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# THE EMINENCE OF AMERICAN PSYCHOLOGISTS

RICHARD A. BAGG

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THE EMINENCE OF AMERICAN PSYCHOLOGISTS

by

RICHARD A. BAGG

B.A., State University of New York at Albany, 1968

M.A., University of New Hampshire, 1973

A THESIS

Submitted to the University of New Hampshire

In Partial Fulfillment of

The Requirements for the Degree of

Doctor of Philosophy

Graduate School

Department of Psychology

June, 1974

This thesis has been examined and approved.

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*April 10, 1974*

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## TABLE OF CONTENTS

LIST OF TABLES . . . . .	vii
ABSTRACT . . . . .	viii
I. INTRODUCTION . . . . .	1
II. METHOD . . . . .	14
1. Sample . . . . .	14
2. Reference Selection Procedure . . . . .	16
3. Statistical Analysis . . . . .	21
III. MULTIPLE REGRESSION . . . . .	25
1. Results . . . . .	25
2. Discussion . . . . .	27
IV. CONSTRUCT VALIDATION . . . . .	34
1. Results . . . . .	34
2. Discussion . . . . .	37
V. GENERAL DISCUSSION . . . . .	40
1. Articles and Citations . . . . .	44
2. Professional Organizations . . . . .	48
3. Editorial Positions . . . . .	49
4. Educational Institutions . . . . .	50
5. Citation Counts . . . . .	52
6. The Most Eminent American Psychologists . . . . .	53
7. Characteristics of Eminent American Psychologists . . . . .	57
8. Important Contributors to Psychology . . . . .	61



9. The Great Man Theory . . . . .	63
10. Future Investigations . . . . .	64
VI. SUMMARY AND CONCLUSIONS . . . . .	67
BIBLIOGRAPHY . . . . .	70
APPENDIX . . . . .	74

LIST OF TABLES

1. Multiple Regression of Eminent Score on Intraprofessional Variables . . . . .	26
2. Mean Comparison of Intraprofessional Variables Between the Eminent and Less Eminent . . . . .	30
3. Rotated Principal Components Factor Matrix . . . . .	36
4. Actual and Predicted Scores, Number of Citations and Number of Journals for the Six Most Eminent American Psychologists . . . . .	55

## ABSTRACT

### THE EMINENCE OF AMERICAN PSYCHOLOGISTS

by

RICHARD A. BAGG

This investigation represented an exploration of the construct, eminence.

For this reason, a sample of eminent individuals was required. From the Annin, Boring and Watson (1968) study, 205 American psychologists were chosen from a list of more than 1,000 "important contributors to psychology." Each was given an eminence rating based on his recognition, contribution, importance and/or distinction by nine judges.

The intention, then, was to determine which variables were significantly associated with the eminence rating. The study was unique in that 19 "intraprofessional" variables were researched; each was amenable to numerical specificity. "Intraprofessional" variables are those that relate to what an individual did professionally from the granting of his terminal degree until his death.

From a multiple regression analysis, it was found that five variables accounted for 56 percent of the variance in the eminence rating. They were number of articles, number of editorial positions, number of productive years, number of journal citations and number of journals in which one's work was

cited. The journals were representative of the various areas within psychology. The two crucial variables which accounted for the most combined variance in the eminence rating were number of citations and number of journals. Although articles are a prerequisite for being cited in a variety of journals, it was demonstrated that articles were not the key variable in the determination of eminent status. It was concluded that the subjective impressions of eminence given by the raters were representative of the objective indices of number of citations in a variety of journals.

To further explore the construct, eminence, a principal components factor analytic solution was used which provided independent characteristics of the sample since the emergent factors were representative of the dimensions of the variables as manifested in the sample. From this solution, there emerged five factors which accounted for 80 percent of the variance. These factors were named "research quality," "professional organizations," "editorial positions," "recognition" and "productive years." Number of journals in which one's work was cited (.90), number of journal citations (.82), the eminence rating (.70) and number of articles (.63) correlated the highest with what was termed the "research quality factor" which accounted for the most variance.

It was concluded that eminence was conferred on those who produced a substantial number of articles which were deemed to be of value through citations in a variety of journals by subsequent professional researchers. Therefore, the work of the eminent had heuristic value to a variety of research areas.

## INTRODUCTION

This study investigated variables associated with eminence in a selected sample of American psychologists. Scientific eminence was conceived as being due to a multiplicity of interrelated variables, some of greater importance than others. The intention, then, was to develop a hierarchical set of variables associated with eminence. Moreover, the particular methodology made it possible to determine the variables on which the more and less eminent members of the sample differed. For example, it is hypothesized that the more eminent had a greater number of publications and citations to their work than did the less eminent.

It would appear that significant progress in the development of an operational definition of eminence has been impeded by the search for and the debate over the definitive variable which accounts for the attainment of eminence. What is required is for diverse variables to be weighted and defined in a multivariate approach to the understanding of eminence. The road to eminence is not unidirectional as is evidenced by a cursory review of the scientific personalities that have attained this status. Within this diversity, however, there are communalities and the investigation required an expansive rather than a restrictive approach if this phenomenon, eminence, was to be made explicable.

In the past, several single criteria have been used for the selection of eminent men. That is, in order to study the variables associated with eminence, criteria have been designed whereby eminent men were selected for investigation.

It must be remembered, though, that the different criteria of eminence are not mutually exclusive, but are related to one another. For example, the number of publications by a psychologist may contribute to his being elected to an office of the American Psychological Association (APA). Therefore, using offices held in organizations as a criterion may be an effect of eminence, not a cause, or it could be both. Eminence, then, should be a composite of these criteria rather than being singly attributed to any one of them in particular.

The most often used criterion has been the judgment of peers (American Men of Science; Annin, Boring & Watson, 1968; Cattell, 1906; Cattell & Drevdahl, 1955; Clark, 1957; Roe, 1951a, b, 1953; Who's Who in America). The frequency with which one's work is cited in the literature has also been used as a criterion for selection (Dennis, 1954b; L'Abate, 1969; Myers, 1970; Myers & DeLevie, 1966; Ruja, 1956). As a variation of peer judgment, eminent men have been selected for study on the basis of whether they have appeared in the American Men of Science (Visher, 1947, 1951) or as members of particular groups (Wispé & Ritter, 1964; Wispé, 1965).

It would appear that any operational definition of eminence delineates the criterion with which the sample is to be viewed. That is, the definition of eminence defines those who will be eminent. For example, "a closer examination of the lives of eminent men reveals that nearly every one of them has been responsible for many works . . . [Dennis, 1954a, p. 35]," "psychologists who are judged to be scientifically eminent . . . are also those most frequently cited in the current journal literature [Myers, 1970, p. 1047]," or "is not a psychologist's eminence measurable not only in terms of number of publications (by him) but also in terms of number of citations (of him)? [Ruja, 1956, p. 149]." The question remains--to what is the psychologist's eminence due?

A number of variables (in distinction to the criteria) have been found to be associated with eminence in the literature. One is the number of publications produced by the eminent (Clark, 1957; Dennis, 1954a, b; Ruja, 1956) moreover, it has been demonstrated that this variable is not only confined to psychologists but to scientists in general (Dennis, 1954c). Another is the frequency with which a man's work is cited in the literature (Brozek & Goodman, 1970; Dennis, 1954b; Goodman, 1971; L'Abate, 1969; Myers, 1970; Myers & DeLevie, 1966; Platz & Blakelock, 1960; Ruja, 1956) or citations in a particular place, i.e., Annual Review of Psychology (Clark, 1957) or in historical texts (Dennis, 1954b; Lehman, 1960) while quality or "unique distinction" has been

mentioned (Platz & Blakelock, 1960; Ray, 1971). The college from where one received a doctorate (Wispé & Ritter, 1964), membership in professional organizations (Clark, 1957; Dennis, 1954b; Gibson, 1972; Myers, 1970; Who's Who in America), rate of educational progress (Meltzer, 1949) and age at first publication (Meltzer, 1949) are four other variables that have emerged. Still other variables include physical and geographical influences (Visher, 1947, 1951), favorable biological background (Roe, 1951a, b, 1953; Visher, 1947, 1951; Wispé, 1965), encouragement or stimulation from parents and/or superior teachers (Clark, 1957; Roe, 1951a, b, 1953; Visher, 1947, 1951; Wispé, 1965), opportunity to obtain adequate training (Visher, 1947, 1951) and high ratings of curiosity, perseverance or enthusiasm (Roe, 1951a, b, 1953; Visher, 1947).

Several of the aforementioned studies are worthy of in-depth comment as they are representative of investigations which have studied eminent scientists.

From a list of 1,027 contributors to psychology, an international panel of nine judges were instrumental in the choice of 538 individuals who were regarded as "important psychologists" (Annin, Boring & Watson, 1968). The judges used the following criteria for evaluation. A score of one was given to those whose name was recognized as a contributor to the history of psychology while more information about that individual could not be specified; a score of two was given to those whose contribution could be specified



(precision not necessary); and a score of three was accorded those who were of such distinction in the judge's opinion that they surely must be included in a list of the most important 500 contributors to psychology. Thus, a score of three given by all nine judges to an individual gave him a score of 27 (the highest one could receive). It had been decided beforehand by the investigators that they would isolate the 500 most important contributors to psychology. Therefore, a score of 11 became the cut-off point as there were 538 contributors who received scores of between 11 and 27. There is a list available of those individuals who received a score of ten or below (Document No. 10006, ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D.C. 20540). This study is of particular importance since the sample used in the present investigation was drawn from it.

Project B was an APA sponsored program which attempted to find out "the nature of the personal and environmental factors influencing the research productivity of psychologists [Clark, 1957, p. 6]." Peer judgment was the criterion used to find out the significant contributors to psychology. This group was compared to other "highly visible" psychologists. The variables used for the study included the total number of publications in the Psychological Abstracts, the number of times an author was referred to in the Annual Review of Psychology and in representative journals (citation counts), 1950-1953 Psychological Abstract citations (yielding

current publication rate), number of APA offices held and total professional income. It was found that voting by peers and citation counts correlated the highest with the correlation being .67. For predicting the number of votes received, a multiple correlation of .79 was obtained from journal citation counts and APA offices held.

The American Physiological Society began a study of eminent scientists and used eight criteria for selection (reported in Clark (1957), but not otherwise cited). These criteria were officer or councillor in one or more of several different societies, editorial board member of a physiological journal, references to authors in the annual review (two or more for a given period), a starred individual in the American Men of Science, department chairman or a comparable rank, faculty rank of professor or associate professor or a comparable title, author of a textbook or monograph and membership in the National Academy of Sciences or a Nobel Laureate. An eminent scientist was one who met at least two of the eight criteria. This project was never completed, ostensibly because other methods of selection not contemplated could have been used and also because some physiologists were opposed to the idea or the study itself.

