

John L. Holland's Contributions to Vocational Psychology: A Review and Evaluation

Gary D. Gottfredson

Gottfredson Associates, Inc.

John L. Holland pioneered in assessing the environments of colleges and universities and their influence on students. His research has been central in the development of knowledge about nonacademic accomplishments. His theory of vocational personalities and work environments revolutionized the delivery of vocational assistance worldwide. He made contributions to research on originality and interpersonal competence. And he influenced our field through his influence on other psychologists. Persistence, focus, horizon-scanning, the interpretation of evidence in novel ways, revision of ideas based on evidence, an emphasis on the practical, generosity with colleagues, and intellectual tension are themes that characterize Holland's working style and explain his enormous influence. Much remains to be done to fully explore and extend Holland's theoretical contributions in the areas of development and socialization, personal and environmental change, assessment and influences of environments, and effects of vocational interventions.

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John L. Holland's monumental research, theoretical, and practical contributions have irrevocably altered the manner in which career assistance is delivered around the world. In his energetic and creative career he has pioneered in assessing the environments of institutions of higher education and their influence on students. He developed a marvelously useful theory of vocational personalities and work environments. He has been central in the development of knowledge about nonacademic accomplishments. He has made contributions to research on originality and interpersonal competence. He has worked to develop career assistance tools to help counselors and clients understand and cope with vocational problems. Finally, Holland has influenced our field through his generative effect on others. Former colleagues, students, and those stimulated by his work are some of today's most active and innovative researchers in education, counseling, and vocational behavior.

The following sections describe Holland's contributions and several themes or

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Address correspondence and reprint requests to Gary D. Gottfredson, Gottfredson Associates, Inc., 3239 B Corporate Court, Ellicott City, MD 21042-2247. E-mail: ggottfredson@gottfredson.com.

styles that pervade his activities. A final section describes an agenda for future research suggested by Holland's products, theorizing, and speculations.

THE CONTRIBUTIONS

I will describe four categories of John Holland's contributions: (a) the intellectual contributions, (b) the engineering of practical devices, (c) the unfrocking contributions, and (d) his influence on the work of scientists and practitioners.

Intellectual Contributions

College effects. At one time it was widely assumed that some colleges had vastly more positive influence than others. In a 1957 article published in *Science*, "The Undergraduate Origins of American Scientists," Holland demonstrated that different universities obtain divergent pools of talented students. This study implied that if one considers the characteristics of students recruited to an institution of higher education, little evidence of an institutional contribution to the production of scientists can be found. Subsequently, Astin (1962) and others developed input-output models to test this idea, and these landmark investigations helped to set the paradigm for what has since become the subfield of the psychology and sociology of college effects. After 40 years of active research, the conclusion of that 1957 paper has become the received view among knowledgeable social scientists. To a remarkable degree, input determines output in academic accomplishment (Astin, 1977, Appendix tables).

This is not to say that students do not change in a number of ways over their college years. Newcomb's (1943) early research on accentuation of political and social attitudes, the Astin and Panos (1969) research on the vocational development of college students, and Astin's (1977, 1993) more recent work imply that many changes occur. But the input-output paradigm has provided a major approach to the study of institutional influences.

Also important for research on the influence of institutions on students has been the Environmental Assessment Technique, suggested by Astin and Holland in 1961. The idea of characterizing an environment by using a census of its inhabitants provided researchers with a tool for studying colleges and other environments. This strategy has become a regular part of the tool kit of psychological researchers (Moos, 1973; Richards, Seligman, & Jones, 1970).

Holland's theory of vocational personalities and work environments. The intellectual contribution for which John Holland is best known is his evolving (1959b, 1966, 1973, 1985a, 1997) theory of careers. This theory has multiple origins. The first, which derives from Murray's (1938) work, is the assumption that behavior depends on both personality and environments. The second is the literature in vocational psychology on the structure of interests and personality (Darley & Hagenah, 1955; Guilford, Christensen, Bond, & Sutton, 1954), and job dimensions (McCormick, Jeanneret, & Mecham, 1972). The third is the Vocational Preference Inventory (Holland, 1958), a personality inventory based on occupational titles. The evolution of the theory into its present form has been

shaped by the guidance obtained from research examining successive versions of the theory.

A remarkable feature of Holland's work has been the sustained way in which he has used evidence and criticism to revise his theory, which was first published in the *Journal of Counseling Psychology* in 1959. This account antedated a series of theory-based research projects conducted by Holland and his colleagues in the 1960s (esp. Holland, 1962; Holland & Nichols, 1964). About 14 major studies related to the first formulation were published between 1959 and 1966. The theory underwent a revision with publication of *The Psychology of Vocational Choice: A Theory of Personality Types and Model Environments* in 1966. The role of the environment and specifications of ways to measure environment were spelled out more clearly in this second version of the theory.

Up to this time, most of Holland's research on the theory had involved youths of high scholastic ability. Reviews of the theory and associated evidence (Osipow, 1973; Walsh, 1973) often cited this limitation of the early research (talented student populations) as a potential limitation of the theory. In the 1960s, Holland (1962, 1966) was also circumspect about the applicability of his measures to both men and women. This scholarly circumspection, was appropriate at the time, but subsequent research has rendered the earlier reviews out of date.

Following publication of the 1966 revision of the theory, Holland and his colleagues performed another ten major theory-based studies. The theory was again revised in 1973. The most notable revision was the explicit incorporation of the hexagonal arrangement of types for assessing degrees of congruence. In addition, the theoretical statement in *Making Vocational Choices: A Theory of Careers* (Holland, 1973) is clearer and more systematic. It contained typologies of persons and of environments that had been developed and revised in response to evidence, used a hexagonal model to coordinate and specify the degrees of resemblance among personality types and environments, offered speculations about development, and provided specific methods for measuring the theoretical constructs. The evidence on which this 1973 revision was based was no longer limited to the work of Holland and his co-workers; many researchers and practitioners had tested his ideas. The 1973 book reviewed this evidence.

