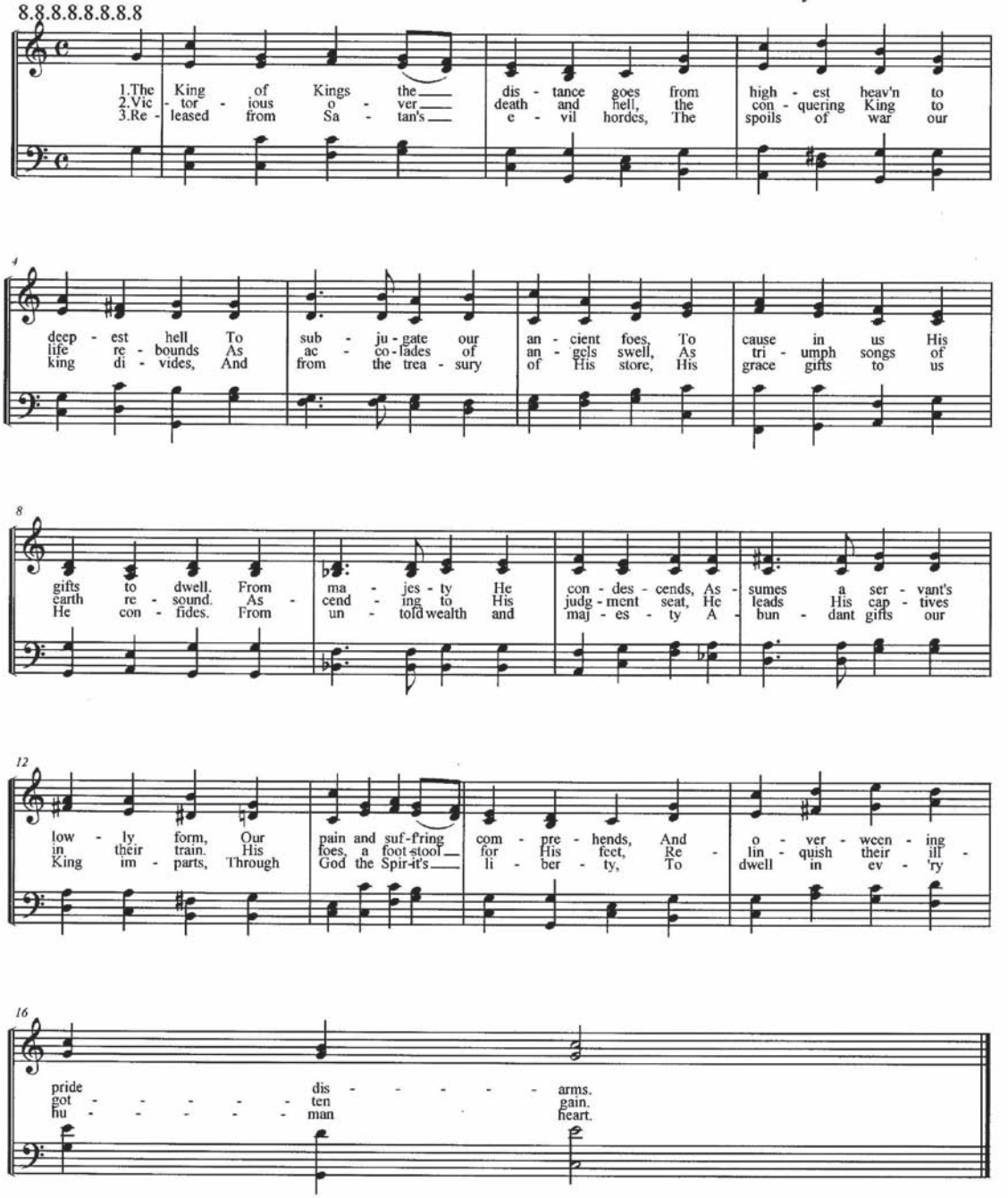
dedicated to Dr. Bert Dominy

Ephesians 4:8-11

words by Randall Bush
music by Ronald Boud

DOMINY

8.8.8.8.8.8.8.8



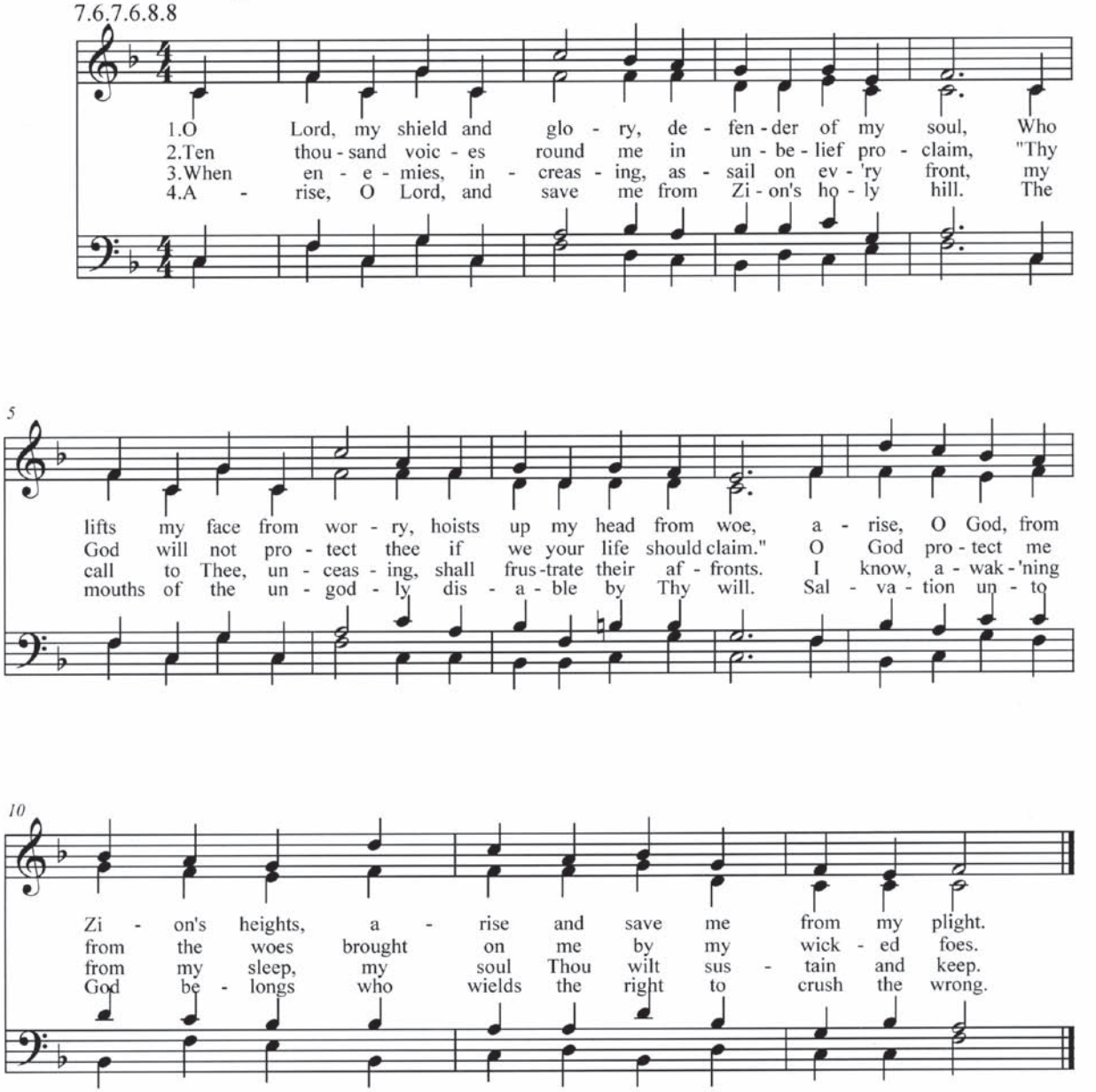
O Lord, My Shield and Glory

dedicated to Dr. John Adams

Psalm 3

ADAMS (Union)
7.6.7.6.8.8

words amd music by Randall Bush