Cattell (1902-1903, 1903a, b), the pioneering investigator, was interested in preparing a directory of 1,000 of the most important American scientists. Cattell selected ten leading scientists in each of the twelve fields of anatomy, anthropology, astronomy, botany, chemistry, geology, mathe-

matics, physics, pathology, physiology, psychology and zoology. They were asked to nominate (in their respective fields) the significant leaders in each of the aforementioned sciences. The men were then arranged in order of merit based on the data supplied by the ten leading students of the science. Cattell then obtained biographical sketches of these 1,000 scientists and placed asterisks next to their names in the first edition of the American Men of Science (1906) which also included approximately 3,000 other individuals. He was editor of this biographical directory. Fifty American psychologists were starred in the first edition.

Many years later, Visher (1947) studied the starred scientists, numbering 2,067 in the first seven editions of the American Men of Science. His objective was to find out where these scientists were born, educated and employed. Ancillary to this was his decision to discover what conditions correlated with the production of these scientists. Visher (1951) also undertook a study of a more geographically localized nature, that of investigating Indiana scientists. For purposes of this project, scientists were considered as those appearing in the American Men of Science one or more times in the first eight editions and who were born, trained or employed in Indiana. He concludes on the basis of questionnaire data from both studies that significant contributors to science are those who had better than average physical and geographical environmental influences, who

received encouragement and stimulation from parents and teachers, who had an opportunity to obtain adequate training and who were found to have high ratings of curiosity, perseverance and enthusiasm (this latter finding mentioned in 1947 study only).

Myers (1970) undertook a study designed "to determine whether the frequency with which a psychologist's publications are cited in the journal literature is a reliable and valid measure of his scientific eminence in contemporary psychology [p. 1041]." Reliability was demonstrated by the use of a smaller set of journals and it was shown that the citation rate was not significantly different. Myers then checked the journal citation counts against other "valid" measures of scientific eminence which included the National Medal of Science, APA presidents, Distinguished Scientific Contribution Awards, to name only a few of the eleven criteria. He found that these scientists were also found to be eminent using these other independent criteria. He concludes that journal citation count appears to be a reliable and valid way of deciding scientific eminence.

Wispé and Ritter (1964) sought to determine where the "recognized" in psychology received their doctorates. Professional recognition was defined as positions filled in fourteen psychologically oriented societies. They found that professional recognition was given those who came from the larger departments of psychology. Harvard, Johns Hopkins, Stanford, Cornell, Columbia, Yale and Chicago were the seven

departments that granted 37 percent of the Ph.D's in psychology but produced 63 percent of those professionally recognized psychologists from the total sample.

Although limited to one individual and a search of papers for a limited amount of time, citation longevity appears to be suggestive of a method to be used for the study of eminence (Brožek & Goodman, 1970). It was found a century later that Donders' 1868 paper on the timing of mental operations was cited in four recent papers (1966-1968). Further, Goodman (1971) found that this same paper of Donders' was cited in five research papers, five articles or books that cite material of historical importance while one paper made passing reference to his study.

Concerning the social and psychological correlates of eminence, two investigators (Roe, 1951a, b, 1953; Wispé, 1965) have done studies in an attempt to delineate the variables involved. Roe was interested in the relationships between personality determinants with vocational choice and occupational success. Her sample was made up of persons who were members of the National Academy of Science and/or the American Philosophical Society. The data came from life histories, personal interviews, a verbal-spatial-mathematical test, the Thematic Apperception Test and the Rorschach. In the groups of biological, physical and social scientists that she studied, it was found that the groups had superior social backgrounds. Also, she demonstrated that they were devoted to their work and had "early feelings of personal or family

superiority on a social or intellectual basis [1953, p. 54]."

Wispe's sample were those who belonged to certain prestigious professional organizations. The data was collected by a questionnaire. He concludes "that the more eminent psychologists came from homes characterized by certain upper-middle class socio-economic and educational advantages, . . . and their parents somewhat better educated [p. 96]." He also argued that the eminent more often than not were influenced by their "masters" under whom they studied.

As one phase of the study, Lehman (1953) wanted "to set forth the relationship between chronological age and outstanding performances [p. vii]." He makes use of lifelong longitudinal and cross-sectional data for persons who have made contributions to the arts and sciences. Lehman sets forth sixteen possible factors involved in age of achievement. Most of them are related to the decline of the biological system while others include the young's concern with building a future, the decrease in flexibility as one grows older and that with success, enhanced prestige and responsibility, the amount of concentrated work decreases. Psychologists' most creative years are from 30 to 39. For elder individual's achievement, Lehman lists five etiological factors. One reason is that the elder exercise their leadership rather than beginning new work while still another asserts that since institutions usually are conservative, they choose conservative individuals to carry out their work wherein

these individuals are usually older.

In a study that investigated whether women published less than men, Guyer and Fidell (1973) also investigated whether age, area of interest (theoretical or applied), level of academic position and prestige of institutional employment related to the number of publications. It was demonstrated that of the aforementioned variables, only 20 percent of the total variance was accounted for with area of interest accounting for the most.

Clemente (1973) in a paper entitled "Early career determinants of research productivity" found that age at first publication and number of publications before the Ph.D. affects positively an individual's later productivity. Variables investigated which were found to exert little or no impact were sex, years between B.A. and Ph.D., age at Ph.D. and "quality" of department from where the doctorate was received. It should be noted that this was a study of productivity, not eminence.

Obviously then, a multitude of variables have been cited in the literature, including intra-professional, socioeconomic and personality variables. Although not directly relevant, in his study of eminence, Wispé (1965) has concluded that the most eminent were those who were better educated and had upper-middle class status.

The validity of this type of statement seems self-evident. It is obvious that the eminent for the most part received extensive education, and in the preponderance of

cases, particularly during the time interval in question, this implied upper-class background.

The key issue is that although these variables may in fact characterize the eminent, they do not adequately differentiate among the eminent, the less eminent and the obscure scientists. Rather than becoming encumbered in the quagmire of distal causes that may encourage the potential for eminence, this study has limited itself to those variables which appear to have relevance in the determination of eminence as perceived by other members of the professional community. Therefore, the selection of the variables was not related to what fostered the development of eminence. Rather, the selection of the variables was relevant to what an individual did within his profession that resulted in eminent status. Therefore, the variables are professionally distinctive.

The significance of the Annin, Boring and Watson (1968) study was that the raters gave eminence scores to contributors to psychology on the basis of perceived degree of eminence. The task then is to determine which intra-professional variables accounted for their designations of eminence and then assign appropriate weights to these variables which were open to public access. A further benefit of this approach is that it avoids the single causation error which does not differentiate the necessary from the sufficient causes which produce eminence.



At this point, attention will be given to the variables used in the present study. A number of variables have been found to be associated with eminence in the literature review above. The variables selected for use in this study were those that could be specified precisely (i.e., numerically). Thus, the variables selected from the aforementioned literature review that were used in this study included number of publications by an individual (articles, monographs and books), the number of journal citations to a man's work, number of memberships and officerships in professional organizations, age at first publication, year of first publication, and the rating of the educational institution from where one received his highest degree. Other variables which were not mentioned in the literature review but which were incorporated in this study included the number of multiple-authored contributions, number of areas contributed to, number of biographical sketches and obituaries/necrologies, number of productive years, number of journal editorial positions held, number of journals cited in (hereafter referred to as journals), years as editorial member and years as an officer in professional organizations.

## METHOD

The method section includes the process through which the sample was selected, the reference selection procedure which was used to investigate the variables and an account of the statistical procedures used to assess the data.

### Sample

Attention is now given to the problem of deciding who should constitute the sample of eminent men. The Annin, Boring and Watson study entitled "Important Psychologists, (1600-1967)" (1968), was selected for three major reasons.

First, the individuals in the sample received ratings based on an estimation of eminence as perceived by the raters from their knowledge of the individuals involved. That is, the raters were not asked to apply any specific criteria in the determination of their ratings.

From the directions to the judges<sup>1</sup> mentioned earlier, it is obvious that an individual's rating was based on recognition, contributions, distinction/and or importance. Let it be reiterated that the ratings were not based on any specific

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<sup>1</sup>The judges were: E. G. Boring, P. Fraisse, R. J. Herrnstein, E. R. Hilgard, M. Imada, R. B. MacLeod, J. R. Nuttin, R. I. Watson, and M. Wertheimer. The raters were chosen by Boring because of their knowledge of psychology's history, although technically, they were not all historians.

criteria such as number of citations or publications, for example.

The second reason for the selection of this study was that all of the individuals in the sample have a numerical standing in relation to all others in the sample. This implies that as an individual's score increases so does his recognition, contribution, distinction or importance.

The third reason for the selection of the sample was that two lists of eminent contributors to psychology were provided. The first list included the names of the 538 most important contributors and appeared in the Annin, Boring and Watson study. The second list was composed of those 500 individuals who were considered of less importance and was reported in a microfilm depository.

For the present study, it was decided that only American psychologists would be used because of the availability of supporting data and the linguistic ease with which the project could be carried out. Consideration will now be given to how the particular sample to be used was derived. Watson and Merrifield (1973) have recently designated the nationality and professional grouping of each of the 538 eminent contributors to psychology. Of the 538, 116 were given the designation, "American psychologist." If an individual worked at an American college or university, he was classified as an American regardless of where he received his degree. He was regarded as a psychologist if he identified himself as one in the authoritative sources, i.e., American

Men of Science or Who Was Who in America, or if his title at an American college or university clearly indicated his being a psychologist.<sup>2</sup> The sample of 116 was used as one part of the group selected for study.

The same criteria employed so as to designate these 116 as American psychologists was applied by the present investigator to the remaining 489 (who score 10 or below) of which 89 emerged as American psychologists. The 89 comprised additional members of the group. Thus, there is a total of 205 American psychologists in the sample who are listed with eminence scores in the Appendix.

#### Reference Selection Procedure

The purpose of this section was to develop a system of reference selection which would be as unbiased as possible so that information on all of the variables for everyone in the sample could be found, irrespective of their eminence rating. It should be noted that an attempt was not made to compile all of the references.

1. Number of publications: The Library of Congress (and National Union Catalog) and the Author Index to Psychological

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<sup>2</sup>Seventeen individuals in the sample had other than academic backgrounds; that is, they were not employed by American colleges and universities exclusively. However, all of them contributed to the growth of psychology in America through American higher education. To cite one example, H. G. Seashore was primarily associated with the Psychological Corporation, but he also taught at Springfield College. Since these 17 psychologists did have varied backgrounds, a separate multiple regression analysis was performed and it was demonstrated that their data was not dissimilar to the other psychologist's data in the sample.