By the time the 1973 version of the theory was published, many reviewers' worries about its applicability to women, to adults, and to a wide range of youths were already being put to rest by evidence. Vocational Preference Inventory data from 43,391 two- and four-year college students—both men and women—had been used to test the hexagonal representation and to classify occupations. Cole's (1973) study of men's and women's interests supported the hexagonal arrangement for both. Holland's (1968) monograph had reported impressive support for most of the theoretical formulations in a longitudinal study of typical college students. Job analysis data (based on PAQ dimension scores, McCormick et al., 1969), and vocational interest data (Campbell & Holland, 1972) had provided evidence from working adult samples that was used to bolster the occupational classification (Holland, Viernstein, Kuo, Karweit, & Blum, 1972). And, the

predictive efficiency of the occupational classification had been tested using work histories from a national sample of about 1000 adult men (Holland, Sørensen, Clark, Nafziger, & Blum, 1973), and similar positive results had been obtained with large samples of young men and women (Nafziger, Holland, Helms, & McPartland, 1974) and older men (Parsons, 1971).

In the 1970s, the journals published numerous articles by independent scholars examining the theory or its uses, and Holland continued to contribute to this literature at a rapid rate. Holland and Gottfredson (1976) extended and clarified the theory, and Holland (1977b) revised the occupational classification to accord with accumulating data. Measurement research was intense during the 1970s, because interest inventories and many other tests were presumed to be contaminated by sex bias. One journal editor who rejected an article (later published, G. Gottfredson, 1976) showing that changing items such as “policeman” to “police officer” made no difference in the proportion of women indicating a preference for the occupation wrote, “We are assuming the existence of sex bias and attempting to eliminate it, despite our inability to demonstrate its existence.”

Unlike the authors of other inventories who made changes to items before doing needed research, Holland insisted that data support decisions about revisions. Following almost feverish effort, both the Self-Directed Search and the Vocational Preference Inventory were revised in 1978 (G. Gottfredson, Holland, & Holland, 1978; Holland, Gottfredson, & Holland, 1978), incorporating psychometrically defensible replacements for offensive items such as “policeman” and other changes to reduce sex differences to the extent possible. Fortunately, the evidence implied that most wording changes did not harm the measurement properties of scales, although some revisions were rejected because they did not produce the expected results.

Holland’s research during the 1970s actively tested his core hypothesis that vocational choices express personality, explored the diagnostic value of vocational identity, and tested the validity of secondary concepts of consistency and differentiation. He conducted an ambitious study designed to test the validity of many of the ideas in his 1973 book. That study (Holland, Gottfredson, & Nafziger, 1975) suggested the usefulness of a new identity scale as a diagnostic sign of decision-making difficulty. Other research by Holland and collaborators showed that a Vocational Identity scale had useful properties (Holland, D. Gottfredson, & Power, 1980).

Also in the 1970s, Holland and his colleagues vigorously pursued a series of investigations testing and confirming the applicability of his taxonomy to working adult men and women. If, as Holland’s theory implied, vocational choices were expressions of personality, then successive choices or occupational destinations should tend to be in the same or related occupational category. Holland et al. (1973), Nafziger et al. (1974), and G. Gottfredson (1977), using large national samples, showed that successive jobs or occupations in adult careers were predictable from the category and subcategory of previous jobs, and that predictability increased with age.

The 1985 revision of Holland's theory built on the research of the 1970s by being more comprehensive and explicit in describing constructs and applications, and incorporated the identity construct. Because some critics of earlier versions did not seem to understand the "other things being equal" nature of any theory of limited scope, Holland wrote clearly about boundary conditions in the 1985 book. He also introduced subsidiary notions about (a) the role of learning in the development of interests and the usefulness of Staats' (1975, 1981) perspective on the learning of behavioral repertoires and affect-laden preferences and (b) how homogeneity of behavior settings may be related to environmental identity.

Of the changes introduced in the 1985 statement, the construct of vocational identity attracted the most attention. Perhaps partly because a simple, easy-to-use measure of vocational identity was available, a great deal of research on the correlates and practical meaning of a person's vocational identity ensued. In the 20 years before the appearance of Holland's first report on vocational identity (Holland et al., 1975), only two articles on vocational identity appeared in journals abstracted in PsychLit. A spate of research, much of it conducted by Holland and his colleagues or stimulated by Holland's ideas produced 13 articles in these journals between 1975 and 1984. Then, 61 articles appeared in the decade 1985 to 1995. A series of studies have shown that the Vocational Identity scale is a useful outcome measure in evaluations of career interventions (Kivlighan & Shapiro, 1987; Johnson, Smither, & Holland, 1981; Rayman, Bernard, Holland, & Barnett, 1983) and that it has desirable psychometric properties (Holland, Johnston, & Asama, 1993). In contrast, Holland's introduction of untested ideas about behavior settings, environmental identity, and the learning of behavioral repertoires and affect-laden preferences and aversions attracted no attention.

Holland incorporated further revisions in the 1997 statement of his theory. This most recent statement adopted a change in vocabulary to characterize the psychological types in terms of "beliefs," incorporating some long available evidence about beliefs and vocational personality. Each personality type has distinctive beliefs about the self and about the consequences of actions, and each model environment promotes different belief systems. The 1997 version also gave greater emphasis to vocational identity, reflecting the research that has shown the usefulness of this construct and the scale that implements it. A tool for assessing work environments in typological terms, the Position Classification Inventory (G. Gottfredson & Holland, 1991), was used as an additional explicit method for implementing the environmental classification. Another change was the more explicit cross-classification of type of work with level of work that is reflected in the substantive complexity dimension. Finally, undaunted by the lack of research testing his idea that an environment's "identity" equals the inverse of the number of distinct behavior settings defined in typological terms, Holland reiterated this proposed operationalization of environmental identity in the 1997 statement. An alternative (also untested) way to operationalize environmental identity was also included—the Organizational Focus Questionnaire.

