INFLUENCE OF SELF CONCEPTS, SIGNIFICANT OTHERS AND INTERACTIVE PATTERNS ON THE PUBLICATION ACTIVITY OF AGRICULTURAL SCIENTISTS

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John S. Murray

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INFLUENCE OF SELF CONCEPTS, SIGNIFICANT OTHERS AND INTERACTIVE PATTERNS ON THE PUBLICATION ACTIVITY OF AGRICULTURAL SCIENTISTS

By
John S. Murray

AN ABSTRACT OF A THESIS

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ABSTRACT

The individual scientist is the primary disseminator of the knowledge he generates. This study was an attempt to account for variation in certain publication activities among a particular set of researchers. The main criterion variables were publication rate and audience emphasis. Associations between publication activity and evaluations received from both peers and administrators were also examined.

The predictor variables, which were derived from symbolic interaction theory, were self-concepts, significant others and interactive patterns. Because of the exploratory nature of the study, the relevance of a large set of other variables was also investigated.

Data were collected, through personal interviews and self-administered questionnaires, from 104 researchers at the Michigan State Agricultural Experiment Station. The respondents were established researchers who held a PhD degree, obtained at least 50 per cent of their salary from the Experiment Station and who had held their position for at least three years.

Self-esteem as a researcher was not associated with any other variable used in the study. The results from a self rating scale and an index of discrepancy between ideal

researcher and self as a researcher were not related to each other. The lack of predictive power of self-esteem was attributed to the restricted effective range among this sample of established researchers.

The audiences researchers claimed for their publications seemed to reflect their immediate social situation and interactive patterns. Self conceptions and significant others were, by themselves, not adequate predictors of publication audience emphasis. Researchers who seldom talked to lay audiences or who claimed only peers as immediate others rarely wrote for lay audiences.

Situational and interactive variables were also the determinants of publication rate. It appeared that multiple audiences are associated with multiple publication, which in turn makes for high overall rate.

High peer evaluation was associated with orientation toward peers as significant and immediate others and with few talks to lay audiences. The exceptions to these associations were mainly among professors, who were more highly evaluated by peers than were non-professors.

Although tenure was the major determinant of percentage salary increment, extent of peer orientation among immediate others was also relevant. Researchers of shorter tenure and exclusive peer orientation generally received higher salary increments.

The apparent relevance of the immediate social situation

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and of interactional patterns to publication activity and evaluation was interpreted as indirect confirmation of the general theory.

Implications of the study for research, for practice and for the theory were discussed. The implications emphasized the significance of face to face interaction to mediated communication. The role-taking capabilities and tendencies of the researcher source are determined by his interactional patterns and expressed in his selection of audiences for his publications.

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Dr. Lloyd M. Turk, as Director of the Michigan State Agricultural Experiment Station, provided financial support for a pretest, gave permission to interview the station researchers and furnished certain data directly.

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My wife Marg is to be especially thanked, for not expressing discouragement when I did.

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Chapter I

Introduction

> "Dissemination of research findings to both scientific and non-scientific audiences is of increasing concern for research and education administrators, scientists and practitioners. The scientist himself is the key figure in the discovery of new knowledge. But scientists vary in the extent and effectiveness with which they disseminate research results to different audiences or work with intermediaries to do so.
>
> "Very little research has been carried on as to what encourages scientists to take initiative in the communication of the results of their research, what influences the nature of their communications efforts, or what highly communicative scientists are like compared with less communicative ones.
>
> "Social science findings in other areas suggest that such factors as the perception a person has of himself as a communicator, the perceptions others have of him in this role, the personality of the communicator, the social system in which the person communicates, and the kinds of behavior that are rewarded in that system are correlated with communicative behavior. There is a definite need to apply the findings of such research to a study of scientists and their part in communication of research findings."