Index (1894-1935) and Psychological Abstracts (1927-1958) and supplementary volumes thereof were searched so as to count the number of original contributions for each individual. For those individuals whose publications appeared before 1894 and whose articles are therefore not included in the Psychological Abstracts, Poole's Index to Periodical Literature (1802-1906) was used. The different forms of potentially available contributions are as follows: articles in journals, chapters in books, monographs, books (reprinted, revised, different editions and/or edited versions), films, necrologies, book reviews and abstracts.

The tally included books, monographs and articles (articles in journals, chapters in books and films). Books that had been reprinted, revised, edited or had different editions nevertheless were counted only once. Necrologies, book reviews and abstracts were not counted following Watson's (in press) convention.

Information on the variables, multiple authorship, age at first publication, year of first publication and number of productive years were gathered while compiling the above.

2. Number of citations: Citation analysis is an established procedure that has proved of value.<sup>3</sup> It was used to indicate

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<sup>3</sup>Citation analysis has been used to evaluate the significance of a man's contribution or idea (Brožek & Goodman, 1970; Goodman, 1971); to evaluate the flow of information between groups of researchers working in different areas, i.e., clinical and experimental psychology (Cartwright, 1966; Myers, 1971); or, to find out who the significant contributors are in a particular field of endeavor (Dennis, 1954b; L'Abate, 1969; Myers, 1970; Myers & DeLevie, 1966; Ruja, 1956).

the extent to which an individual's work was "cited" in the research literature. In order to evaluate the variable, citations to a man's work, the principal journals appropriate to the time span under consideration were searched. These journals included most APA and "Murchison" journals and several other relevant journals.<sup>4</sup> These journals were judged to reflect adequately the resources used for publication by the members of the sample. They were chosen because of their high degree of visibility, their reflection of the temporal period and their appeal to the interests of the sample. Every bibliography in every fifth volume of the 19 journals was searched from its inception to 1967 for the number of citations to a man's work. Most of the work was done by inspection of the terminal bibliographies. Where these did not appear, either footnotes or names appearing in the articles were utilized. All instances of op. cit. and ibid. were not counted. A total of 240 volumes were searched. Self-citations were not counted (Watson, in press). The variable number of journals cited in was found by summing across journals after the citation count had been made.

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<sup>4</sup>The APA journals included the American Psychologist, Journal of Abnormal Psychology, Journal of Applied Psychology, Journal of Comparative and Physiological Psychology, Journal of Consulting and Clinical Psychology, Journal of Counseling Psychology, Journal of Educational Psychology, Journal of Experimental Psychology, Psychological Bulletin, Psychological Monographs and the Psychological Review. The "Murchison" journals included the Journal of General Psychology, Journal of Genetic Psychology, Genetic Psychology Monographs, Journal of Social Psychology and the Journal of Psychology. Other journals included the American Journal of Psychology, Archives of Psychology and the Journal of Personality. The current or last name used for each journal is given above.

3. Rating of educational institution from where received highest degree: The Hughes (1934) study was used to rate educational institutions. Other studies could have been used, however, but the one that most adequately represents the time span for the present investigation is the 1934 study. In the Hughes study, eleven schools were rated distinguished while 20 were rated adequate. A score of two was assigned the distinguished schools while a numerical rating of one was used for the adequate schools. If an individual graduated from a school not on the list, he received a rating of 0. This procedure is supported by the fact that 95 percent of the sample (minus the foreign graduates) graduated from the 31 schools. This rating was done only on American colleges and universities. So as not to penalize those whose degrees were obtained outside of the United States, this particular variable was not evaluated for those individuals of which there were 20.

4. Area: The variable that makes reference to area is number of areas contributed to. Several sources have been used to select the areas in psychology (Fernberger, 1938, 1943; Harvard List of Books in Psychology; Watson, 1964). Number of areas was arrived at by the process of collapsing across these sources and conceived of as the appropriate areas in psychology. The American Men of Science was used to make a count of areas contributed to. Twenty-three areas have been designated.<sup>5</sup>

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<sup>5</sup>The areas included abnormal, animal, applied clinical/counseling, developmental/child, educational, emotion,

5. Other variables: The commonly used, agreed-upon authoritative sources<sup>6</sup> (Bagg, 1973) were used to identify the remaining variables: number of memberships and officerships in professional organizations, biographical sketches, obituaries/necrologies, journal editorial positions held, years as editor and officer.

The validity of this investigation rests on the assumption that the sources used provide reliable and complete information.<sup>7</sup> Experience has shown that the information was not as accurate as would have been desired. For example, the Author Index to Psychological Index (1894-1935) and Psychological Abstracts (1927-1958) and supplementary volumes lists senior author alphabetically. If an individual was a junior author of a publication, this information could not be found. The Psychological Abstracts also includes many misprints and omissions as only certain journals are searched for inclusion. The Library of Congress and National Union Catalogue lists books of a non-psychological nature which, on occasion, inflated an individual's contributions to psychology. Several sources had to be used for researching

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history, individual differences, learning, memory, motivation, motor processes, perception, personality, physiological, psychophysics, reaction time, sensation, social, statistics/research methodology, tests, thinking, and others.

<sup>6</sup>These sources included the American Men of Science, Biography Index, New York Times Obituary Index, Who Was Who in America and an obituary list from the American Journal of Psychology.

<sup>7</sup>Unfortunately, two individuals had to be dropped from the investigation because biographical information could not be found.



biographies and obituaries as one representative source could not be found for an accurate count. The Biography Index, American Journal of Psychology and the New York Times Obituary Index was used for this purpose. It should be remembered though that the high intercorrelations which will be referred to later indicate the correctness of the obtained information in the reference sources.

### Statistical Analysis

To find out what differentiates the more from the less eminent, we have to know what the concept eminence means, therefore these objectives are intimately related. If we look at the criteria used whereby eminent men are selected for inclusion in the American Men of Science or the National Academy of Sciences, we find the phrases "notable research" and "scientific achievement" used. The task then becomes to determine what constitutes notable research and/or scientific achievement. The 19 variables selected provide a working definition.

The intention of the statistical analysis then was to 1) isolate those variables involved in the overall decision process of rating an American psychologist with a 27, 26, etc. (Annin, Boring & Watson, 1968); and 2) to explicate the various dimensions of the construct, eminence. The particular statistical methods used to evaluate these two intentions are discussed in the subsequent paragraphs.

The Annin, Boring and Watson study is the only investigation that has evolved a numerical ranking (from 1 to 27) for eminence based on peer judgment. We can assume that an individual's eminence is not the peer rating, but that the peer rating represents degree of eminence. Eminence, then, is based on the directions for rating these men and/or "something else" (variables). The criteria (directions to the raters) used were based on recognition, contribution and importance. An attempt was then made to find "something else" (variables) that relates to our common usage of the term eminence while incorporating those variables that emerged from the literature review. One qualification was that the variables had to be amenable to numerical specificity.

The primary question then, is what variables influenced the rater's decisions? With the exception of one study (Clark, 1957), investigators in separate studies have shown that an individual's status in the scientific community (or eminence) is defined by number of publications, number of citations, etc. These univariate analyses are shallow at best. What is required is a multivariate approach to the study of eminence.

The most straightforward solution to this problem is to perform a multiple regression analysis. Since each individual in the sample had an eminence score of from 1 to 27, the multiple regression procedure allowed for the determination of the relationship between the 18 variables and the global ratings of eminence given by the peer raters. The peer ratings or eminence score was the criterion. The

resultant beta weights of the predictor variables indicated which of the variables were the most important in the prediction of the eminence scores.

The second intention of this investigation was to explicate or validate the various dimensions of the construct, eminence. Does eminence exist in the real world independent of judges or only insofar as we can operationally define it? The position taken is that eminence exists only by way of the operations (i.e., variables) selected that "might" define the construct.

To validate eminence, we first have to specify those variables that represent eminence; that is, we need to find variables that converge on the construct. But this is not sufficient for construct validation. Campbell and Fiske (1959) point out that not only is it necessary to demonstrate convergent validity, but it is further necessary to demonstrate that there are variables that do not relate to eminence. This latter procedure provides an indication of divergent validity.

Factor analysis "is a crucial aspect of construct validation [Nunnally, 1967, p. 289]." According to Nunnally, factor analysis is used to find "the number of dimensions required to represent a matrix of correlations [p. 303]." For validation, a principal components factor analytic procedure was used. A principal components technique represents an a posteriori analysis of the data. Thus, the emergent factors are named after the procedure has been performed.

"To represent the original set of variables in terms of a number of factors, determined in sequence so that at each successive stage the factor would account for the maximum of the variance [Harman, 1967, p. 5]," is the basis of the principal components model. The intention is to reduce the variables to a smaller set of factors--the factors representing the communalities among the variables. The extent to which the resultant factors explain the correlations among the variables, determines the principal axes model's adequacy.

The next step was to rotate the factors so as to make them more interpretable (the rotated factors account for the same amount of variance as do the unrotated factors). A varimax rotation was performed which is orthogonal. That is, the emergent factors are uncorrelated with one another.

## MULTIPLE REGRESSION

The purpose of this section is to isolate those variables which best predict the eminence score. An ancillary purpose was to determine which variables differentiate the more from the less eminent.

### Results

Seventeen variables<sup>8</sup> were used in a multiple regression analysis with the total 205 individuals in the sample. It was found that the multiple correlation between the 17 predictors and the eminence score was .78. These 17 predictors accounted for 61 percent of the variance and was found to be significant ( $F(17, 187) = 17.51, p < .01$ ). In Table 1 is listed the 17 predictors, their correlations with the eminence score and their beta weights.

For purposes of parsimony, an attempt was made to reduce the number of predictors, without sacrificing accountable variance. It was found that five predictors yielded a

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<sup>8</sup>Eighteen variables were used as possible predictors. One of these was the educational institution from where an individual received his highest degree. This variable was evaluated using the designation of distinguished and adequate institution. This evaluation had been made on U. S. institutions only. Since there were 20 individuals in the sample who received their degrees from foreign institutions, this evaluation could not be made for these 20. Therefore, this variable was evaluated for the remaining 185 individuals in the sample. When it was found, from the multiple regression analysis, that school did not correlate with the eminence score (that correlation being .02), it was dropped from further analysis.