Academic and nonacademic accomplishments. A third area in which Holland has made major intellectual contributions is the study of academic and nonacademic accomplishments. He and his colleagues produced evidence that more than a single dimension of talent is important in life. Studies by Thorndike and Hagen (1959); Getzels and Jackson (1962); MacKinnon (1962); Torrance (1962); Gough, Hall, and Harris (1963); and Taylor (1958) implied that correlations between academic aptitude as measured by typical tests and nonacademic achievement and originality are modest. But those studies generated controversy: They were contrary to popular belief (at least among psychologists), and they were criticized as being the result of statistical artifacts or for using faulty criteria (McNemar, 1964; Werts, 1967). In a series of reports (Baird & Richards, 1968; Holland & Richards, 1967; Hoyt, 1966), Holland and his colleagues provided compelling evidence that college selection practices relying heavily on measures of academic potential result in much lost talent. Selecting students from about the top decile of high school grades, for example, would exclude about 86% of high school class presidents. Selecting only A students results in the exclusion of about 95% of national science award winners.

This area of research has been a sleeper that has shown only sporadic signs of waking up. Although Holland's attempts to engineer methods to assess potential for creativity (Holland & Baird, 1968b) and interpersonal competency (Holland & Baird, 1968a) received little attention, the notion that talent is multidimensional and the idea that common selection practices can be counterproductive have been suggested from time to time. Tyler's (1973) APA presidential address contrasted sharply with McNemar's (1964) presidential address 9 years earlier. Whereas McNemar had flagellated researchers (including Holland, 1961) who suggested that nonacademic accomplishments may be largely independent of measures of academic potential, Tyler called for a more hopeful psychology with multidimensional thinking about testing.

Reviews of the empirical literature on varieties of accomplishment and admissions practices were published by Richards (1970) and by Wing and Wallach (1972). Hirschberg and Itkin (1978) reported a negative correlation between GRE verbal scores and publication among psychology graduate students, and a positive correlation for undergraduate research experience with this same criterion. A longitudinal study by Munday and Davis (1974) convincingly showed that measures of nonacademic performance in college are useful predictors of certain adult accomplishment, whereas typical measures of academic potential are not. Finally, the convincing demonstrations that most of the predictive value of cognitive ability tests can be had from tests of general cognitive ability (Schmidt, Ones, & Hunter, 1992) seems to have stimulated further interest in non-cognitive aspects of personality that predict important performance outcomes.

Schmidt and Hunter (1998) have summarized evidence that non-cognitive aspects of personality are useful for predicting work performance. Evidence implies that conscientiousness and initiative are important dimensions of performance in graduate departments of chemistry, English, and psychology (Reilly,

1976) and that conscientiousness and need for achievement predict success as psychology graduate students (Hirschberg & Itkin, 1978). Biographical data related to interests or achievements of a creative nature predict creativity among scientists (McDermid, 1965; Whiting, 1972) and artistic performance among artists (James, Ellison, Fox, & Taylor, 1974); personality or interests related to leadership, energy, sociability, ascendance or dominance predict earnings among MBA graduates (Harrell, Harrell, McIntyre, & Weinberg, 1977). Very recently, Enright, Rock, & Bennett (1998) again found trivial correlations between cognitive measures (Graduate Record Examination scales) and accomplishments in aesthetic expression, practical language, and leadership. In short, although the research that Holland and his colleagues began to report in the early 1960s did not attract a focused or programmatic research effort in the same way his theory of personality and environments did, it remains a potentially high payoff area for further research and development. The potential to develop useful non-cognitive predictors of nonacademic accomplishments appears great.

Engineering Practical Devices

The contributions that may be most directly responsible for Holland's appeal to practitioners are the instruments he has engineered. The devices Holland has developed are not typical examples of psychological tests. All are marked by a common cachet—they are practical devices. The easily scored Vocational Preference Inventory (Holland, 1985b), the self-scored and self-interpreted Self-Directed Search (SDS; Holland, Fritzsche, & Powell, 1994; Holland, Powell & Fritzsche, 1994), and My Vocational Situation (Holland et al., 1980)—are all designed to provide vocational assistance cheaply and with minimal counselor intervention.

Holland's practical self-help devices are distinctive in part because he developed them during years when psychology was throwing up barriers against clients making their own use of tests by insisting that psychologists interpret tests for them (American Psychological Association, 1975, Principal 14). This narrow-mindedness on the part of the profession contributed to nonpsychologists filling the gap in the provision of vocational assistance. Fortunately, this narrow-mindedness is gone from the current version of the Ethical Principles.

These popular practical devices attest to the utility of Holland's theoretical work. The Self-Directed Search could not have been developed without useful typologies, because it requires classifications of persons and occupations in parallel terms: the six personality types and the six categories of occupations. The initial use of these typologies in restructuring the Strong-Campbell Interest Inventory (Campbell, 1974), and its current use in the Strong Interest Inventory as well as a number of imitations also attest to the theory's value.

The practical nature of these devices is the result of explicit and continuing effort to use appropriately simple technology and to put assessment in the hands of the user. It is easier for test-taker and counselor to use a paper version of the SDS than to send a bubble sheet off to a scoring service, and it is probably easier,

faster, and less expensive to use a paper version than to use a computerized adaptation of the SDS. The structure of the SDS also makes the scoring and nature of assessment transparent to the user—an additional benefit. Holland has continued to seek appropriately simple technology in more recent assessment tools. For example, the Career Attitudes and Strategies Inventory (Holland & Gottfredson, 1994) is intended to be scored and interpreted by the user, who may or may not decide to share the results with a psychologist or other helping professional.