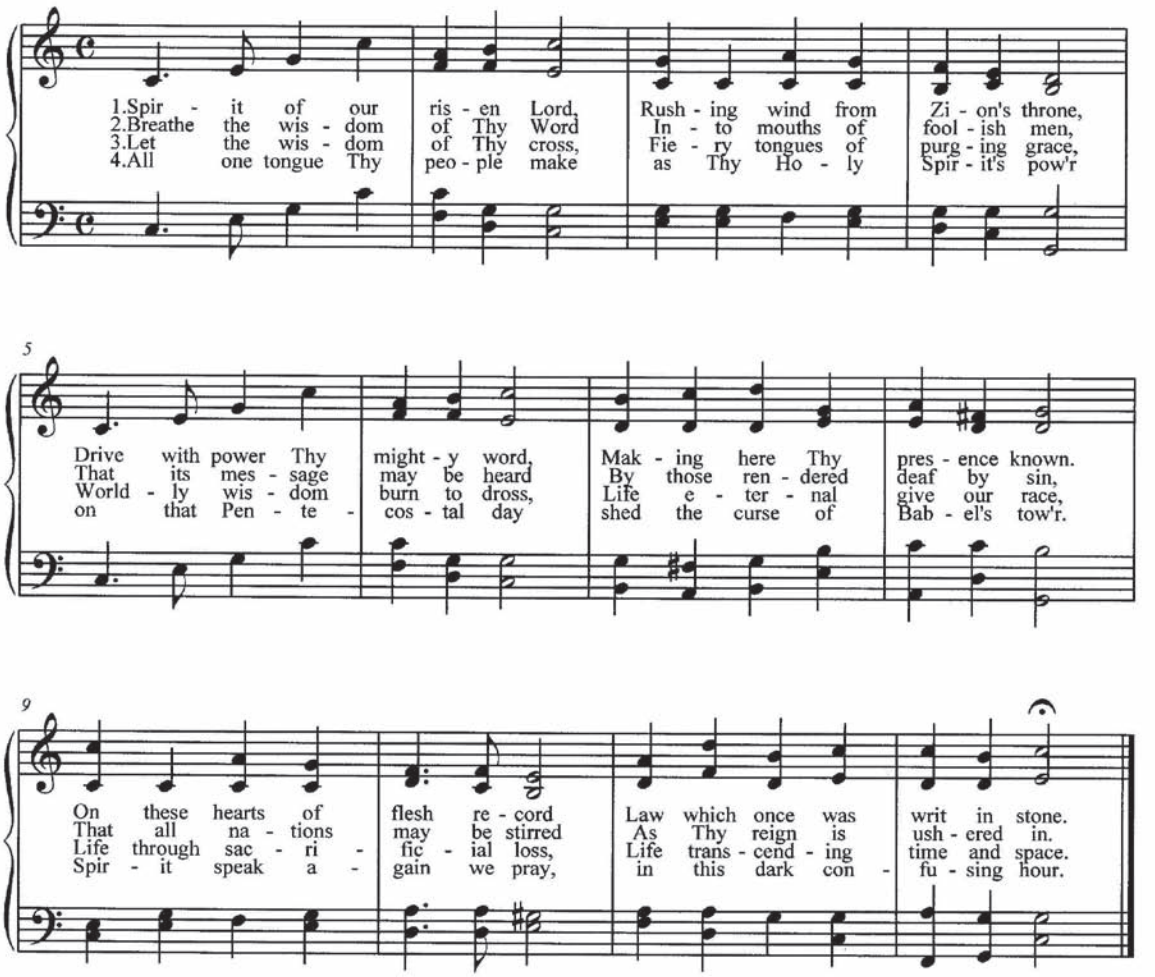


Spirit of our Risen Lord

In memory of Dr. John Kiwiet
Acts 2:1-4

KIWIET
7.7.7.7.7.7.

words and music by Randall Bush
arranged by Ron Boud

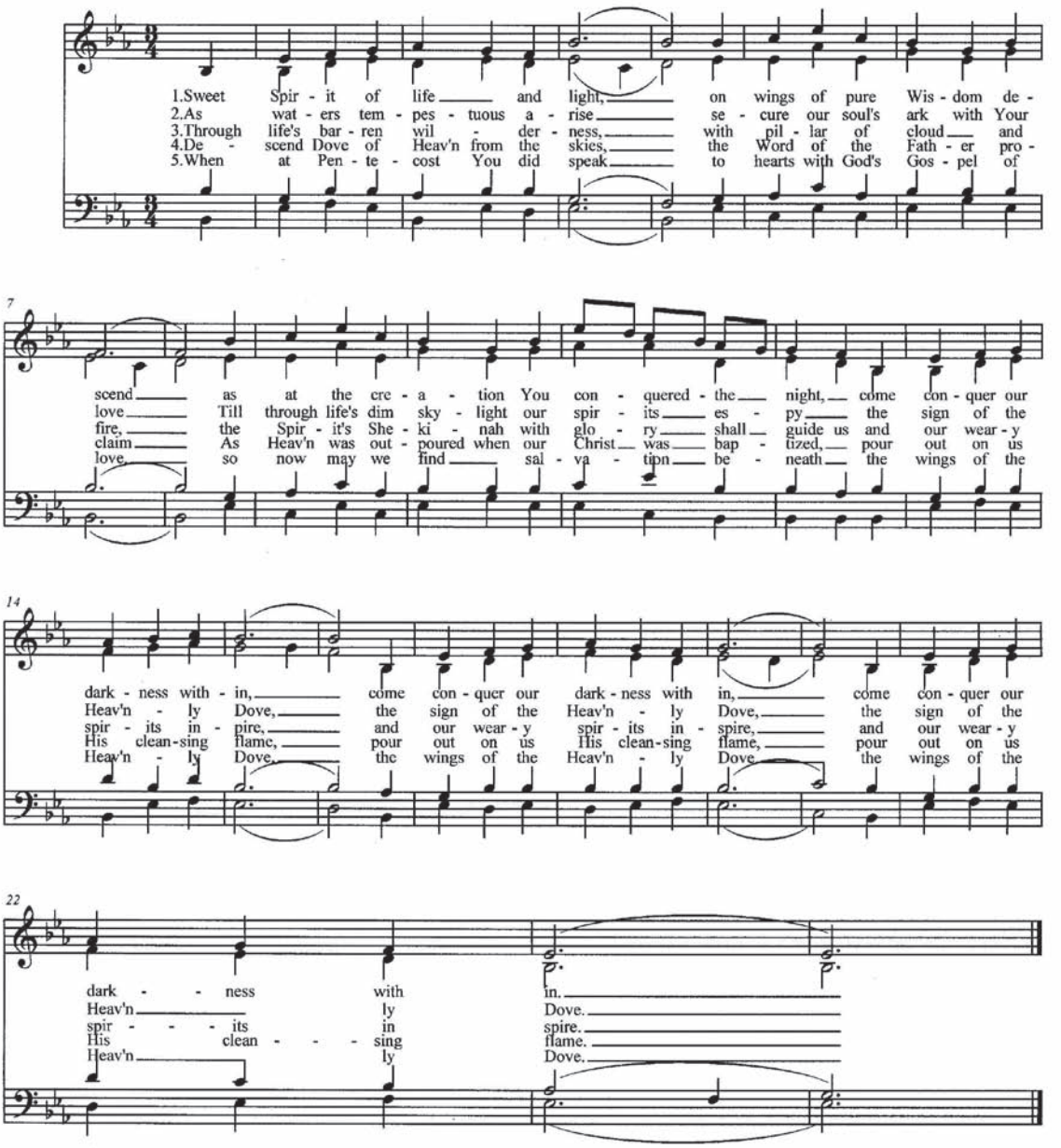


Sweet Spirit of Life and Light

dedicated to Mrs. Christy Young

YOUNG (Union)