TABLE 1  
 MULTIPLE REGRESSION OF EMINENCE SCORE  
 ON INTRAPROFESSIONAL VARIABLES

Variables	Correlation with Eminence Score	Beta Weights
Number of Journals Cited In	.63	.361
Number of Citations	.60	.231
Number of Articles	.57	.208
Number of Productive Years	.45	.159
Number of Memberships	.24	.136
Number of Obituaries	.46	.129
Number of Editorial Positions	.45	.126
Number of Areas Contributed to	.06	.120
Number of Monographs	.15	.113
Number of Multiple-Authored Contributions	.31	.101
Number of Years as Editor	.31	.089
Year of First Publication	-.15	.045
Number of Books	.41	.030
Number of Biographies	.46	.015
Age at First Publication	-.25	.013
Number of Officerships	.33	.009
Number of Years as Officer	.15	.001

multiple correlation of .75. These five variables accounted for 56 percent of the variance in the eminence score which was significant ( $F(5,199) = 51.4, p < .01$ ). It is noted here that a reduction of variables from 17 to 5 only reduced the accountable variance from 61 to 56 percent. These five variables were number of journal citations, number of journals, number of productive years, number of editorial positions and number of articles. The beta weights yield the relative importance of each of the predictors. The beta weights were: citations (.266), journals (.255), productive years (.197), editorial positions (.192) and articles (.115).

A multiple regression analysis was also done on the number of citations per journals, with the eminence score as the criterion, to determine which journals best predict the eminence score. While all 19 journals account for 51 percent of the variance in the eminence score, three were found to account for 45 percent. In order of importance, they were the American Journal of Psychology, the Journal of Genetic Psychology and the Journal of Abnormal Psychology.

### Discussion

From the multiple regression analysis, the best predictors of the eminence score are number of journals an individual's work is cited in, number of journal citations, the number of years an individual worked, the articles produced and the editorial positions held. However, the fact that all five variables had substantial beta weights indicates

that each was partially unique. In order that the potential for eminence exists, the professional must have produced a substantial number of articles which is clearly a function of time worked since it takes a given period of time to produce an article. Given this structural base, the potential for citation is actualized as a function of the quality of the research.

The intercorrelation between number of journals and articles is .59. Clearly this is consistent with the obvious: articles are a prerequisite to being cited in a variety of journals. However, if we look at the effect of the number of journals on the eminence score with articles partialled out, we find that correlation to be .44. This suggests that while a significant number of articles contributes to eminence, it is not sufficient to produce eminence. The quality control is evidenced through the evaluation by other professional researchers that the published material is worthy of citation and/or supportive of research in a variety of areas. For example, M. L. Haggerty with an eminence score of only 8, had 119 publications but was cited in only three journals. Similarly, if the correlation between number of journals and number of areas contributed to is examined, it is found to be .20. This implies that publishing in a variety of areas does not insure citation in a variety of journals. Clark Hull, for example, although having worked in the area of suggestion, published primarily in one area, learning. However, his publications in learning were cited in all but one



journal researched. In fact, he had the highest number of citations (622) of the 205 persons researched. Obviously, then, his professional peers evaluated his research as having heuristic value to a variety of study areas.

The differentiation between sheer productivity and the designation of eminence is further buttressed in reviewing the Annin, Boring and Watson instructions to the raters who assigned eminence scores to this population. In objectifying these directions, the raters were asked to give 3 to those psychologists of importance and distinction; 2 to those who had contributed and 1 to those who were recognized. We find that the raters' subjective decisions are supported by the objective data provided by this research. For example, Clark Hull scored 3 across 9 raters thus being ranked in the category of importance and distinction. This is consistent with the fact that he published 74 articles and was cited in 18 journals. Samuel W. Fernberger scored 2 across 9 judges and was, therefore, designated as a contributor. This is consistent with the fact that he published a similar number of articles as Hull but was cited in only 12 journals. M. L. Haggerty, who scored about 1 across 9 raters was designated in the recognized group. This is supported by the fact that he published comparably to the other two, but was cited in only three journals. Here again, the volume of articles is demonstrated not to be the key factor.

What variables differentiate the more from the less eminent? Table 2 makes a comparison of the 17 variables for

TABLE 2  
 MEAN COMPARISON OF INTRAPROFESSIONAL VARIABLES  
 BETWEEN THE EMINENT AND LESS EMINENT

Variables	Eminent	Less Eminent
Number of Journals Cited In	11.0	6.0
Number of Citations	82.0	20.0
Number of Articles	59.0	27.0
Number of Productive Years	39.0	28.0
Number of Memberships	4.4	3.7
Number of Obituaries	2.4	1.0
Number of Editorial Positions	1.5	.4
Number of Areas Contributed to	3.8	3.6
Number of Monographs	1.2	1.0
Number of Multiple-Authored Contributions	12.0	3.0
Number of Years as Editor	8.0	2.0
Year of First Publication	1909	1912
Number of Books	6.0	3.0
Number of Biographies	1.0	.2
Age at First Publication	28	30
Number of Officerships	1.3	.7
Number of Years as Officer	2.7	1.2

these two groups of eminent men. The more eminent were those who scored 11 and above, while the less eminent were those scoring 10 and below.

Although significant beta weights are statistically more meaningful, Table 2 provides a general impression of the difference between the eminent and the less eminent. Further, it is interesting to note that year of first publication did not matter in the designation of eminence; it would therefore appear that these two arbitrary groupings were involved in a productive effort during the same period.

There were several high intercorrelations among the predictors. Those of .60 or above will be mentioned; there were five. The highest was .74 between editorial positions held and years as editor. Number of journals and number of citations correlated .68. Number of officerships and years as officer correlated .63. Number of memberships and officerships correlated .60. Number of biographies and obituaries correlated .60. High intercorrelations mean that each of the variables were measuring the same dimension of the eminent person. Therefore, we would expect high intercorrelations among the predictors mentioned above. It should be noted that there were not any high intercorrelations which were not expected. Also, high intercorrelations between the variables mentioned above, give credence to the assertion that the information found in the sources used for the research was correct.

One of the interesting findings of this study was that the educational institution from where one received his highest degree did not enter into an individual's resultant eminence score. There are several reasons for this finding. During the time span in question, most individuals received their degrees from similar institutions because there were not as many schools granting the Ph.D. in psychology as there are today. Currently, prestige of degree is in large part a function of institution; during the time span in question, the prestige was intrinsic to the degree itself as opposed to the institution. Also, more sophisticated methods have been derived since 1934 (the date of publication of the Hughes' study) for rating graduate programs in psychology which have more clearly demarcated a school's standing among other schools. This finding, though, may be artificial in that the data does not permit an examination of the number of Ph.D.'s produced from each institution. That is, the distinguished schools may have produced more eminent men relative to the total number of graduates than the adequate schools, for example.

Number of journals in which one's work is cited appears to be one of the most significant predictors. Not only was its beta weight one of the highest in the two multiple regression analyses, but also its correlation with the eminence score was the highest (.63). Of the 205 individuals in the sample, only three were cited in all 19 journals searched. They were Gordon W. Allport, E. L. Thorndike and

L. L. Thurstone--all of whom received eminence scores of 27. Six psychologists were cited in 18 journals. They were Clark Hull, L. M. Terman and R. S. Woodworth, with scores of 27; E. R. Guthrie with a 26; and E. K. Strong and Florence Goodenough with scores of 20. There appears to be a strong agreement between the eminence score given by the raters and the number of journals an individual's work was cited in.

Of the 19 journals, 3 appear to predict the eminence score without losing much accountable variance. They are, in order of importance, the American Journal of Psychology (1887-), the Journal of Genetic Psychology (1891-) and the Journal of Abnormal Psychology (1906-). There are several reasons that may account for this finding. Since these journals cover such a long time span, more American psychologists had an opportunity to be included in the search. Subsequently, more volumes were included in the search for references. Further, the scope of coverage of articles for inclusion in two of the journals, the American Journal of Psychology and the Journal of Genetic Psychology, was far broader than many of the other journals searched.

## CONSTRUCT VALIDATION

In this section, an attempt has been made to validate the various dimensions of the construct, eminence. The factor analytic procedure used allows for the a posteriori naming of the emergent factors which, in turn, will be used to define eminence.

### Results

The purpose of this section is to report the results concerning validation of the various dimensions of the construct, eminence. For this reason, a principal components solution was used. A principal components analysis allows for the abstraction of the minimal number of factors that account for the maximum of variation and also designates factors which are independent of one another. For purposes of this analysis, the variable, educational institution, was dropped because it had a negligible correlation with the criterion and also because 20 psychologists in the sample could not be rated since they graduated from foreign schools.

A principal components solution was attempted with 12 variables which were the result of deleting six from the analysis. The six variables which were dropped from this analysis included number of monographs, number of books, number of multiple-authored publications, number of areas contributed to, age at and year of first publication. It was found from a multiple regression analysis that number of

articles, number of books, number of monographs and number of multiple-authored publications accounted for 35 percent of the variance in the criterion, while number of articles alone accounted for 33 percent. Articles seemed best to represent an individual's production while the other variables seem to convey redundant information. Areas, age and year at first publication were dropped because of their low correlations with the criterion. Therefore, a total of 12 variables were used in this analysis. Table 3 represents the results of this analysis.

Five factors emerged in this rotated solution accounting for 80 percent of the variance. The final communalities indicate what percentage of the variance for each variable was picked up by the five factors. Factor 1, accounting for 22 percent of the variance, emerges as the "research quality factor" because of the variables that load high with this factor. They were: the eminence score, number of journal citations, number of articles and number of journals one's work was cited in. Further, number of journals correlates the highest (.90) with this factor. Factor 2 was named the "professional organization factor" since number of memberships, number of officerships and years as officer correlates the highest with this factor. Factor 3 was named the "editorial factor" because number of editorships and years as editor appear to define this factor. Factor 4 was named the "recognition factor" since number of biographies and obituaries define this factor. Factor 5 has been termed the "productive

TABLE 3  
 ROTATED PRINCIPAL COMPONENTS FACTOR MATRIX

Variables	Factors					Final Communalities
	1	2	3	4	5	
Eminence Score	<u>.70</u> <sup>9</sup>	.04	.29	.23	.32	.73
Number of Articles	<u>.63</u>	.20	.11	.32	.37	.69
Number of Journals Cited In	<u>.90</u>	.13	.13	.04	.08	.85
Number of Citations	<u>.82</u>	.12	-.02	.35	-.06	.81
Number of Memberships	.27	<u>.71</u>	.14	.17	.00	.62
Number of Officerships	.19	<u>.84</u>	.25	.15	.11	.83
Number of Years as Officer	-.06	<u>.83</u>	.17	-.04	.10	.73
Number of Editorships	.23	.21	<u>.84</u>	.22	.07	.86
Number of Years as Editor	.05	.33	<u>.88</u>	.04	.09	.89
Number of Biographies	.25	.05	.29	<u>.78</u>	.18	.79
Number of Obituaries	.24	.15	.01	<u>.86</u>	.13	.83
Number of Productive Years	.19	.13	.10	.20	<u>.91</u>	.94
Accountable Variance	22%	18%	15%	15%	10%	= 80% total

<sup>9</sup>The italicized correlations indicate the variables used to name the factors.



years factor" since number of productive years correlates the highest with this factor. Factor 5 is essentially a specific factor since no variables, save for the number of productive years, loads substantially on this factor.