Unfrocking Contributions

I have labeled one category of Holland's contributions "unfrocking" contributions. These are not distinct from his other intellectual contributions, but discussing this aspect of his work separately calls attention to his intellectual independence and ability to see what others overlook. He has repeatedly challenged the prevailing views of psychologists by bringing counter evidence into the discussion or by presenting a divergent, usually practical, point of view.

Holland's hypothesis that the relatively large number of Ph.D.s and scientists produced by elite institutions may be due more to recruitment and selection of students than to the effects of these institutions is a good illustration of his unfrocking activity. The studies of academic and nonacademic accomplishment, which implied that excessive focus on academic aptitude tests and grades to select students may be unfortunate, is another. That these contributions were met by the howls of those unfrocked is not surprising. Critics complained that ranges were restricted and that the criteria of accomplishment were trivial. Well, they turned out to be wrong when the dust settled. Creating the confrontation required (a) a nose for news, (b) a straightforward and clear statement of the news, and (c) the persistence, talent, and resources to cope with critics. On occasion the critics have been excoriating, arrogant, and acrimonious, as well as mistaken.

Holland's insistence on pointing out (although test publishers reach for the Maalox every time he mentions this fact) that classified vocational aspirations generally have more predictive validity than do inventoried interests (Holland & Gottfredson, 1975; Holland, Gottfredson, & Baker, 1990) illustrates an unfrocking contribution.

Other unfrocking contributions have been more literary and based on hard-headed common sense. Examples can be found in Holland's reviews of developmental theorists (Holland, 1974a, 1975a, 1994), reviews of the vocational literature (Holland, 1984; Holland & Whitney, 1969; Holland, Magoon, & Spokane, 1981), responses to his critics (Holland, 1975b, 1977a; Holland & Gottfredson, 1992), attempts to provide an honest account of the reality of research (Holland, 1991), and punditry (Holland, 1982, 1986). A distinguishing feature of this unfrocking is the straightforward but graciously humorous way in which it is done. In short, when others have offered what Holland saw as a flawed overview of a topic, he has felt free to offer what one of his colleagues at Johns

Hopkins called an “underview”—an alternative construal of reality unclothed by pretentious garb.

And, on the topic of construction, far from being infected by the virus of social constructionism, Holland's construction has been that positivism is the way to go. Apparently, he has thought that most of the mumbo jumbo characterizing constructionist views was already humorous enough, so there was no need to poke fun at it.

Finally, by exemplifying ways in which vocational assistance can be offered with minimal psychologist intervention (Holland, Hollifield, Nafziger, & Helms, 1972; Holland, 1974b, 1976), Holland has helped to demystify psychological assessment and stimulate the development of a number of less traditional devices and techniques for providing vocational services. His practical devices have provided researched and evaluated interventions (Zener & Schnuelle, 1976; Holland, Fritzsche, & Powell, 1994, pp. 53–58) that require minimal counselor intervention, and he has suggested practical ways for practitioners to improve their efficiency (Holland, 1974b).

Influence on Others

Scientists. Just as Holland was himself influenced by John Darley, Donald G. Patterson, Paul Meehl, Ralph Berdie, and less directly by Henry Murray, he has directly or indirectly influenced some of the most productive of contemporary psychologists. Influence on others is an essential ingredient in the advancement of science (Merton, 1968). Consequently, any assessment of the contributions of a scientist must include an attempt to assess the extent to which others incorporate a scientist's work into their own and use the products of that scientist's efforts to advance their own work.

The scientists who have built on, incorporated, or been influenced by Holland's ideas constitute a sizable proportion of the active researchers in higher education, counseling, and vocational behavior. Among today's eminent higher education researchers, the list includes Alexander W. Astin (worked with Holland at the National Merit Scholarship Corporation), Leonard L. Baird (worked with Holland at the American College Testing Program, ACT), Charles F. Elton (ACT), James M. Richards, Jr. (ACT and later at Johns Hopkins University), John Smart (a student of Charles Elton), and Douglas R. Whitney (ACT). Among the productive researchers in counseling and vocational behavior the list includes Fred H. Borgen (Borgen was a student of David Campbell), Linda S. Gottfredson (her dissertation was supervised by Holland at Johns Hopkins), Thomas M. Magoon (Magoon and Holland both pursued their graduate studies at the University of Minnesota, overlapping for 2 years, 1948 to 1950), James O'Neil (a student of Thomas Magoon), Paul R. Salamone (Salamone took a graduate course from Holland when Holland took over John O. Crites' course at the University of Iowa for a semester), Arnold Spokane (a student of Bruce Walsh), Keith Taylor (visiting scholar at Johns Hopkins), W. Bruce Walsh (Walsh did his dissertation on the validity of self-report measures at the University of Iowa

under Holland's supervision). Among test developers, psychometricians, and researchers the list would include David P. Campbell (Campbell and Holland collaborated in developing the theme scales for the Strong-Campbell Interest Inventory), Nancy Cole (ACT), Jo-Ida Hansen (a student of David Campbell, Hansen did her dissertation on the relation of Strong items to Holland's typology), Charles B. Johansson (a student of David Campbell), Dean H. Nafziger (Hopkins), and Dale Prediger (Prediger inherited parts of the research program left behind by Holland and several of his colleagues when Holland was fired at ACT).

Practice. Holland's contributions have revolutionized the provision of vocational assistance worldwide. It is an understatement to say that he has had a major influence on counseling practice. The popularity of counseling tools using his typologies (including the Self-Directed Search and the Strong Interest Inventory), the size of the groups attending his presentations at national meetings of counselors and psychologists, the incorporation of his typology in the O*NET system (the replacement for the *Dictionary of Occupational Titles*; Peterson et al., 1996; U.S. Department of Labor, 1999), the translation of his tests into many languages, the incorporation of his typology into assessments used in military recruiting, and the use of his ideas in career education in the schools all attest that the influence on practice has been overwhelming. A practical account of how to use Holland's inventories and scales has been assembled by Reardon and Lenz (1998).