The foregoing is excerpted from the minutes of the North Central Regional Mass Communications Committee, Chicago, May, 1963. This committee is not alone in recognizing the problem

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of scientific communication.[1]

Several scientific disciplines, e.g., Chemistry, Biology and Psychology, have undertaken large scale communication studies.[2] The National Science Foundation has established a special section to promote and support research on the communication of scientific information. Herbert Menzel recently developed a proposal to integrate research findings in the field of scientific and technical communication. Such activity indicates an increasing awareness of the problem and a willingness to deal with it on the part of social scientists. The study proposed here is a further attempt to deal with the problem of communication in science. The scientists to be studied are researchers employed by the Michigan State Agricultural Experiment Station.

The theoretic perspective of the study will be social-psychological, in the tradition of George Herbert Mead.[3]

It is accepted as given, that scientists engaged in research generate scientific information, and that they publish this information for different audiences. Frequency of

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[1] Floyd Mann and Rensis Likert, "The Need for Research on the Communication of Research Results," Human Organization, 1952, 11, 4, 15-19.

[2] Herbert Menzel, Review of Studies in the Flow of Information Among Scientists, Bureau of Applied Social Research, Columbia University, 1960, 60-62.

[3] Manford H. Kuhn, "Major Trends in Symbolic Interaction Theory in the Past Twenty-five Years," The Sociological Quarterly, 1964, 5, 1, 61-84.

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publication and diversity among the apparent audiences of the published reports will be key concerns in this study.

The study is an attempt to account for variability in these publication behaviors in terms of the researcher's conceptions of self and others and their interactive patterns. The relationship between source behaviors of researchers and evaluations received will also be investigated.

The Research Context

Research in the area of science and communication of scientific information may be classified under several headings. The following six categories suggest major emphases of current and past research on this topic.

1. The earliest studies include those dealing with the nature of, and conditions surrounding, scientific creativity. This search for understanding of the creative process continues to receive attention from many eminent scholars.[4]

2. General studies of scientists, their work and environment, have been treated by Caplow and McGee,[5]

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[4] Lewis M. Terman, "The Discovery and Encouragement of Exceptional Talent," American Psychology, June 1954, 221-230; J. P. Guilford, "Creativity," American Psychology, 1950, 5, 444-454; and Homer G. Barnett, Innovation: The Basis of Cultural Change, New York, N.Y.: McGraw Hill, 1953.

[5] Theodore Caplow and Reece J. McGee, The Academic Marketplace, New York, N.Y.: Basic Books, Inc., 1958.

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B. Glaser[6] and W. Kornhauser.[7] These works have documented the nature of the scientist role and have identified some of the major types of role conflict and resulting problems.

3. Within specific disciplines intensive studies have been carried on and are continuing, e.g., psychology,[8] chemistry,[9] and biology and biochemistry.[10] Much of this work has been concerned with the information needs of scientists, their use of information sources, the adequacy and function of the existing information channels and problems of indexing, abstracting and translating.

4. The scientific process in specific organizational settings constitutes still another area of research. The

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[6]Barney G. Glaser, "Variations in the Importance of Recognition for Scientists' Careers," Social Problems, 1963, 10, 3, Winter, 268-276; also, Organizational-Scientists: Their Professional Careers, Indianapolis, Ind.: Bobbs-Merrill, 1964.

[7]William Kornhauser, Scientists in Industry: Conflict and Accommodation, Berkeley, Calif.: University of California Press, 1962.

[8]American Psychological Association, Reports of the American Psychological Association's Project on Scientific Information Exchange in Psychology, Vol. 1, December 1963.

[9]Anselm L. Strauss and Lee Rainwater, The Professional Scientist, Chicago, Ill.: Aldine Publishing Co., 1962.

[10]Herbert Menzel, "Flow of Information on Current Developments in Three Scientific Disciplines," Columbia University, Bureau of Applied Social Research, Reprint No. 232; also, "The Information Needs of Current Scientific Research," Columbia University, Bureau of Applied Social Research, Reprint No. 333, 1961; Biological Sciences of Communication Project; George Washington University, Suite 700, 2000 PM, N.W., Washington 6, D.C., 1963 and 1964.

of Shepard[11] and Pelz[12] and Ben-David[13] are typical. The main concern in these studies has been the specification of relationships between (1) the organization and administration of science and (2) "scientific productivity" as measured by volume of publication or reputation.