### Discussion

In the principal components solution, the first factor was termed the "research quality factor." The multiple regression analysis, it will be remembered, also demonstrated that the variables which load high on this factor were very important in predicting the eminence score. The highest correlation with the "research quality factor" was with number of journals in which a given individual was cited. This appears to be the most important predictor in the determination of the eminence score. Factor 2, the "professional organization factor," appears not to relate to the eminence rating as the eminence score correlates only .04 with factor 2. This is further substantiated by the fact that the multiple regression analysis demonstrated that the correlation between number of memberships and the eminence score was .24 while .33 was the correlation between number of officerships and the eminence score. The eminence rating, therefore, did not take into consideration that an individual was a member or officer of a professional organization. Factor 3, the "editorial factor," appears to be related somewhat to the eminence rating because the eminence score correlated .29 with this factor. Factor 4, the "recognition factor,"

appears to be related to number of articles since it correlated .32 with this factor. It appears also to be related to number of citations since this variable correlates .35 with the "recognition factor." Both number of articles and number of citations, therefore, are necessary for recognition. The "productive years factor" is related both to the eminence score (.32) and to number of articles (.37) which indicates a dedication to work that tends to be typical of the eminent and less typical of the less eminent. It should be noted here that these five factors represent dimensions of the variables as manifested in the sample, and these will be discussed in a later section entitled "Characteristics of eminent American psychologists."

To validate the various dimensions of eminence, it is necessary to show that the factors used to define eminence possess both convergent and divergent validity. It will be remembered that variables were chosen that represented a working definition of the construct, eminence. These variables were then factor analyzed--the results of which indicated factors or dimensions of the construct, eminence. Inspection of Table 3 indicates that each of the factors possess convergent and divergent validity. Factor 1, for example, has been named "research quality." The four variables that define this factor correlate appreciably with this factor and negligibly with the other four factors. The other eight variables that load on this factor have small correlations with it; therefore, this dimension of eminence--

"research quality"--has been shown to possess both convergent and divergent validity. This same argument may be extended to include factors 2 through 5. However, it should be noted that two alternative interpretations are feasible for the principal components solution. One is that the eminence score is factorially simple in that it loads highest on factor 1 with negligible loadings (.32 or below) on factors 2 through 5. Therefore, the eminence score is related to number of articles, number of citations and number of journals (factor 1) and unrelated to factors 2 through 5. The alternative explanation is that the eminence score is factorially complex in that it has correlations of .29, .23 and .32 with factors 3, 4 and 5, respectively. So long as a given variable does not correlate 1.00 with a given factor, it can relate to other factors. Therefore, the eminence score could be interpreted as relating to the factors, "editorial positions," "recognition" and "productive years," because the interpretation of factors are dependent upon what level of loading is considered substantial or negligible.

## GENERAL DISCUSSION

In evaluating the past research which examines the concept of eminence, it is evident that the current investigation is unique in several ways. The foundation for the research, the sample, is exceptional in that there is provided a ranking of eminent men in discrete categories of from 1 to 27. Whereas previous research dealt with the comparison of the eminent to the non-eminent, this study was able to further refine its conclusions by examining the variables which influence the gradations of eminence, from the most to the least. Further, the time sample of eminent men covered a publication period of 89 years.

Also, peculiar to the study is the fact that the raters were given no a priori definition of eminence, but were asked to rate eminence on perceived degree of recognition and contribution. That is, no specific criteria were enumerated which predicated the eminence rating.

Therefore, the format of this research relates to a project mentioned earlier which never reached fruition. The American Physiological Society attempted to designate criteria of eminence. These criteria were then to be used for the selection of eminent physiologists. The present investigation asserts that eminent men should be selected first and then the characteristics which distinguish them may be deduced. The criteria thus evolved may then be employed in future selections of eminent men. That eminent men may be

designated a priori to the selection of the criteria is demonstrated by the Annin, Boring and Watson (1968) study.

The methodology of this investigation is further unique in reference to the number of variables employed in the multiple regression equation. No previous research investigated the interrelationships of this number of variables and while the present study incorporated most of the variables previously cited in the literature, several new variables were evolved such as number of productive years and number of editorial positions. This latter, previously uninvestigated variable, was found to be of considerable significance in examining eminence. Furthermore, this is the only study in which the methodology has included an attempt to validate the various dimensions of the construct, eminence, by using a factor analytic solution.

This unique sample was utilized and the methodological procedure was devised, then, for the task of identifying those objective and quantifiable variables which were the foundation for and which were reflected in the subjective designation of eminence by professional peers. In analyzing the resultant statistical profile, it is evident that the complex clusters of interrelating variables are indicative of the existence and nature of the objective indices which were sought.

In order to introduce clarity to the complexity of results previously cited, the general discussion will be divided into several sections.

The presentation of the following sections will be ordered in terms of their specificity to the discussion of eminence. Those factors which are most closely related to the results of this investigation will be examined initially. Thereafter, the discussion will broaden to examine tangential topics such as the Great Man theory and its relationship to eminence.

First to be examined will be the significance of the variables, number of articles and citations, number of professional organizations and number of editorial positions. These crucial variables will be examined further through reference to previous investigations in which their influence has been evaluated. Also eminence will be considered as it relates to the educational institution from which these psychologists received their highest degrees.

Since the multiple regression analysis demonstrated that citations were a significant variable, the usefulness of citation counts will be explicated. This investigation allows for the determination of who should be labelled the most eminent of American psychologists; and, therefore, the communalities among those individuals will be discussed. Closely related to this issue are the characteristics of eminent American psychologists which were provided by the principal components analysis. This investigation also allows for a reordering of eminent psychologists based on their

predicted eminence score. This will be discussed in the section entitled "Important contributors to psychology."

The objective variables found to be associated with the designation of eminence will be evaluated in terms of the "great man" approach to the theoretical evaluation of the relationship between eminence and the progression of knowledge. And, last, future investigations will be suggested.

Many variables have been found to be associated with eminence in previous investigations. Investigators have delineated such influences as the sociological, psychological, and intraprofessional as being instrumental in the attainment of eminence. There are a host of difficulties involved in attaining accurate sociological and psychological indices of eminence; therefore the present investigation has focused on intraprofessional variables only. Intraprofessional variables are those that relate to what an individual did within his profession from the granting of his highest degree until his death. Of necessity, these variables had to be available for public access. And, one other qualification was necessary --that the variables were amenable to numerical specificity for purposes of a statistical analysis.

The fact that the variables for study were selected on the basis of their potential for quantitative analysis could be a reason for a phenomenologist's objection to this methodology. The criticism that the variables were designated by the methodology instead of the more theoretically

sound alternative of allowing the variables to define the style of analysis is significant. However, this objection may be partially negated by the quality of the results. It has been demonstrated here that the objective assessment of eminence using quantifiable variables is highly reflective of the assessment of eminence in the subjective opinion of raters. Therefore, the research has not violated the intuitive non-numerical reaction of the raters but rather has supported them by explicating the communalities that prompted the subjective response. What is provided, then, is an objective breakdown of a phenomenological response to the concept of eminence.

#### Articles and Citations

Dennis (1954a) has demonstrated that the most distinguished psychologists are responsible for many publications. He has further shown that most of the publications in psychology are the result of the work of a relatively few psychologists and that the work of these individuals was most often cited in the literature of psychology (1954b).

Several other investigators have found that both number of articles and citations are a prerequisite to eminent status (Clark, 1957; Myers, 1970; Platz & Blakelock, 1960; Ruja, 1956). Clark has found that current Psychological Abstract counts, Annual Review citations and journal citations correlate positively with the number of votes received by "highly visible" psychologists, those correlations being



.43, .58 and .68, respectively. The present study did not use current Psychological Abstract counts because of the long time span in which the sample published (89 years). Annual Review citations were not used as a predictor because this publication was not inaugurated until 1950. However, the current study does support the importance of number of articles and citations in the designation of eminence. The correlations between number of articles and the eminence score was .57 while .60 was the obtained correlation between number of citations and the eminence score. Ruja has also shown that the more productive psychologists are those who are most often cited in the journal literature. Myers concludes that "psychologists who are judged to be scientifically eminent are also those most often cited in the current journal literature [p. 1047]."

The present project would add one important qualification to these previously cited findings. It is not merely the number of citations which are important in the designation of eminence, but it is the variety of journals in which these citations are found that indicate eminent status. The number of journals in which one's work was found to be cited correlated .63 with the eminence score. Further, this significant variable was found to correlate the highest with the "research quality" factor which emerged in the principal components solution.

Platz and Blakelock (1960) investigated quality versus quantity in the matter of published research. They

assert that there are different methods for evaluating the variable, number of citations, as a predictor of eminence. These methods include citations in journals, citations in the Annual Review and citations in history texts. They caution that "the answer to the question as to whether high producers also produce high quality work seems to depend on the severity of the criterion used to measure quality [p. 312]." That is, citations in journals may point out the ephemeral nature of an article's worth while citations in history texts, for example, demonstrate long-range worth. It should be noted that Clark (1957) used citations in journals and the Annual Review whereas Dennis (1954b) and Lehman (1960) focused on citations in history texts. For purposes of the present investigation, it was felt that the day-to-day activities of psychologists could best be discerned by a search of the journal literature's citations. Further, since history texts are selective in the presentation of material, many of the individuals in the sample would not be included, therefore; an accurate indication of the value of their research could not be evaluated. Also, the use of history texts would only serve to perpetuate the selection of similar individuals. And, the selectivity of history texts truncates the distributions and therefore reduces the relationships.

Dennis (1954c) has asserted that "whatever else is required to achieve eminence in science, sustained effort is one prerequisite [p. 182]." The multiple regression analysis has demonstrated that number of productive years is also an

important correlate of eminence. Obviously, the longer one works, the more likely it is that many articles will be produced. Dennis adds that "the greater the number of pieces of scientific work done by a given man, the greater the likelihood that one or more of them will prove to be important [p. 182]."