words and music by Randall Bush

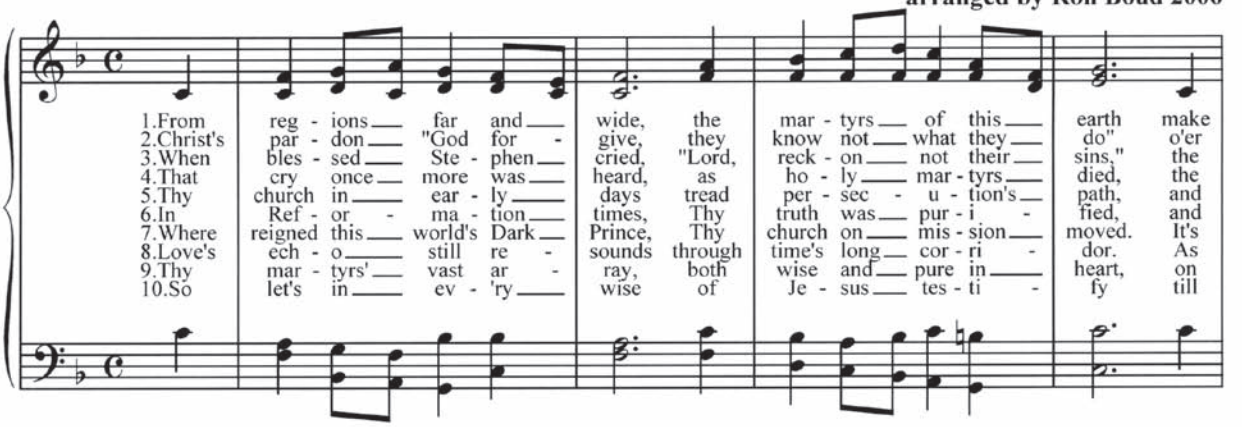


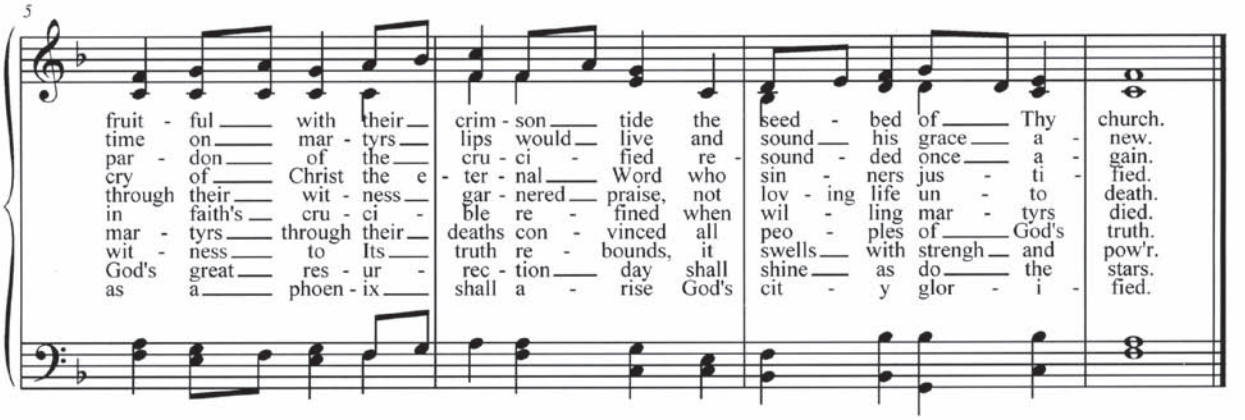
From Regions Far and Wide

dedicated to Dr. James Patterson

PATTERSON

words and music by Randall Bush
arranged by Ron Boud 2006



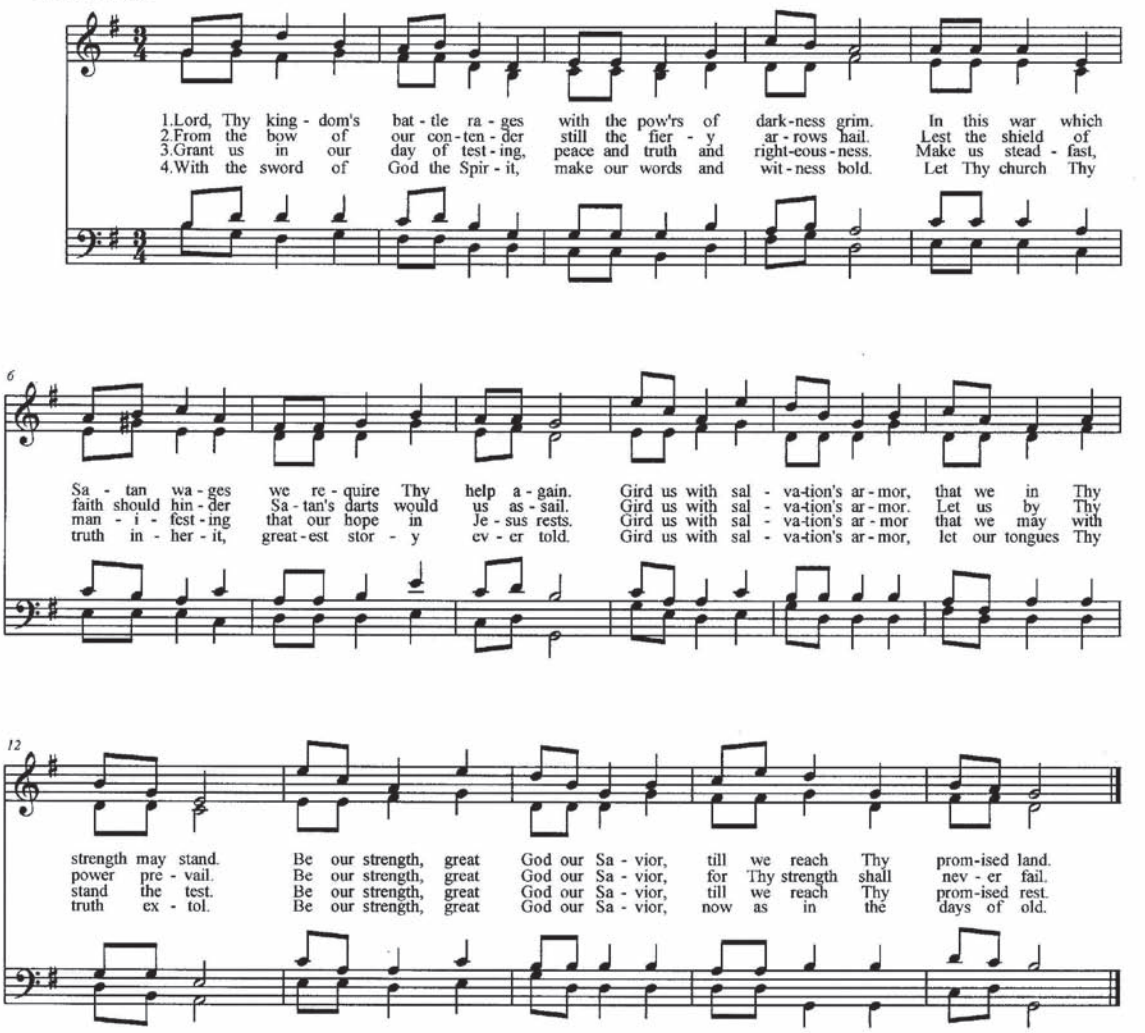


Lord, Thy Kingdom's Battle Rages

In Memory of Dr. Cecil Roper