Scientific literature. Holland's influence on the scientific literature has been enormous. His theoretical perspective is an important part of reviews (Helson & Mitchell, 1978; Osipow, 1987; Walsh, 1973) and textbooks or collections (Brown & Brooks, 1996; Brown & Lent, 1992; Hall, 1976; Osipow & Fitzgerald, 1995; Borgen & Harmon, 1996). To a great extent, the usefulness of Holland's theory and typology are so well accepted that they are now assumed as background—the context within which much career practice and career research is conducted rather than as a topic for inquiry.

A quantitative way to evaluate Holland's contribution to the literature is to count his contributions and to count the number of times his ideas are used by others. As a producer, Holland has been prolific. Since 1953 he has published six books, at least 136 articles (including 5 monographs and 2 review articles), 11 chapters, 13 test manuals, 12 major technical reports not published elsewhere, 9 book or test reviews, and other published contributions. A sustained average over the 28-year period between his first publication in 1953 and his formal retirement in 1980 of between five and six contributions per year put Holland in the top one-tenth of one percent of publishing psychologists according to the norms provided by Garvey and Griffith (1971).

Science may be viewed as a social system (Garvey & Griffith, 1971). A contribution to science has been made only when a scientist influences others. In the social system of science a contribution is validated by others, and the operation of the system proceeds in stages. The first formal stage occurs when a

manuscript is reviewed for journal publication. Later, evidence that the work has influenced others turns up in the form of citations to that work in journal articles published by others. Eventually, the work may become codified or assimilated in a field of knowledge, and citations in review articles and texts begin to appear. Thus, an examination of citations provides insight into the extent of a scientist's influence and who is being influenced.

Holland's (1973) book, *Making Vocational Choices: A Theory of Careers*, was cited more than 260 times between 1973 and 1980 ("Citation Classics," 1980). For comparison, the typical article published in a journal in 1973 received 5.7 citations between 1973 and 1976. The influence of this single book is only part of the story. A 1980 computer-assisted search of the *Social Science Citation Index* (SSCI) files implied that by the year of his formal retirement, works of which Holland was the primary author had been cited at least 699 times in English language journals and an additional 26 times in foreign language journals included in the SSCI system, which extended back only as far as 1971 (ambiguous citations and multiple citations from the same source not counted).

Endler, Rushton, and Roediger (1978) performed bibliometric analyses for faculty members in 180 psychology departments in the United States, Canada, and the United Kingdom. These departments were the top-ranked departments in the Roose and Anderson (1970) ratings, the "most productive" departments in the Cox and Catt (1977) study, and other departments they thought might be blooming. They also supplemented the list of psychologists they studied by adding S. Freud, J. Piaget, and others who occurred to them. Therefore, their sample grossly overrepresented eminent psychologists and psychologists in psychology departments in elite institutions. The average psychologist in their 180 select departments was cited 13.6 times (and published 0.9 articles, $N = 5597$) in 1975, according to the SSCI. Holland was not affiliated with a psychology department in 1975 and so was not included in the Endler et al. study. But using their methods, Holland turns out to have been cited 192 times in 1975. This ties him for 66th place in their list of the 100 most cited psychologists. For comparison, F. E. Fiedler, S. E. Asch, and M. Argyle were cited 134 or 135 times in 1975; A. Bandura was cited 650 times, D. T. Campbell was cited 515 times, and B. F. Skinner was cited 501 times.

The Institute for Scientific Information data on citations reveal that 23 journal articles by Holland published between 1980 and 1998 (i.e., published the year of his retirement or after) were cited 345 times. This *excludes* citations to Holland's (1985, 1997) books, to manuals for the Self-Directed Search (1985, 1994), to book chapters, or to any publications prior to 1980!

Additional insight into the groups of scientists most influenced by Holland's work comes from an examination of the patterns of citations across journals covered by the SSCI. Tallies of the journals in which citing articles were published both before and after 1980 converge on a similar pattern, with citing articles most often appearing in the *Journal of Vocational Behavior*, *Journal of Counseling Psychology*, *Career Development/Vocational Guidance Quarterly*,

Measurement and Evaluation in Guidance/Counseling and Development, and *Personnel and Guidance Journal/Journal of Counseling and Development*. The range of citing journals is broad, ranging from A to Z (*Academy of Management Review* and *Adult Education Quarterly* to *Zeitschrift für Arbeits und Organisationspsychologie* and *Zeitschrift für Pädagogik*). Most of the citations are from articles published in vocational research, counseling, or measurement journals. One interpretation of this pattern is that Holland's greatest current influence is among researchers working in career counseling, and that his earlier work on nonacademic accomplishments and higher education is now receiving less attention.

COMMON THEMES AND WORKING STYLES

Holland's extraordinary influence results in part from the ways he has pursued research. Several common themes or styles pervade his work: persistence, focus, horizon-scanning, the interpretation of evidence in novel ways, attention to evidence and the revision of ideas based on evidence, an emphasis on practical problems, generosity with colleagues, and intellectual tension.

Persistence and Focus on Practical Problems

One distinguishing style is a persistence in focusing on a small number of practical research problems. Holland has persisted in a few core programs of research: finding structures to explain person-environment interactions and careers, unraveling vocational indecision, charting nonacademic competencies, and creating appropriate technologies for vocational assistance.

Holland's first publication in 1953 reported a classification of occupations based on Kuder profiles (Holland, Krause, Nixon, & Trembath, 1953), and a few years later he reported on an occupational classification in terms of personality and intelligence level (Holland, 1959a). Before the first publication of the *Occupations Finder* (Holland, 1977b), he produced at least six papers on this topic and then periodically revised the *Occupations Finder*. Holland and his colleagues conducted a series of investigations of the validity of the classification and approaches to improving occupational classification over the years (G. Gottfredson, 1982; L. Gottfredson, 1980; G. Gottfredson & Holland, 1991, 1996; Holland et al., 1972; Holland, Whitney, Cole, & Richards, 1969; Viernstein, 1972) with the result that researchers and practitioners today have tools to classify any occupational environment in terms of Holland's typology. Holland's efforts over a period of more than 40 years to organize occupational information provides one example of his focus and persistence.