5. Information theory, computers and systems analysis also provide a base for an approach to problems of scientific information. Brownson[14] and the special issue of The American Behavioral Scientist[15] describe this area quite adequately.

6. The literature concerning the diffusion of innovations includes considerations of the dissemination of

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[11]Herbert A. Shepard, "Nine Dilemmas in Industrial Research," Administrative Science Quarterly, 1956, 1, 295-309; "Patterns of Organization for Applied Research and Development," Journal of Business, 1956, 29, 53-58; "Superiors and Subordinates in Research," Journal of Business, 1956, 29, 261-267.

[12]Donald C. Pelz, "Some Social Factors Related to Performance in a Research Organization," Administration Science Quarterly, 1956, 1, 310-325; "Interaction and Attitudes between Scientists and the Auxilliary Staff: I. Viewpoint of Staff," Administrative Science Quarterly, 1959, 4, 3, December, 321-366; "Interaction and Attitudes between Scientists and the Auxilliary Staff: II. Viewpoint of Scientists," Administrative Science Quarterly, 1960, 4, 4, March, 410-425.

[13]Joseph Ben-David, "Scientific Productivity and Academic Organization in Nineteenth Century Medicine," American Sociological Review, 1960, 25, 6, December.

[14]Helen L. Brownson, "Research on Handling Scientific Information," Science, 1960, 132, 3440, 30, December, 1922-1931.

[15]The American Behavioral Scientists, special issue on Information Retrieval in the Social Sciences: Problems, Programs, and Proposals, edited by Ted Gurr and Hans Panofsky, 1964, VII, 10, June.

scientific information to non-scientists. These works have been summarized by Rogers[16] and Katz, Levin and Hamilton[17] but seldom treat the scientist as the source of scientific information for non-scientists.

This sample review illustrates the scope of research being conducted in this field and the differing emphases. It is within this research context that the present study is proposed. The proposed study is distinctive in that it focuses on the researcher as the source of scientific information, considers both scientific and lay audiences, and includes scientists from a variety of disciplines who work within a common organizational framework.

Science as Communication

Symbolic communication enables man to coordinate his behavior with others and thus establish stable relationships -- social systems. However, until written communication was achieved, a social institution such as science was not possible. The development of writing expanded the traditional limits of time, space, fidelity and quantity associated with

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[16] Everett M. Rogers, Diffusion of Innovations, New York, N.Y.: Free Press, 1962.

[17] Elihu Katz, M. L. Levin and H. Hamilton, "Traditions of Research on the Diffusion of Innovations," American Sociological Review, 1963, 28, 2, April.

verbal communication. In its early stages, while the total amount of knowledge was relatively small, science was relatively unified. Learned men could, and some did, address the reports of their observations and reflections to the community of learned men. These early scientists, of an age and area, generally shared a common language. This language was sufficient for them to share meaning on a full range of topics. The learned societies of the seventeenth century were formed by men with varied interests but with a common language.[18]

As the sum of human knowledge increased, specialization occurred. With the evolution of disciplines and subdisciplines, refined languages developed which were unique to their own subject matter.[19] While such languages (terminologies) promote clarity and specificity within a discipline, they magnify the difficulties of communicating scientific information across disciplinary boundaries and to the larger society beyond the scientific community. The communication of scientific information to scientists and to the lay public appears essential for continued progress in science and for the betterment of society at large. Problems of communicatinn in science have been accentuated by the current expansion of

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[18] Warren Weaver, "Science and the Citizen," Bull. Atomic Sci., 1959, 13, 10, December, 361-365.