Ephesians 6:10-17

ROPER
8.7.8.7.8.7.8.7

words and music by Randall Bush

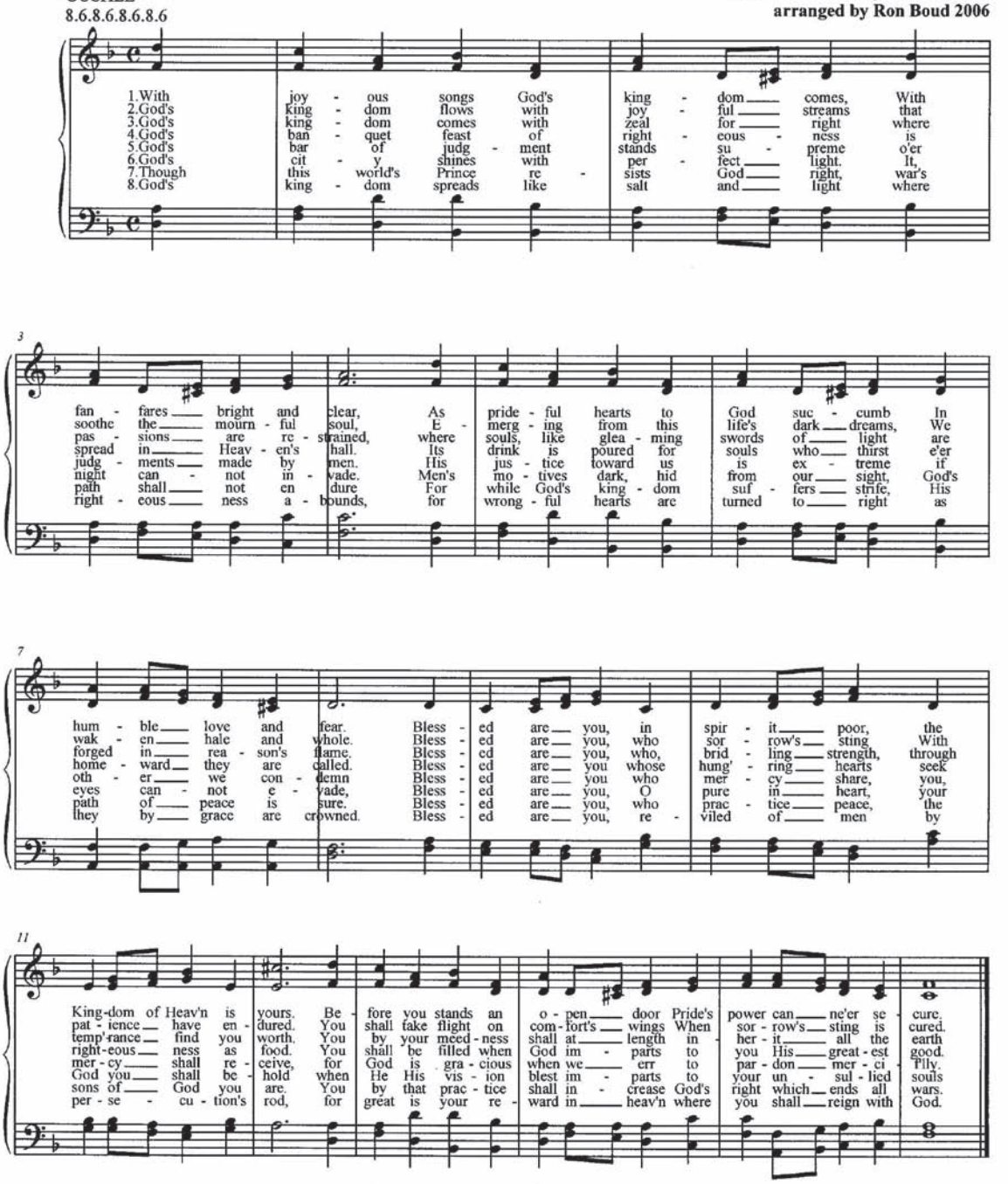


With Joyous Songs God's Kingdom Comes

Dedicated to Dr. David Gushee
Matthew 5:1-12

GUSHEE
8.6.8.6.8.6.8.6

words and music by Randall Bush
arranged by Ron Boud 2006



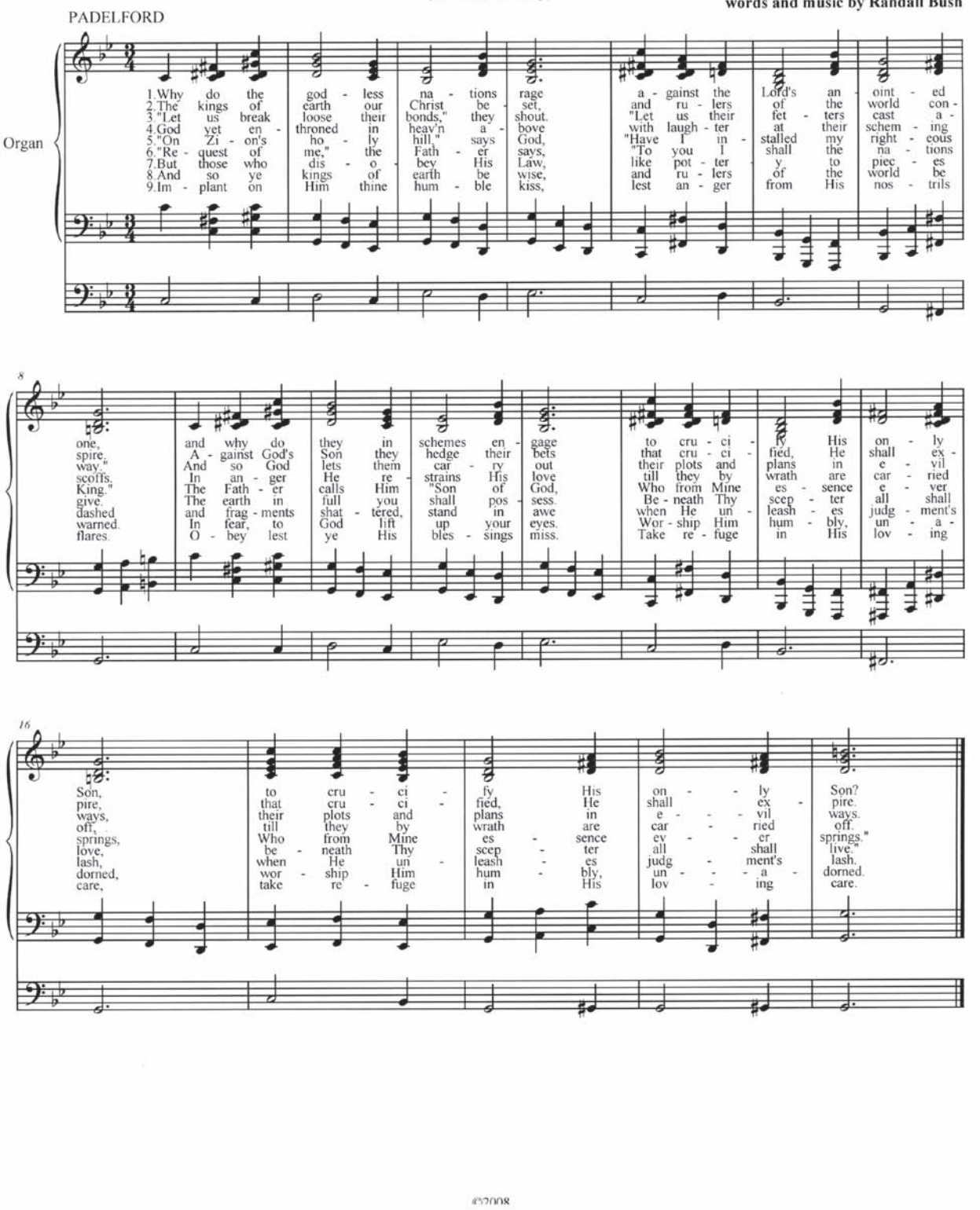
Why do the Godless Nations Rage?