A second example is Holland's pursuit of the problem of vocational indecision. In the early 1960's Holland began research on undecided students (Holland & Nichols, 1964). Counselors and theorists regarded undecided students as a major problem, and as an appropriate target for counselor concern. But the research evidence seemed to imply that decided and undecided students were similar in most measurable ways (Baird, 1969). Nevertheless, there were some

differences (Elton & Rose, 1971; Kimes & Troth, 1974). Authors began to distinguish the merely undecided from the "indecisive" person, and proposed treatment schemes (Crites, 1976).

In a series of investigations in the 1970's, Holland persisted in pursuing the meaning and counseling implications of indecision (Holland et al., 1975; Holland & Holland, 1977), and so did other researchers (Osipow, Carney, & Barak, 1976). This persistence payed off. Some individuals are not only undecided, but they are also dissatisfied and express doubts about their capacity to make decisions, their ability, and their self-knowledge. Perhaps this is the group that most needs assistance. Holland developed and tested a Vocational Identity scale for diagnosing people who show this pattern (Holland et al., 1975; Holland & Holland, 1977; Holland et al., 1980). The Identity scale was originally conceived of as a theory-relevant criterion measure for use in assessing the validity of some theoretical signs of decision-making ability (Holland et al., 1975). If vocational personality involves one's conceptions of competencies, preferred activities, interests, and vocational goals as implied by Holland's (1973) theory and the content of the Self-Directed Search, then it made sense to use a direct assessment of the clarity and confidence of one's identity in these same terms.

Because of the accumulating evidence of the usefulness of this direct assessment of identity in understanding vocational personality, Holland incorporated identity as a secondary concept in the 1985 revision of his theory. The first full account of the Identity scale (Holland, D. Gottfredson, & Power, 1980) has since been cited 55 times in journal articles, and evidence subsequently developed (Holland & Gottfredson, 1994; Holland, Johnston, & Asama, 1993) has shown that the scale has substantial validity as a sign of career decision-making difficulty, vocational well-being, and the likely need for assistance. Its use has been incorporated in training materials to make it more useful in vocational diagnosis and in planning vocational assistance (Reardon & Lenz, 1998).

Horizon Scanning—Divergent and Convergent Thinking

A second style pervading Holland's work is an attention to evidence. He regularly scans the horizon for interpretable evidence that may help organize knowledge or bolster or undermine his notions in an area in which he works, and like a pack rat he stores these bits of evidence for later retrieval. For years, he has scanned abstracts and read *Contemporary Psychology*, which he says "provides a cheap education." This scanning of divergent information is coupled with a kind of convergent thinking that finds connections with his own theory and research that would elude others. His abiding focus on a few core problems is supplemented by information and ideas gleaned from other areas. Then he uses this evidence, together with the evidence he develops or helps to generate (and the evidence and argument contributed by critics) to revise his ideas and theory. Consequently, his modern differentialist theory has undergone four major revisions, each more empirically defensible, more explicit, and more elegant than the last—outcomes that imply that his style works.

Generosity With Colleagues

A third style may loosely be termed “altruism.” Holland consistently recognizes and fosters the contributions of others. This theme is important because it provides part of the explanation for his influence on others, and may characterize eminent scientists generally (Merton, 1968).

Holland is dutiful in answering correspondence from professionals or students seeking assistance. He has regarded the provision of useful replies as a professional obligation. In recent years, Holland has sought to stimulate scholarly contributions of others by attempting to identify people with the potential to do useful work and providing modest financial support for their research.

Holland directed research programs at National Merit Scholarship Corporation, American College Testing Program, and Johns Hopkins University. During the periods of his leadership, those research groups were remarkably productive. This may be due to an understated but forceful ability to give colleagues the direction they need to be productive.

Examples may help to describe how these subtle influences operate. When Holland was at Hopkins, his office was next to the research unit’s front door. I never heard him criticize anyone for coming late to work, but everyone noticed that he glanced at his wristwatch when they walked in.

I met John Holland in 1973 when I was a graduate student in psychology at Hopkins. I asked him for a job, and worked for him that summer. Between the fall of 1973 and spring of 1976 Holland allowed me to have an office, a typewriter, and the use of his research center’s IBM 1401 computer at night. Most days, at a time not predictable, he would come to my office and ask, “What’s new?” This generated a desire to have something new to report. The combination of the research space and computer, freedom from duties that a National Science Foundation fellowship allowed, the privilege of working on projects together with John Holland, and the daily “what’s new?” led to a productive period for me. Holland’s management of the research center during this period was so subtle, that I cannot recall many instances of supervision more directive than, “You might consider . . .” Holland *always* read draft manuscripts produced by the research staff promptly, and one of the few directives I can recall was that when a researcher asked another to read a manuscript, the review was to be completed in 2 days. Momentum has value.

Hull (1978) argued that scientists often behave selflessly because it is in their best interest to do so, and that this happens to coincide nicely with the goals of science. Hull noted that the best thing scientists can do for their own careers is to get others to accept and use their ideas. Success in science is determined by the transmission of ideas, just as biological success is determined by the transmission of genes. Scientists pass on their ideas by getting them incorporated in the work of others. Altruism—in the form of recognizing and fostering the contributions of colleagues or students, helping others who seek advice on a research problem or in attempts to engineer a practical program, or assisting

those who wish to extend research or theory in new ways—may be a royal road to scientific fertility.