Though the quality of research as evaluated and expressed in the frequency and diversity of citation is the key factor in determinence of eminence, the relationship between quality and quantity of productivity is complex. Obviously, a high rate of productivity, though not a determinant of professional recognition, is supportive of this outcome. A prolific researcher is one who has indicated the motivation to contribute to the knowledge base of the field and his perseverance may result in a more sophisticated understanding of methodology, improvement in research significance, and professional visibility. By definition then, a researcher must publish in order to be cited, and the potential for citation is improved to some extent by the amount of productivity.

Citation count is, therefore, the single most crucial index of eminence. This finding does not imply a univariate cause of eminence but is, rather, indicative of the complex interaction of variables in which citations are correlative. The number of citations is obviously related to number of articles and number of journals. Also, the professional visibility which results from citation is associated with

officerships in professional organizations, editorial positions and number of biographies and obituaries. In stipulating that citation count is the most reliable indication of eminence, it is concluded that the other variables which have been found to be associated with eminence may be inferred from such a count.

### Professional Organizations

This project has demonstrated that there is a .24 correlation between number of memberships in professional organizations and the eminence score and a correlation of .33 between number of offices held in professional organizations and the eminence score. Two other investigators also found positive correlations (Clark, 1957; Myers, 1970). Clark found there to be a .64 correlation between APA offices held and the votes received by "highly visible" psychologists. The present investigation cannot comment on APA offices because a count of all offices held in professional organizations was used as a variable. To further validate his own findings, Myers tallied positions held in psychological organizations and found there to be a very high agreement between this variable and the designation of eminence given to psychologists based on a citation count.

While making reference to number of offices held and eminence, it should be noted that 39 of the first 52 presidents of the APA were included in the sample of the present investigation. Of the 39, 38 received eminence scores of 11

or more while one person, Peterson, received a score of 9. Of the remaining 13, 4 were American philosophers, 1 was a German-American psychologist who had made a considerable impact in Germany before migrating to the United States, and the other 8 were alive and, therefore, could not have been included on the list.

Although the results presented in a previous paragraph showed that high correlations did not exist, to conclude that there is not a relationship between professional organizations and eminence would be erroneous. Further refinements in the data would allow for more specific hypotheses to be tested. Further, this investigation has focused on variables involved in the attainment of eminence. Another investigation might use number of offices held in psychological organizations as a criterion measure for eminence; that is, offices held might be an effect of eminence, not a cause.

#### Editorial Positions

It is inexplicable that this variable which would seem to be indicative of high prestige and professional recognition has never been examined in studies relevant to the designation of eminence. Perhaps this experimental omission was due to the fact that there are relatively few journals and that the numerically few positions are typically held for a long period of time. It might, therefore, have been assumed that this variable would be relevant to too few people to be

of significance in differentiating the eminent from the non-eminent. This investigation would indicate that this assumption was erroneous and performance of an editorial position is, in fact, correlative to the designation of eminence.

#### Educational Institution

Wispé and Ritter (1964) have demonstrated that 63 percent of America's recognized psychologists came from seven departments of psychology (Harvard, Johns Hopkins, Stanford, Cornell, Columbia, Yale and Chicago). Therefore, there appears to be a positive relationship between the degree-granting institution and Wispé's and Ritter's definition of the professionally recognized--belonging to psychologically oriented associations in which membership or officership held was considered to be "an honor" by fellow professionals. The present investigator found a .15 correlation between memberships and degree-granting institution and a correlation of .11 between officerships and school. Further, the correlation between the degree-granting institution and the eminence score was .02 using the data from the Hughes' (1934) classification of institutions. Although investigating productivity rather than eminence, Clemente (1973) found that the "quality" of the department from which one received the doctorate did not affect an individual's productivity. It is concluded, therefore, that there is no demonstrable relationship between the institution from which an individual received his highest

degree and the subsequent designation of eminence.

Another analysis was performed to assess the relationship between the college or university with which the individual had the closest identification as a psychologist and the eminence score. For example, although Cattell taught at the University of Pennsylvania, he did his most important work at Columbia which was the designation used. The correlation between university most closely identified with and the eminence score was .30. However, Guyer and Fidell (1973) found that educational institution in which one worked mattered little in the question of published research, although the authors, too, were interested in productivity as differentiated from eminence.

Therefore, there appears to be a difference in significance between the school from which one received the highest degree and the school with which one is most closely identified during his career in the relationship to the eminence score. This is true of the sample because, while there were few prestigious degree-granting institutions, there were many academic environments in which psychology could be taught. Today, due to the hierarchical classification of graduate programs which exists in the report, A Rating of Graduate Programs (Roose & Anderson, 1970), these variables would probably be more closely related in that if one does not graduate from a prestigious institution, his chances of being associated with the faculty of a prestigious school would appear to be somewhat less probable.

### Citation Counts

A citation count was found to be one of the variables that differentiates the more from the less eminent. One significant aspect of this investigation relates to the writing of history textbooks in psychology. If a text is to present a broad overview of the development of psychology, how are individuals selected for inclusion in the text as representative of important figures in psychology? It is suggested that psychologists with the largest citation count be chosen as representatives of the field. In terms of citations, the top ten eminent men were Clark Hull (622), E. L. Thorndike (569), Kenneth W. Spence (438), L. L. Thurstone (406), Gordon W. Allport (310), R. S. Woodworth (309), L. M. Terman (274), K. S. Lashley (269), E. C. Tolman (244) and C. I. Hovland (215). The raters in the Annin, Boring and Watson (1968) study gave the aforementioned men an average score of 26.4 while the results of the study showed that each man was cited in an average of 17.6 out of a total of 19 journals. There is a very strong agreement between the eminence score received and the psychologist's citation and journal count.

Although not strictly related to citation counts, Wurtz (1961) made a survey of psychology's most important books. Eighty psychologists judged 29 authors to have produced books which were considered to be "landmarks" in psychology's development. Nine of these authors appear in the



sample used in this investigation, seven of which are included in the top ten scorers in terms of citation counts: Clark Hull, E. L. Thorndike, R. S. Woodworth, E. C. Tolman, Gordon W. Allport, L. M. Terman and K. S. Lashley. Therefore, it is concluded that the individuals who have produced psychology's "landmarks" are also those most often cited in the journal literature.

Enumeration of eminent men serves to make the study of history less abstract and more intelligible. In viewing the progression of a science as a function of its eminent contributors, it is crucial to select those men that did in fact have the most pervasive influence. Citation counts provide us with this non-arbitrary criterion, and, therefore, provide us with the "coathangers" in psychology's development.

#### The Most Eminent American Psychologists

As has been previously stipulated, the criteria used for designating eminence will in large measure determine the men so named. In this study, it has been demonstrated that there are several ways of assessing eminence. Eminent psychologists may be selected on the basis of the actual eminence score or by the number of citations given to their work. Also, eminence may be determined by examination of the number of journals in which their works were cited. The latter two criteria were found to correlate highest with the eminence score, had the highest beta weights and were found to be the best predictors. Finally, eminence may be

evaluated based on the predicted eminence score in the multiple regression analysis (with all variables included).

Therefore, in order to stipulate the most eminent men in American psychology, it would seem most efficient for purposes of analysis to select those individuals who satisfy the criteria of all four methods cited, and thus would be designated eminent by any of the above described techniques.

Utilization of the composite criterion necessitates inclusion of all psychologists with the actual eminence rating of 27, the top ten predicted scorers, those ten with the most citations and those whose work was cited in at least 18 of the 19 journals researched. (This criterion was dropped to 18 because only three psychologists were cited in all 19 journals.) This process results in the designation of the following six American psychologists who satisfy these criteria as being the most eminent: Gordon W. Allport, Clark Hull, L. M. Terman, E. L. Thorndike, L. L. Thurstone, and R. S. Woodworth. Table 4 gives the actual and predicted scores, the number of citations and the number of journals each man's work was cited in.

Having designated these six American psychologists as the most eminent, it is now possible to evaluate the communalities among these men to further elaborate on the determinants of eminence.

In tracing the profile of eminence, it is first crucial to note that these men received their highest degree between 1898 and 1922. Therefore, their productive period

TABLE 4  
 ACTUAL AND PREDICTED SCORES, NUMBER OF CITATIONS  
 AND NUMBER OF JOURNALS FOR THE SIX MOST  
 EMINENT AMERICAN PSYCHOLOGISTS

Name	Actual Score	Predicted Score	Citations	Journals
Allport	27	25	310	19
Hull	27	31	622	18
Terman	27	31	274	18
Thorndike	27	37	569	19
Thurstone	27	27	406	19
Woodworth	27	25	309	18

was during those years in which psychology as a science was burgeoning. These men had and actualized the potential to be involved in the foundation of the field and this undoubtedly affected their eminent status. This is not to say that their eminence was an accident of timing. Scientific eminence is obviously, in part, a function of the Zeitgeist, but of the many who have access to the tools of eminence, very few achieve this status.

Further communalities are evident in the academic settings from which these men graduated and with which they were associated. All of them graduated from prestigious schools (Allport--Harvard, Hull--University of Wisconsin, Terman--Clark, Thurstone--Chicago, Thorndike and Woodworth--Columbia) and each was associated with a prestigious university throughout his career (Allport--Harvard, Hull--University of Wisconsin and Yale, Terman--Stanford, Thurstone--Chicago, Thorndike and Woodworth--Columbia). This latter factor is crucial in several ways. First, a prestigious school implies a graduate program with numerous graduate assistants of high calibre. The assessibility of such assistants was undoubtedly a factor in the productivity of these eminent men. Also, having had a significant number of graduate students under their tutelage insured the eminent of apostles to carry out their research interest and promulgate their research activities through citations.

It is also interesting to note that, with the exception of Hull (University of Wisconsin, 13 years and Yale, 18

years), the remaining five men were associated with the same school for a long period of time (Allport, 43 years; Terman, 32 years; Thorndike, 42 years; Thurstone, 31 years; Woodworth, 39 years). This factor, combined with the fact that each man was primarily associated with one area of psychology (Allport: personality; Hull and Thorndike: learning; Terman: intelligence; Thurstone: psychometrics), served to make these men highly visible. The exception to this is Woodworth who was called the "great eclectic" but who was also extremely visible. Their recognition was undoubtedly encouraged by the fact that for the bulk of their careers, they were in the same academic setting and worked extensively in the same area.