dedicated to Dr. Walton Padelford

Psalm 2

(for Good Friday)

words and music by Randall Bush



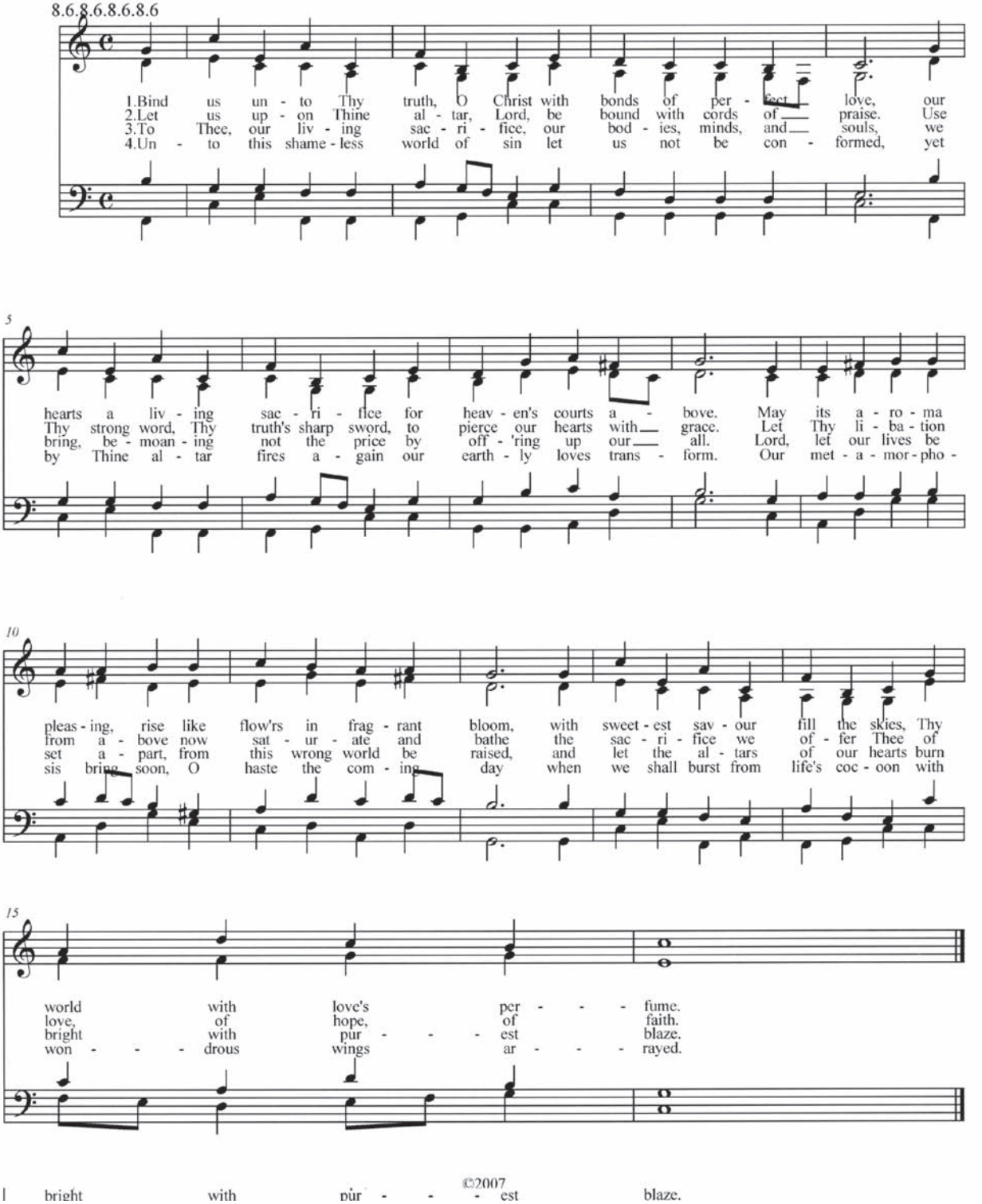
Bind Us unto Thy Truth, O Christ

Romans 12:1-2

RELIGIO ET ERUDITIO

words and music by Randall Bush

8.6.8.6.8.6.8.6

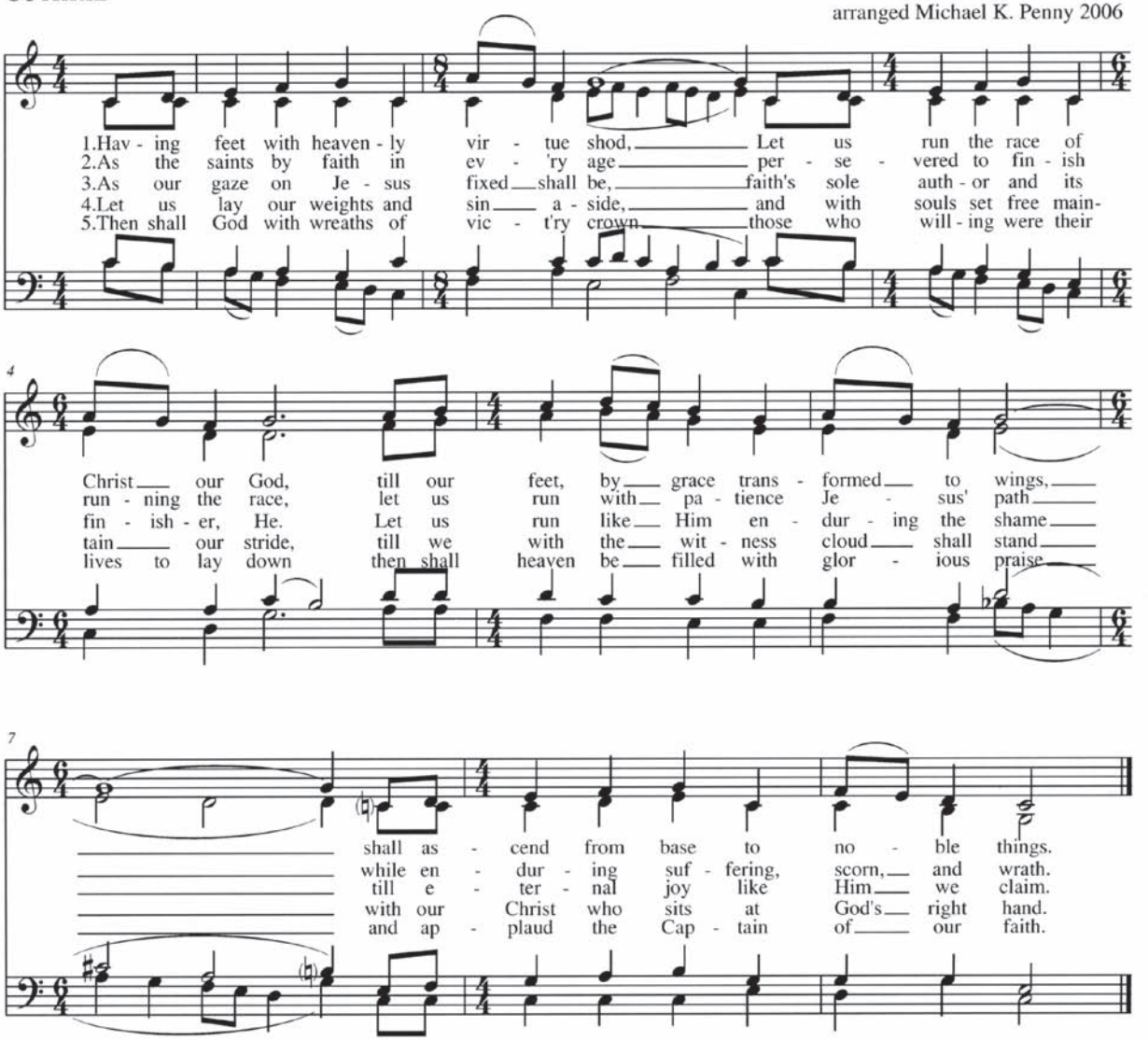


Having Feet With Heavenly Virtue Shod

dedicated to George Guthrie
Hebrews 12:1-3

GUTHRIE

words and music by Randall Bush
arranged Michael K. Penny 2006

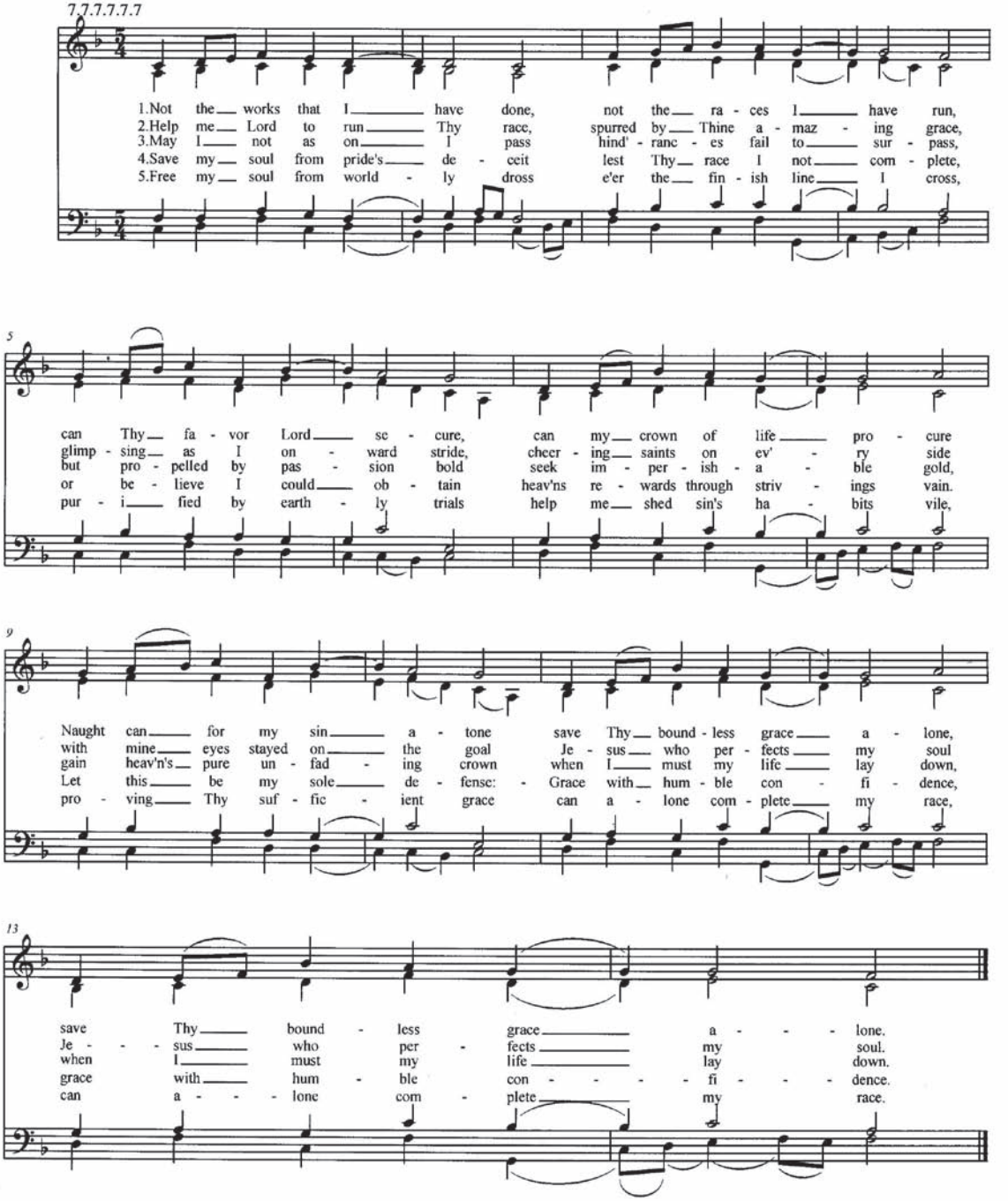


Not the Works that I Have Done

dedicated to Tyler Worley

words and music by Randall Bush

WORLEY
7.7.7.7.7.7

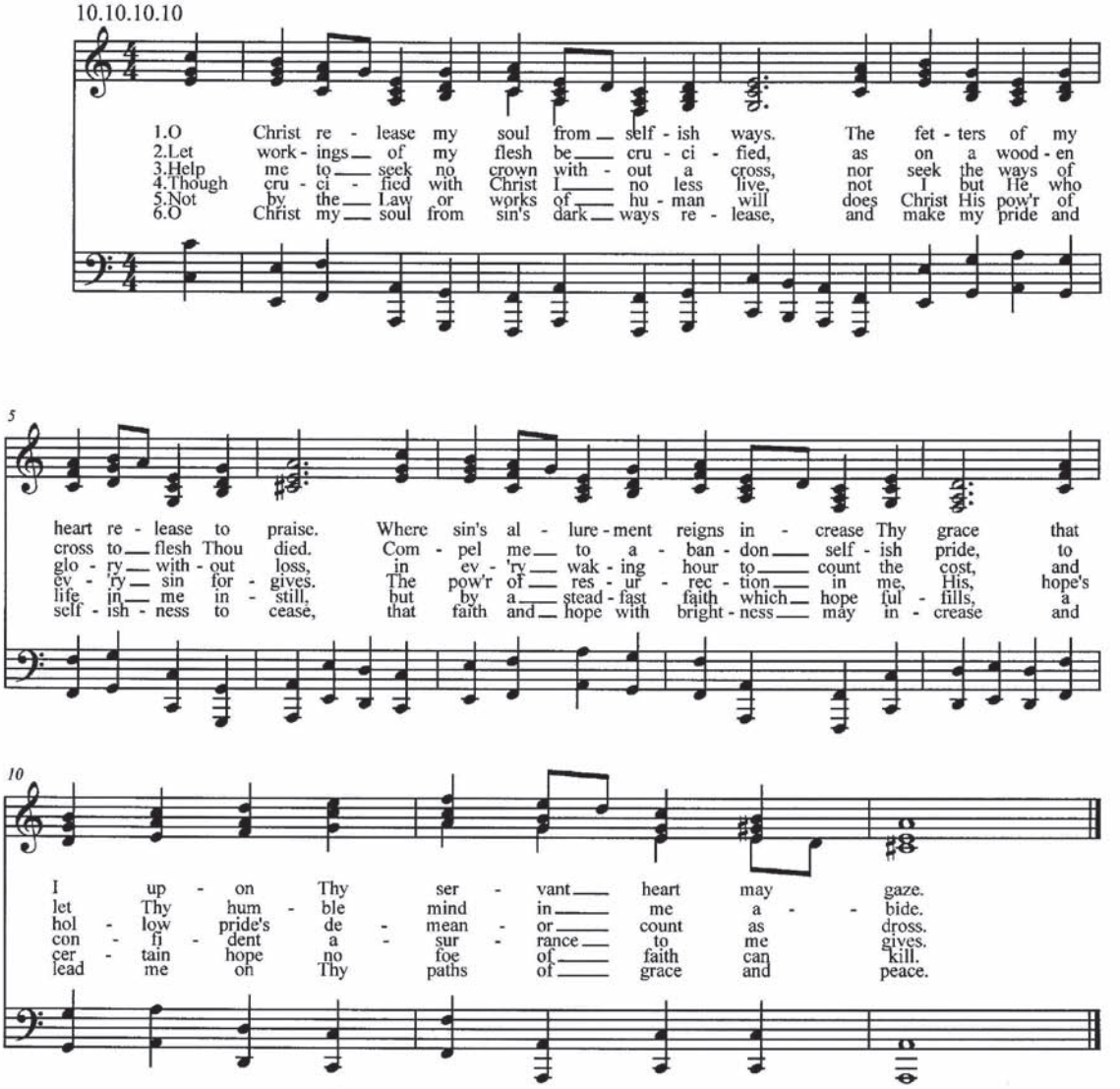


O Christ Release My Soul from Selfish Ways

Galatians 2:17-21

METANOIA
10.10.10.10

words and music byRandall Bush

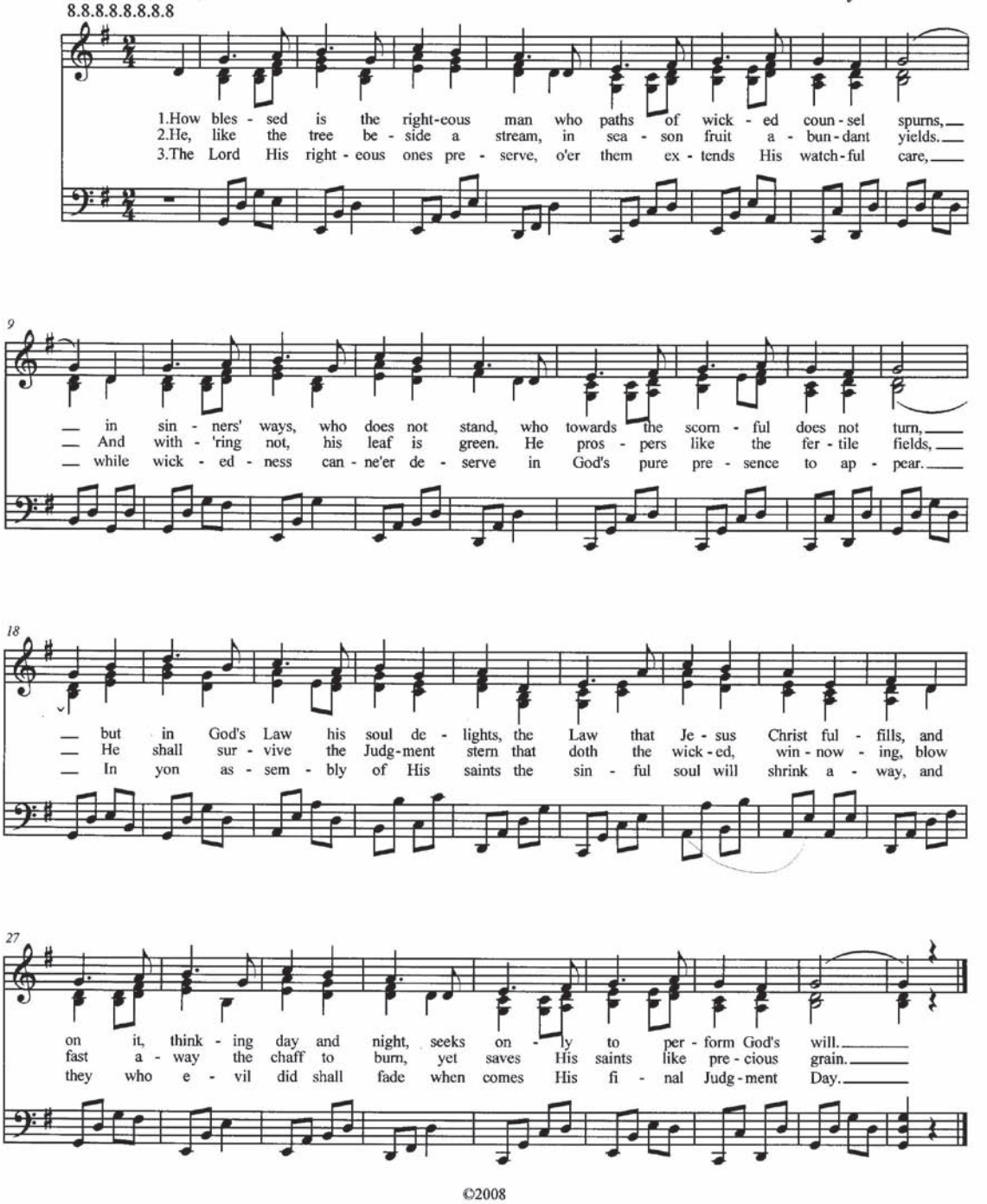


How Blessed Is the Righteous Man

dedicated to Mr. Gary Carter
Psalm 1

CARTER (Union)
8.8.8.8.8.8.8.8

words and music by Randall Bush

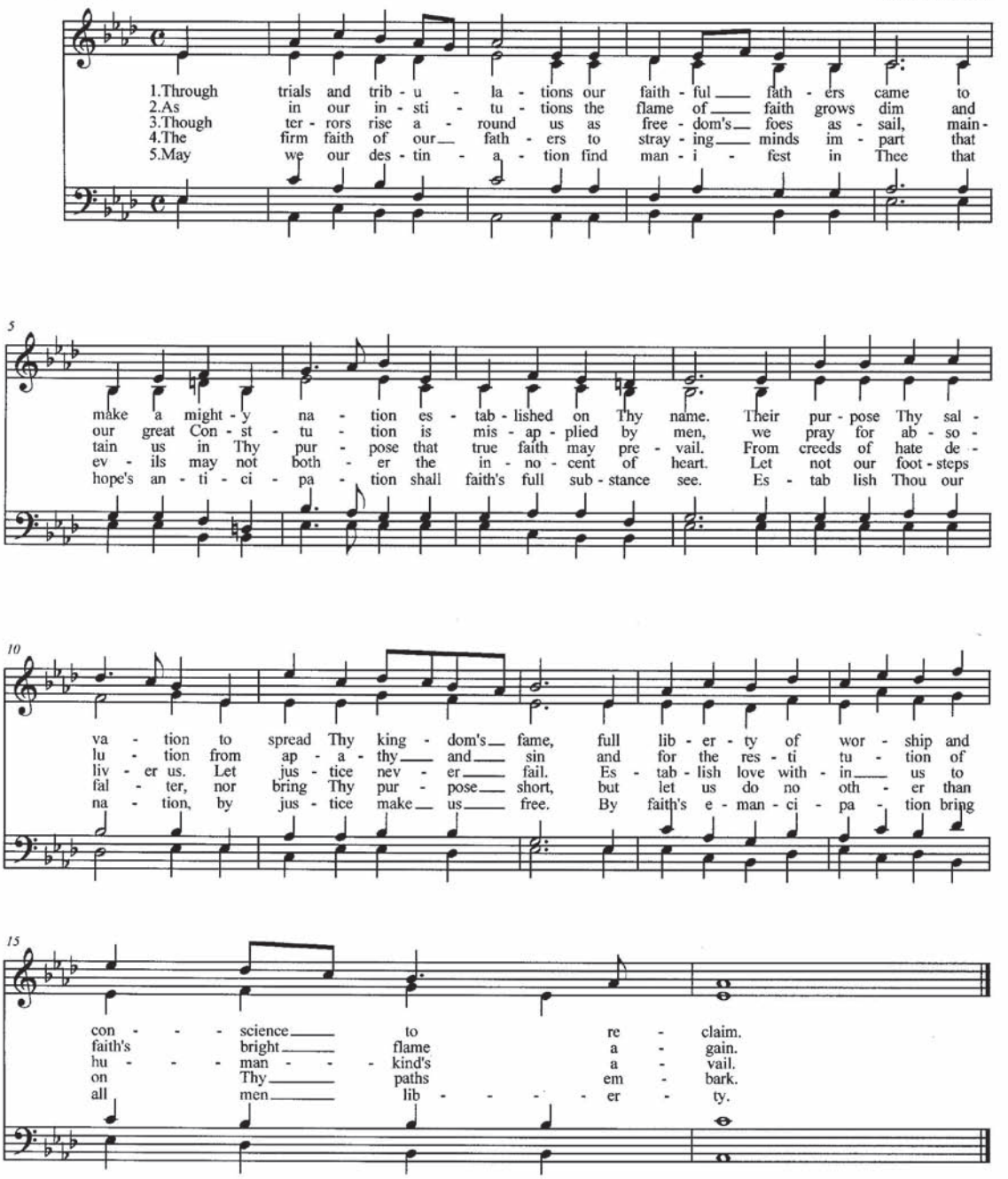


Through Trials and Tribulations

dedicated to Dr. Daryl Charles

CHARLES

Randall Bush



JUFF Contributors

Beverly Absher is in her fifth year with Union and currently serves as Associate Professor of Educational Leadership and Chair of the Department of Continuing Studies. Her article in this issue summarizes results from a recent survey of faculty members employed by CCCU member schools in North America.