Tension

A final theme that pervades Holland's work is tension. This tension no doubt stems in part from his "unfrocking" contributions, and his predilection for stating in direct terms the shortcomings he sees in the theories or strategies of others (e.g., Holland, 1975a, 1982, 1994). This tension may result partly from Holland's feeling that authors representing the "vocational development" perspective sought to marginalize his contributions, combined with his determination to overcome disparagement. When the vocational development perspective (Jordaan, 1974) was popular in vocational psychology, Holland's modern-differentialism—his person-environment perspective—was represented by central figures in vocational psychology as a clone of a defunct trait-and-factor approach (Super, 1975), or was not mentioned (Crites, 1974). Disparaging references by developmentalists continued for some time (Super, 1980). At times, it has seemed that critics have assumed there has been no progress in person-job vocational psychology since Parsons (1909).

As Holland's theory and devices became more popular, they became a natural and appropriate target for criticism (Diamond, 1975; Harmon, 1973; Prediger & Hanson, 1974). Journal editors sometimes found articles criticizing the theory or devices more attractive than research articles reporting work to revise them. The articles reporting the development of the new edition of the SDS (Holland, Gottfredson, & Holland, 1978) and the seventh revision of the Vocational Preference Inventory (G. Gottfredson, Holland, & Holland, 1978) were rejected by the *Journal of Vocational Behavior* and *Measurement and Evaluation in Guidance*, which had published at least 10 critiques that had prompted the research leading to the revisions.

This tension is to be expected when a theoretical perspective becomes widely influential. Not everyone copes with tension in productive ways, however. It is characteristic of Holland's style to cope effectively in writing with the tension resulting first from his marginality (psychologists used to laugh at the idea of a personality inventory composed of occupational titles) and later from his success. His responses to critics have been not only effective, but they are often humorous as well (e.g., Holland, 1974b, 1975a; Holland & Gottfredson, 1992; Holland & Richards, 1967). In short, Holland has used tension to fuel his research vehicle.

THE UNEXPLORED AGENDA

A review should suggest areas for future work. Although my review has been unconventional in many respects—it is biased, selective, and personal—I shall end it by suggesting areas where exploration or further research on Holland's theory may be especially productive. Four areas provide fertile ground for another generation of researchers: (a) development and socialization, (b) personal and environmental change, (c) assessment of environments and environmental

influences, and (d) effects of vocational interventions delivered by alternate means and media.

Development, Socialization, and Attainment

Research is needed to provide a more fine-grained account of development and socialization. Although evidently overlooked by many who use other parts of Holland's theory in research and practice, the theory (1973, 1997) has long provided an explicit and provocative account of the development of stable adult interests. A child's biological dispositions in interaction with early experiences (opportunities and reinforcement) produce learned preferences for some activities and aversions for others. Over time, a child's hereditary and other biological potentials, combined with patterns of opportunities and the shaping provided by environmental reinforcers, begin to develop increasingly stable affective responses to different situations or opportunities. These preferences and aversions together with developed competencies or skills are eventually associated with patterns of values, beliefs, and styles. The personality typology provides a way of summarizing the progress and result of this developmental process. Interests (or other measures of personality) become increasingly stable with age, so that adult personality tends to show great stability (Costa & McCrae, 1986; Costa, Metter, & McCrae, 1994; McCrae & Costa, 1994).

To say that personality traits stabilize with age (becoming quite stable around age 30 years) does not imply, as some have suggested, a *static* view of personality or development. On the contrary, it implies that the *interactions* individuals have with environments as they make choices, display competencies, seek pleasure and avoid punishing experiences are due in part to underlying dispositions. These dispositions make these interactions predictable in the aggregate. (I say in the aggregate, because it is not necessary to accurately predict the result of each interaction to be generally accurate across a sufficient number of interactions.) Stability in vocational dispositions has clear benefit. If I couldn't predict what kinds of work tasks or people I would enjoy, I would be unable to control my future experiences.

More knowledge about the specific manipulable experiences through which these dispositions develop and the circumstances under which they may be influenced—as well as about obstacles to such changes—would be helpful. Research on the heritability of interests and personality (Grotevant, Scarr, & Weinberg, 1977; Loehlin, McCrae, Costa, & John, 1998; Lykken, Bouchard, McGue, & Tellegen, 1993), family background and attitudinal antecedents of classified adolescent vocational aspirations (Kelso, 1976; Mumford & Owens, 1982), changes in aspirations or interests in the face of natural or intentional influences (L. Gottfredson, 1979; Wirtenberg, 1979) provides examples of productive strategies, but additional research and theoretical integration has much to offer in the exploration of the potentials and limits of influence on vocational personality.

Years ago Blau, Gustad, Jessor, Parnes, and Wilcock (1956) provided a crude

navigational chart that may help structure this exploration. This chart, research, and theory imply that occupational level (G. Gottfredson, 1977, 1982; L. Gottfredson, 1980, 1981; Tracey & Rounds, 1996) and the distribution of available work (G. Gottfredson, Holland, & Gottfredson, 1975; L. Gottfredson, 1979) are important adjuncts to the typology. Recently, level of substantive complexity was integrated with the Holland occupational classification (G. Gottfredson & Holland, 1996) to facilitate research on level of aspiration and attainment. This summary index of the level and variety of cognitive demands occupations make on workers is available to those who use and conduct research with the classification. Further consideration of explanations of the development of personality dispositions, occupational entry, and of occupational achievement or attainment may be fruitful.

Personal and Environmental Change

Change is a problem closely related to socialization and development, but some specific problems of change merit special emphasis. What are the major modes of coping with incongruent environments? Under what circumstances do people leave incongruent environments? Seek to change the environment? Are vocational identity or environmental identity related to the degree of personal or environmental change?