#### Characteristics of Eminent American Psychologists

It should be stipulated that the factors that emerged from the principal components solution represent characteristics of the variables as manifested in the sample of eminent American psychologists selected for study. This finding is based on the assumption that the Annin, Boring and Watson (1968) sample represent the eminent persons in psychology. To validate this assumption, it was not only necessary to find variables that predict the eminence score, but also those variables that relate to what the construct, eminence, means. It was demonstrated that five variables predict the eminence score with a multiple correlation of .75. Therefore, there

is a high correlation between the predictors--number of citations, number of journals cited in, number of articles, number of productive years and number of editorial positions --and the eminence score with citations (number of journal citations) in a variety of journals (number of journals cited in) accounting for the most combined variance in the eminence score (45 percent).

Prior to the investigation, it was assumed that number of citations would correlate the highest with the eminence score. However, the resultant multiple regression analysis refined that prediction. It was demonstrated that the eminence score could best be predicted by two variables: number of citations and number of journals. Therefore, eminent status (the eminence score) was conferred on those who were cited in a variety of journals; that is, the eminent individual's research had heuristic value to a variety of research areas. It was therefore concluded that the Annin, Boring and Watson sample did, indeed, represent the eminent in psychology because the desire was to relate the eminence score to quality of research.

The principal components solution provides factors which represent characteristics of the sample of eminent men. Those characteristics include:

1. Research quality. It was pointed out previously that number of articles, number of journals, number of citations and the eminence score define this factor. The eminence score correlates higher with this factor than with any other

factor. The variable that correlates the highest with this factor is number of journals. Further, it was demonstrated previously that although articles are necessary for eminence, they are not sufficient for that designation. It was concluded that eminent status was given to those whose work was of sufficient quality to be "cited" by other professional researchers.

2. Professional organizations. The eminence score correlates .04 with this factor. Had further refinements been made in the data collection for example, using psychological organizations or APA offices only, it would be hypothesized that the eminence score would correlate higher with this factor than it did. Although this factor represents a characteristic of the sample of eminent men, it appears to be unrelated to the eminence score because of the method used to collect the data on the variables--number of memberships, number of officerships and number of years as officer.

3. Editorial positions. The eminence score correlates .29 with this factor. It was pointed out earlier that this was a significant variable for the designation of eminence, but its weight in that determination is not significant as number of journals, for example. It was stipulated previously that number of editorial positions was probably not used in prior investigations as a variable because its use as a reliable discriminator was seen as questionable.

4. Biographies and obituaries. The eminence score correlates .23 with this factor. Therefore, it would appear that biographies and obituaries are written for a variety of reasons, one of which is that the individual was eminent.

5. Productive years. Although the eminence score correlates .32 with productive years, this factor is specific and therefore unrelated to the other factors. Individuals may work many years, but this does not insure eminence. However, it was shown in Table 2 that the eminent worked an average of 39 years while the less eminent worked for 28 years. The significance of the fact that the eminent worked eleven years longer is not seriously distorted by differentiated longevity between the eminent and the less eminent. (The mean age of the eminent at death was 70 while the mean age for the less eminent was 65.) Further, this variable was found to be significant in the multiple regression analysis but did not account for as much variance as number of journals did, for example.

It was noted that almost all of the persons in the sample were primarily academicians throughout their careers. The data of the 17 persons with varied backgrounds, other than academic, indicated no difference on the variables used for the investigation. Therefore, the population is homogeneous.

It is concluded that the eminent in psychology are those who were primarily academicians, who worked many years producing many articles, and who were cited in a variety of



journals. The six most eminent American psychologists epitomize all of these characteristics.

The five factors represent characteristics of the eminent sample with the exception of factor 2 (professional organizations). Therefore, factors 1, 3, 4 and 5 are related to the construct, eminence; the most important of which is the "research quality" factor. Since this factor accounts for the most variance, the construct of eminence is most closely related to "research quality."

To summarize, it was found that the eminence rating could best be predicted by the combined variables: number of citations and number of journals. It was therefore concluded that the sample represented the eminent persons in psychology. It was found from the principal components analysis that there were five dimensions of eminence--the most important one being "research quality." It was concluded that this was the most important characteristic of the eminent man in psychology.

#### Important Contributors to Psychology

Using the significant variables isolated in this study as predictors of eminent status, which individuals would have been included on the list of 116 "important contributors to psychology" as published by Annin, Boring and Watson (1968)? And, who would have been on the list in the microfilm depository with the designation "less eminent"? The predicted scores in the multiple regression analysis can be

used to answer these questions. Using the top 116 scorers, the cut-off point for the designation of eminence becomes 12; therefore, 23 psychologists would have been included on the list of eminent persons in psychology.<sup>10</sup> On the other hand, 22 individuals did not receive predicted scores of 12 or more and would not have been on the list of eminent psychologists had these predictor variables been used.<sup>11</sup> Most of these individuals, it so happens, were those whose secondary literature, i.e., citations in books and journals, was proven to be scant in a systematic search of selected references to be

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<sup>10</sup>These psychologists with their predicted and actual scores, respectively, in parentheses, included: W. C. Bagley (12-8), A. G. Bills (13-9), F. E. Bolton (14-4), E. S. Conklin (14-10), E. A. K. Culler (13-9), R. C. Davis (15-5), Grace M. Fernald (12-7), A. R. Gilliland (15-10), Kate M. Gordon (12-6), M. E. Haggerty (13-9), G. W. Hartmann (13-9), S. P. Hayes (15-10), J. H. Hyslop (13-8), H. M. Johnson (15-10), H. E. Jones (14-9), H. D. Kitson (14-5), Lillian M. Martin (12-8), J. J. B. Morgan (13-7), J. Petersen (15-9), W. S. Shipley (14-10), C. A. Strong (12-7), H. K. Wolfe (12-3), and Helen B. T. Woolley (12-9). It is significant to note that all of these individuals scored near the lower end of the continuum; that is, no one scored over 15.

<sup>11</sup>The psychologists with their predicted and actual scores, respectively, in parentheses, that would not have been on the list had the predictors in this investigation been used, included: R. P. Angier (7-12), C. Bird (10-11), J. W. Baird (11-17), W. F. Book (11-12), D. Farnsworth (8-12), T. Karwoski (5-11), C. E. Kellogg (9-13), Christine Ladd-Franklin (11-22), D. M. McGregor (8-12), E. Mayo (11-11), H. W. Nissen (9-14), E. S. Robinson (11-16), F. H. Sanford (11-16), B. Sidis (11-17), W. S. Small (9-18), G. S. Snoddy (8-11), E. D. Starbuck (9-12), E. B. Twitmyer (9-14), L. H. Warner (9-11), A. P. Weiss (11-22), L. Witmer (11-19), and K. E. Zener (11-15). It is significant to note that many younger psychologists appear on this list whose citations may not have been yet available. Therefore, these scores are unfair for some people.

included in a bibliography in preparation (Watson, private communication).

### The Great Man Theory

A more general issue, not as closely tied to the results as the earlier sections were, is the Great Man theory. The Great Man theory asserts that investigation of great men is the key to understanding history or at least that the great man may be a major factor among many in the determination of historical developments. Although fraught with many problems, the main difficulty of this theory has to do with the selection of the great men. What objective standard can be used as a basis for selection? Nine historians of psychology rated 205 American psychologists as to their perceived degree of importance to psychology. It has been demonstrated that the related variables which correlate the highest with the eminence score are number of journals and number of citations. We are here provided with an objective yardstick from which to choose the great men of psychology. The great men in psychology are those whose work has been found by subsequent professional researchers to be of value.

This investigation also allows for an estimation of the influence of great men. Once representative men have been selected, the extent of their influence can be determined by taking citation counts over various journals during the time span in question.

According to Thomas Carlyle, history is the "biography of great men." But William James cautions that there is a difference between the origin of outstanding individuals and their subsequent achievements. He asserts that the latter is the more important: It is not what one is, but what one does that determines one's influence on psychology. Several previous investigations sought to determine the social and psychological correlates of eminence. The intention of the present investigation was to comment on the results of the social and psychological--that is, the intra-professional--variables. It is these variables which determine an individual's eminence in the field of psychology. They were found to be number of productive years, number of articles, number of editorial positions, number of citations and number of journals.

#### Future Investigations

Though the current study has been confined to American psychologists who were primarily academicians, the methodology may be employed to examine eminence in diverse populations. For example, the Annin, Boring and Watson (1968) study provides the names and scores of other nationalities (German, French, British, and others) and contributors to psychology from other professional groupings related to psychology (philosophers, physiologists, psychiatrists, psychoanalysts and others). It would be interesting to examine if different

cultural setting and/or professional specialty differentially affected the designation of eminence.

Similarly, the methodology here devised may be employed in examining the eminence potential of recently deceased psychologists. The American Psychologist publishes a list of those who have died in recent months. The eminence formula developed in the present investigation may be used to predict which psychologists will be accorded eminent status on the basis of a projection of the current citation rate. Such research over a period of time would also serve to designate shifts in the assignment of priorities resulting in the designation of eminence. The formula provided is not assumed to be static and investigation of changes in the definition of eminence may be charted and evaluated over time.

Further refinement of the eminence formula may also be accomplished through comparison of the eminent with a control group of randomly selected psychologists. Since the emergent factors designate dimensions of the variables as manifested in the sample, another study would compare the 205 psychologists in the present investigation with another 205 individuals randomly chosen from the APA biographical directory so as to compare the two groups on the basis of the variables found to be related to eminence. Such research would allow for further explication of that which differentiates the eminent from other individuals in psychology.

In evaluating the methodology of the current study, further research should examine the process of citation counts,

Platz and Blakelock (1960) designated several methods for employing citations as correlates of eminent status. These methods are enumeration of citations in journals, used in this study, Annual Review citations, and citations in history texts. A significant investigation would assess the different obtained correlations among these three citational indices and eminence.

Emerging fortuitiously was another variable which appears to be of significance. In the discussion of the six most eminent American psychologists, there was mentioned the fact that these men had many graduate assistants. It is suggested that this variable be used in future research endeavors.

Integral to the investigation of these topics is the Science Citation Index. Its viability as a research tool is only diminished by the fact that it has been developed only recently. It is useful as a retrieval tool in that it cites over 25 percent of the books and papers published; and, further, it indicates the relationship between the published paper and those publications that are cited in the primary paper. In this manner, the relationship among all scholarly contributions may be discerned.

## SUMMARY AND CONCLUSIONS

The importance of 18 "intraprofessional variables" was assessed in their relation to eminent status accorded to 205 deceased American psychologists by using a criterion rating of eminence based on peer judgment. A multiple regression analysis demonstrated that five variables accounted for 56 percent of the total variance in the eminence score. These variables were number of productive years, number of articles, number of journal citations, number of editorial positions and number of journals that an individual's work was cited in.