[19] Charles S. Slichter, Science in a Tavern, Madison, Wis.: University of Wisconsin Press, 1958; and Joseph K. Senior, "The Vernacular of the Laboratory," Phil. Sci., 1958, 25, 3, July, 163-168.

science, the attempt to accelerate development in the emerging nations, and the attempt to utilize new information storage-retrieval systems.

Florian Znaniecki[20] has discussed the role of the scientist as (1) an explorer, (2) a theoretician, and (3) a technologist. While the Znaniecki formulation may have utility, its lack of emphasis on communication activities makes it incomplete. In the first place, the work of a scientist, whether as explorer, theoretician or technologist does not occur in a social vacuum. The scientist must have interacted with others to become a scientist. The conduct of his inquiry is continually influenced by the information he receives from others. Secondly, unless the information a scientist produces is shared with others, there is no science. A "private science" could not be distinguished from any other covert experience. The communication of research findings is a necessary condition for the existence and continuance of science. The current public support of scientific activity carries with it some obligation for scientists to make their findings available for practical application. From this perspective, communication is an essential, central process in science.

Science and Agriculture

The land-grant colleges of agriculture were the first

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[20] Florian Znaniecki, The Social Role of the Man of Knowledge, New York, N.Y.: Columbia University Press, 1940, p. 14.

large scale attempt to publicly support science. The intent was to deliberately foster practical technological innovations and to diffuse these innovations to the primary producers, (who formed a large part of the population). This endeavor was notably successful.[21] It has resulted in the proportionately smallest agricultural labor force and the least expensive and most abundant food supply for a large population in all history. The science of the colleges of agriculture has not been restricted to routine testing and problem-solving.[22] Throughout their existence, colleges of agriculture have fostered basic, developmental and applied research in a variety of traditional and newer disciplines. Despite the success of the colleges of agriculture in making and instigating technological and social change, they are themselves now caught up in this change.

These colleges are faced with severe competition for students, personnel, monies and clients from a multitude of other agencies. The dual emphasis on basic and applied research and the conflicting demands of scientific and lay audiences are increasingly troublesome. As diversity increases in both agricultural science and in client demands, the limitations of current communication systems grow more apparent. On

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[21] H. C. Knoblauch, E. M. Law and W. P. Meyer, "State Agricultural Experiment Stations. A History of Research Policy and Procedure," United States Department of Agriculture, Miscellaneous Publication, No. 904, May, 1962.

[22] H. C. Knoblauch, "Basic Research at State Stations," Science, December 11, 1959, 130, 3389, 1639-1640.

the one hand, a force of extension specialists and an information service unit have been established to synthesize and facilitate the flow of scientific information to the public.

On the other hand, the office of experiment station editor and interdisciplinary research projects combat, to some extent, the impediments to communication of scientific information among scientists.

It is within this general context that the experiment station scientist conducts his research and enacts his role as information source.

Role of Agricultural Researcher

The most striking feature of the role of agricultural experiment station researcher is its breadth and diversity. The scientists who enact this role represent a wide range of subject matters, conduct diverse types of research with a variety of methodologies, and work under many different social arrangements.

The disciplines represented in the experiment station include economics, engineering, animal medicine, soil physics, food chemistry, statistics, microbiology, plant pathology and floriculture to mention a few. Most of these subjects have obvious relevance to agricultural or at least rural problems. However, the significance of knowledge generated through experiment station research is seldom confined to the agricultural application. Furthermore, the theoretic, methodological and

empirical findings of the "mother disciplines" must be attended to by experiment station researchers. Research conducted within the experiment station encompasses most of the physical sciences and parts of the social sciences.

The research of experiment station scientists ranges from the strictly controlled chemical experiment to the descriptive-historical area resource study. Instruments vary from the spectrograph and microscope to the mailed questionnaire and personal interview. Within most of the disciplines both highly theoretic (basic) research and strictly limited testing (applied) are carried out. The same individual may be involved simultaneously in several projects representing the basic and applied aspects of a question. Other individuals do research which is only basic or only applied. Considerable variation exists in the activities regarded as research within the experiment station.