Recently, Holland and Gottfredson (1994) developed an inventory of career attitudes and strategies to supplement the typological formulations in understanding change and stability in career behavior. Whatever the degree of congruence between a person and a work environment, a person's experience of interpersonal abuse, job dissatisfaction, conflict between work and family, or a propensity to take risks should all be predictive of career change. And whatever the degree of incongruence between a person and a work environment, geographical barriers, a submissive style, or a tendency to avoid risk should all be predictive of stability. A related hypothesis is that incongruent persons who are high in vocational identity, risk-taking style, or dominant style may be expected to attempt to leave or change the environment (whereas congruent persons and persons low in vocational identity, risk-taking style, or dominant style are not expected to leave or try to change the environment). Research that combines measures of person-job congruence, vocational identity, and these career attitudes and strategies may help provide a fuller understanding of change and stability.

We now face an epidemic of opinion that changes in the nature of work are rendering "careers" a thing of the past. Pundits forecast that people will move from one job or occupation to another with increasing frequency—requiring great flexibility and demanding change on the part of workers. Yet it is not clear that moving from one employer to another or from one assignment to another entails moving from one type of work to another. It seems likely that people who change jobs will continue to change disproportionately from one Investigative job to another Investigative job, from one Enterprising job to another Enterprising job. In other words, stability in typological terms will continue to characterize

careers. This expectation should be studied by organizing job analysis data for successive jobs or assignments in contemporary careers.

Assessment of Environments and Environmental Influences

Although the classification of occupations and environments has survived some impressive tests (G. Gottfredson, 1977; G. Gottfredson & Holland, 1991, 1996; L. Gottfredson, 1980; Helms, 1996; Holland et al., 1973; Maurer & Tarulli, 1997; Mount & Muchinsky, 1978; Rounds, Shubsachs, Dawis, & Lofquist, 1978), it remains an understudied aspect of the theory. The classification of occupations was initially grounded in the plausible assumption that persons gravitate to congruent environments and that the character of an environment is determined largely by the characteristics of its incumbents. It is difficult to imagine these assumptions being false, but more direct measures of environmental characteristics are desirable. One reason for favoring direct assessments of work environments is that it is unlikely that congruence is the only determinant of who inhabits an environment. The old but instructive account of employer biases provided by Noland and Bakke (1949); segregation of sexes across occupations and fields of study; segregation by socioeconomic origins and ethnicity across educational and occupational levels; and evidence that mobility among occupations is strongly linked to sex, educational level, and to some degree race (G. Gottfredson, 1982) all converge in implying that a more direct approach to the measurement of environments is important.

The use of empirical job analysis data developed by the U.S. Department of Labor to classify all occupations in the *Dictionary of Occupational Titles*, *Standard Occupational Classification*, census, and Occupational Employment Statistics classifications (i.e., the development of the *Dictionary of Holland Occupational Codes*; G. Gottfredson & Holland, 1996) was one step toward direct assessment of occupational environments. The theoretical classification was more directly implemented by the development of the *Position Classification Inventory* (G. Gottfredson & Holland, 1991). This direct approach to the classification of occupations in studying worker–job congruence has rarely been implemented in research. An important study by DeFruyt & Mervielde (1999) is an exception. It is ironic that interest in the measurement of congruence has been expressed in research comparing alternative congruence indices in samples in which the occupational environment is classified approximately (by looking up the code in a reference list) rather than through direct measurement (Camp & Chartrand, 1992; Oleski & Subich, 1996; Young, Tokar, & Subich, 1998). Congruence research will be advanced if researchers measure the occupational environment in diverse samples of occupations rather than relying on approximate methods.

In addition, finding ways to cope in theoretical terms with the potency of an environment would be useful. Holland (1973) suggested the need to find ways to characterize the distribution of power in environments. More recently (1985, 1997), he introduced the notion of environmental identity: “An environment with

a high (clear) identity would have a focused set of consistent and explicit goals; and an environment with a low (diffuse) identity would have a large set of conflicting and poorly defined goals" (1997, p. 50). Finally, for some people, some environments or parts of environments may be more salient than others. A more complete understanding of person–environment interactions will require an exploration of these matters.

Effects of Vocational Interventions

A last item on the unexplored agenda is work to develop technologies for constructing, understanding, and selecting appropriate career interventions. Existing research (Spokane, 1991) implies that a variety of career interventions have modest positive effects. At the same time, research on career interventions directed at learning what leads to effectiveness is surprisingly rare in view of the importance of the problem. We need more research on how to create more powerful treatments that are targeted to the specific needs of individuals and that are inexpensive.

Holland has shown a special concern for the effects of the Self-Directed Search and other interventions on clients, and this concern is reflected in reports of research on these effects in the Self-Directed Search manual (Holland, Fritzsche, & Powell, 1996, Chap. 5). As interventions as seemingly simple as interest inventories continue to change, questions for research on effects on users will continue to evolve. Does it help to provide users with more extensive lists of occupational alternatives to explore, or do users benefit from more focused lists? Are computerized reports that spoonfeed clients with information rather than having them locate and synthesize their own information more or less beneficial? How does transparency in scoring of inventories versus opaque computerized scoring effect users' experiences? What about the ability to change answers and re-score an inventory? Do clients get the kind of help they need when they locate and take interest inventories or other tests in *U.S. News and World Report*, on the World Wide Web, in *Cosmopolitan* or *Seventeen*? Do clients get the kind of help they need when they locate and take interest inventories assisted by the growing troupe of counselors who are "qualified" to administer the test they offer because they took a workshop?

There will never be enough fully trained and skillful psychologists or counselors to provide one-on-one assistance to everyone who can benefit. Accessible, valid, and helpful career assistance for everyone will depend on progress in the development and evaluation of inexpensive, valid, and helpful interventions.

CONCLUSION

To echo Lewin's (1951) dictum, nothing is so practical as Holland's theory. By focusing in a persistent way on a few important problems, seeking elegant and parsimonious ways to summarize knowledge, and using evidence in an open and creative way, Holland has transformed the way vocational assistance is rendered.

Future developments in vocational psychology will often rest on theoretical and practical foundations laid by John Holland.

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