From a principal components factor analytic solution, there emerged five independent factors which were named "research quality," "productive years" "professional organizations," "editorial positions," and "recognition." The variable that correlated the highest with the "research quality" factor was the number of journals an individual's work was cited in. It was therefore concluded that eminent status was conferred on those whose work was "cited" in a variety of journals. Further, the various dimensions of the construct, eminence, were shown to possess both convergent and divergent validity.

The validity of this investigation is dependent upon three assumptions: first, that the sample was representative of the eminent in psychology because the five emergent factors

represent characteristics of the variables as manifested in the sample; second, that the data collection (sources used, human error) was accurate; and third, that the intraprofessional variables chosen do in fact characterize all or nearly all of the public information that could be collected for this sample of eminent psychologists.

In examining the practical implications of this research, we find that it allows for an objective analysis of the subjective impression of eminence. As indicated by the Annin, Boring and Watson (1968) study, professionals in the field expressed a highly consistent subjective analysis of those men who have achieved eminence. This research allows us to determine the components of this subjective analysis. It is therefore possible to operationally define eminence in terms of the variables which, when differentially weighted, define this status.

Eminence is a subjective phenomenon attributed by professional colleagues to given persons without objective analysis. This study has purported to and has succeeded in demonstrating a common objective base which underlies and supports these subjective conclusions. That is, eminence is conferred on those whose work has been found to possess heuristic value to a variety of research areas.

Using this objective data, it is also possible to specifically evaluate a given man's current status in the field. If he is accorded eminent status, it is possible to stipulate why and also it is possible to predict eminent



status among working professionals. In this sense, the formula could also serve as a guide to our more ambitious colleagues.

If we know what the variables are that relate to eminence, educational institutions can manipulate them. Time can be given to professional researchers to publish articles that hopefully would be cited in the literature. Individuals who hold editorial positions can be rewarded. Knowledge of these variables could be used by educational institutions in decisions of tenure.

Another implication of this research is not content specific but is of equal, if not greater, importance. It is here demonstrated that historical data may be quantified and subject to statistical analysis. Theoretical historical analysis will never be replaced by the computer; but objective analysis could in many instances, buttress theory and remove historical inquiry from the arena of moot opinion.

The viability of this method is in its flexibility to extend beyond this particular historical inquiry into other areas such as information processing and decision making.

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## APPENDIX

## EMINENT AMERICAN PSYCHOLOGISTS

Listed below are the 205 American psychologists used in this investigation with their actual and predicted scores, respectively, in parentheses; the married names of females are also in parentheses.

Allport, G. W. (27-25)	Bolton, T. L. (4-11)
(Anderson), Gladys Lowe (8-8)	Book, W. F. (12-11)
Angell, F. (16-13)	Breese, B. B. (7-8)
Angell, J. R. (27-14)	Brigham, C. C. (10-9)
Angier, R. P. (12-7)	Bronner, Augusta F. (Healy)
Arps, G. F. (7-7)	(11-12)
Babcock, Harriet (9-9)	Brown, W. (11-14)
Bagby, E. (7-7)	Bryan, W. L. (16-13)
Bagley, W. C. (8-12)	Buchner, E. F. (2-7)
Baird, J. W. (17-11)	Burks, Barbara S. (10-9)
Baldwin, B. T. (8-7)	Burnham, W. H. (13-14)
Baldwin, J. M. (25-17)	Calkins, Mary W. (20-16)
Beebe-Center, J. G. (19-12)	Carr, H. A. (23-15)
Bentley, (I.) M. (21-14)	Cason, H. (11-12)
Bergstom, J. A. (6-8)	Cattell, J. McK. (26-25)
Bills, A. G. (9-13)	Colvin, S. S. (6-9)
Bingham, W. V. D. (23-17)	Conklin, E. S. (10-14)
Bird, C. (11-10)	Coover, J. E. (8-8)
Boder, D. P. (5-10)	Craig, W. (7-10)
Bolton, F. E. (4-14)	Culler, E. A. K. (9-13)

- Davis, R. C. (8-15)  
 Dearborn, G. V. N. (7-11)  
 Dearborn, W. F. (12-12)  
 Delabarre, E. B. (12-11)  
 Dockeray, F. C. (8-10)  
 Dodge, R. (20-22)  
 Downey, June E. (14-14)  
 Dunlap, K. (22-22)  
 English, H. B. (14-13)  
 Farnsworth, D. (12-8)  
 Farrand, L. (11-12)  
 Fearing, F. (12-12)  
 Fernald, Grace M. (7-12)  
 Fernald, Mabel R. (5-8)  
 Fernberger, S. W. (18-18)  
 Ferree, C. E. (11-13)  
 Fitts, P. M. (16-12)  
 Fletcher, J. M. (8-7)  
 Franz, S. I. (20-16)  
 Freeman, F. N. (11-18)  
 Fryer, D. H. (10-15)  
 Fullerton, G. S. (14-12)  
 Gamble, Eleanor A. McC. (7-8)  
 Garth, T. R. (6-6)  
 Geissler, L. R. (4-10)  
 Gesell, A. (L.) (25-23)  
 Gilliland, A. R. (10-15)  
 Goddard, H. H. (19-19)  
 Goodenough, Florence L.  
     (20-19)  
 Gordon, Kate M. (6-12)  
 Guthrie, E. R. (26-18)  
 Haggerty, M. E. (9-13)  
 Haines, T. H. (1-7)  
 Hall, G. S. (27-27)  
 Hartmann, G. W. (9-13)  
 Hayes, S. P. (10-15)  
 Henmon, V. A. C. (11-14)  
 Hollingworth, H. L. (20-20)  
     (Hollingworth), Leta  
         Streeter (12-17)  
 Holsopple, J. Q. (9-9)  
 Holt, E. B. (22-17)  
 Holzinger, K. J. (13-16)  
 Hovland, C. I. (23-18)  
 Huey, E. B. (7-11)  
 Hulin, W. S. (10-7)  
 Hull, C. L. (27-31)  
 Hunter, W. S. (25-26)  
 Hyslop, J. H. (8-13)  
 Israel, H. E. (9-7)  
 Jastrow, J. (22-20)  
 Jenkins, J. G. (7-10)  
 Jenkins, W. L. (10-9)

- Johnson, B. J. (6-11)
- Johnson, H. M. (10-15)
- Jones, H. E. (9-14)
- Judd, C. H. (22-21)
- Karwoski, T. (11-5)
- Kelley, T. L. (21-17)
- Kellogg, C. E. (13-9)
- Kelly, G. A. (17-13)
- Kirkpatrick, E. A. (11-14)
- Kitson, H. D. (5-14)
- Kuhlmann, F. (11-13)
- Lacey, O. (3-8)
- Ladd, G. T. (24-13)
- Ladd-Franklin, Christine  
(22-11)
- Landis, C. (16-16)
- Langfeld, H. S. (20-18)
- Lashley, K. S. (27-25)
- Lecky, P. (10-8)
- Leuba, J. H. (15-17)
- Lindley, E. H. (6-7)
- Lindner, R. M. (10-10)
- Lorge, I. (14-17)
- Louttit, C. McK. (13-13)
- MacDougall, R. (6-10)
- Martin, Lillian J. (8-12)
- Mateer, Florence (8-9)
- Maxfield, F. N. (4-11)
- Mayo, (G.) E. (11-11)
- McGeoch, J. A. (20-17)
- McGregor, D. (M.) (12-8)
- Miner, J. B. (7-10)
- Morgan, J. J. B. (7-13)
- Muenzinger, K. F. (16-14)
- Murchison, C. (20-14)
- Nissen, H. W. (14-9)
- Norsworthy, Naomi (6-8)
- Ogden, R. M. (20-16)
- Pace, E. A. (5-9)
- Paterson, D. G. (15-21)
- Patrick, G. T. W. (8-11)
- Peterson, J. (9-15)
- Pierce, A. H. (2-10)
- Pillsbury, W. B. (21-17)
- Pintner, R. (18-15)
- Porter, J. P. (5-11)
- Pyle, W. H. (7-11)
- Rapaport, D. (21-15)
- Reymert, M. L. (14-12)
- Rich, G. J. (6-11)
- Roback, A. A. (17-17)
- Robinson, E. S. (16-11)
- (Robinson), Florence  
Richardson (7-5)



- Rogers, D. C. (2-6)  
Ruch, G. M. (7-9)  
Ruckmick, C. A. (17-16)  
Sanford, E. C. (20-17)  
Sanford, F. H. (16-11)  
Schlosberg, H. (20-16)  
Scott, W. D. (11-19)  
Scripture, E. W. (23-17)  
Seashore, C. E. (24-18)  
Seashore, R. H. (10-11)  
Shepard, J. F. (11-12)  
Shepard, J. F. (11-12)  
Shepherd, W. T. (3-5)  
Shipley, W. C. (10-14)  
Shirley, Mary M. (7-8)  
Sidis, B. (17-11)  
Small, W. S. (18-9)  
Smith, S. (9-8)  
Snoddy, G. S. (11-8)  
Spence, K. W. (25-22)  
Starbuck, E. D. (12-9)  
Stenquist, J. L. (7-8)  
Stetson, R. H. (10-8)  
Stone, C. P. (16-15)  
Stratton, G. M. (22-20)  
Strong, C. A. (7-12)  
Strong, E. K. (20-22)  
Sutherland, A. H. (5-4)  
Swift, E. J. (7-11)  
Symonds, P. M. (11-18)  
Tait, W. D. (5-6)  
Taylor, F. V. (9-9)  
Terman, L. M. (27-31)  
Thorndike, E. L. (27-37)  
Thurstone, L. L. (27-27)  
Titchener, E. B. (27-22)  
Tolman, E. C. (27-22)  
Tolman, Ruth (10-8)  
Triplet, N. (7-5)  
Troland, L. T. (21-13)  
Twitmyer, E. B. (14-9)  
Valentine, W. L. (13-13)  
Vaughn, W. F. (5-6)  
Warden, C. J. (19-15)  
Warner, L. H. (11-9)  
Warren, H. C. (23-21)  
Washburn, Margaret F. (23-18)  
Watson, J. B. (27-26)  
Weiss, A. P. (22-11)  
Wellman, Beth L. (7-8)  
Wells, F. L. (11-19)  
Wembridge, Eleanor H. R.  
    (3-6)  
Wheeler, R. H. (19-13)

Whipple, G. M. (20-19)  
Willoughby, R. R. (9-13)  
Witmer, L. (19-11)  
Wolfe, H. K. (3-12)  
Woodworth, R. S. (27-25)  
(Woolley), Helen B. Thompson  
    (9-12)  
Yerkes, R. M. (27-25)  
Yoakum, C. S. (9-10)  
Zener, K. E. (15-11)