Keith Absher, Dean of the School of Business, has been active in research for a number of years, with approximately 200 articles, publications, or proceedings to his credit. This is his first contribution to *JUFF*.

David Austill is starting his twelfth year with Union and is currently Professor of Management. He has had a number of recent papers and journal articles in the area of Business Law, and his contribution to this issue argues that states be allowed the right to force remote sellers to collect and remit use taxes just like brick and mortar retailers.

Kevin Barksdale, Associate Professor of Management, is another first-time contributor to JUFF, and in this issue he provides a review of the empirical justifications for data aggregation.

Randall Bush brings a first to *JUFF* with his collection of sacred hymns. He is Professor of Christian Studies and Philosophy and Director of the Interdisciplinary Honors Program, and has been a faculty member at Union since 1991.

Web Drake joined Union this fall as Associate Professor of Communication Arts, bringing ten years of collegiate coaching experience to the Union Debate Team. His submission, *Perspectives on the Cross: First Person Accounts*, is a stirring depiction of emotions experienced by those closest to our Savior at the crucifixion.

Patty Hamilton came to Union in 2001, and is currently Associate Professor of English. She has been recognized for her teaching as well as her scholarly activities, and was the 2006 winner of the "Newell Innovative Teaching Award."

Joe Harrison, a first-time contributor to *JUFF*, has been with Union for more than ten years and is currently Associate Professor of Management. Joe is the holder of four software patents and completed all necessary requirements to be awarded the title of "Wide Band Certified Network Engineer" by the International Academy of Science.

Kenny Holt has a keen understanding of economics and finance and has recently been interviewed by local media regarding his views on the banking crisis and its impact on the average citizen. This is the first JUFF submission for the Associate Professor of Economics and Management.

Kyle Huggins, Assistant Professor of Marketing, would likely say his greatest work produced during his first year at Union was twins, Lauren and Blake. He also has a number of recently published journal articles and proceedings to his credit.

Mark Kossick is starting his fourth year at Union and is currently Senior Fellow and Professor of Nursing. His work has been widely published and he has recently written a textbook, *Nurse Anesthesia*. In this issue of JUFF, he shares two of the chapters that he authored.

Emily Lean, Instructor of Business, is one of Union's newest faculty members. Her cutting edge leadership research may be the first to prove the link between leader integrity and employee behavior, and will be published in an upcoming issue of the *Journal of Business Ethics*.

Terry Lindley has been a faculty member at Union since 1986, faculty sponsor of the Rutledge Honorary History Club for over fifteen years, and is currently Professor of History. His contribution in this issue reflects his frequent research in the intersection of church history and contemporary worship trends.

Karen Miller, Associate Professor of Accounting, has been with Union for twelve years. In this issue, she shares findings from her study on internal control deficiencies and how they impact financial reporting.

Bill Nance is currently Associate Professor of Management and Department Chair in the School of Business. Prior to his career in academia, he was a senior level manager of three different manufacturing operations. His article in this issue applies a business model to higher education to better understand the decision processes used by buyers (students).

Walton Padelford, University Professor of Economics, has been a regular contributor to *JUFF.* His offerings over the years have ranged from poetry and prose to business theories and theology.

Gavin Richardson joined Union in 1998 and is currently Associate Professor of English. Last year's winner of the "Newell Innovative Teaching Award," a great number of his presentations and publications focus on ancient and medieval literature.

Darin White has co-authored and published ten different articles with five different faculty members in the fields of ethics, economics, MIS, management, and marketing since 2005. He has been with Union since 1994, and is currently Professor of Marketing and Director of Research.