A final area of diversity lies in the immediate social setting of the researcher's work. Some individuals work alone, they cooperate with no one in the research enterprise. Their research may fit into an overall department program and utilize graduate students but it is exclusively theirs from beginning to end. Other station researchers do most of their work as members of teams or project groups.[23] The extent of

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[23]Gordon W. Blackwell, "Multidisciplinary Team Research," Social Forces, 1955, 33, 4, May, 367-374.

the autonomy of the individual in choice of project, methods, and coworkers varies by department and over time. Researchers also differ concerning the centrality of their work to a discipline. Some work clearly within a single discipline. The work of others is multidisciplinary, even to the extent of dual appointments. Some disciplines are very new, others large and well established. Some researchers have formal non-research duties in administration, teaching or extension. Some research is "on contract" or "funded." Such funding may result from the researcher's own initiative or from the efforts of some committee or administration.

The individual researcher has much leeway to make his role in the experiment station. Many options and opportunities are present which enable the scientist to do the kind of research he wants to or is able to within the experiment station. Should he tire of research or fail at it, most station scientists can move, gradually and with ease, to teaching, extension or administration, within the college of agriculture. Many station researchers also have freedom to move to other colleges on or off campus or to industry, while retaining or discarding the researcher role. In view of the original self selection, the role flexibility, and the continued potential mobility, the agricultural experiment station researchers should be a fairly happy lot.

Lest the foregoing give the impression of anarchy or

social disorganization in the experiment station, some consensual expectations will now be stated.

The researcher is expected (1) to have proper credentials - academic degrees, (2) to search for knowledge in a specified area, (3) to employ scientifically justifiable procedures, and (4) to communicate his findings to others - i.e., to publish.

In return for such performance, the researcher may expect from the organization, (1) a title, (2) salary, (3) resources with which to conduct research, and (4) a certain amount of freedom in inquiry and disposition of findings.

This role definition is minimal and does not distinguish the agricultural researcher role from that of most other researchers.[24] However, any more stringent definition seems invariably to exclude individuals who now occupy research positions in the agricultural experiment station. The present-day agricultural researcher is a scientist who, by choice or accident, happens to be working for an agricultural agency. The organization (college of agriculture) is somewhat distinctive in that research, teaching and extension activities are carried out and to some extent integrated. However, the individual researcher is largely free to participate or not in teaching or extension. This scientist has a variety of others with whom he may interact and an assortment of audiences

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[24] Gerard DeGre, Science as a Social Institution, New York, N.Y.: Random House, 1955, pp. 21-30.

to whom he may direct his written reports.

Communication Activities of Researchers

A report from the Case Institute of Technology states:

> "The data collected on a large representative sample of chemists indicated that the average chemist working in industry seems to spend more time in scientific communication (reading, writing, listening and talking about scientific matters) than in all the rest of his activities concerned directly with science." [25]

Of 32.4 hours of scientific activity per week, the chemists spent 16.5 hours in scientific communication, 10.4 hours working with equipment, 3 hours in data treatment and 2.5 hours thinking and planning.

The outcome of all this scientific activity, communicative and otherwise, is the published report. The written account is the "permanent" public evidence of science. The report is a visible expression of many decisions made by the scientist-writer. The scientists' choices of topic, language, form and apparent audience may be inferred from his reports.

The publication activities of researchers will be emphasized in this enquiry. Such emphasis does not deny the importance of other communicative activities but regards them

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[25] Case Institute of Technology, Operations Research Group. An Operations Research study of the scientific activity of chemists. Cleveland, Ohio, November, 1958.

as antecedents or consequences of publication.[26]

The type of research performed seems clearly related to the type of report published. Scientists who do basic research are likely to use highly technical language in writing journal articles for an audience of other basic researchers. Applied researchers seem more likely to direct non-technical reports to audiences without formal scientific education. The basic-applied distinction has been discussed by Barney G. Glaser[27] and seriously investigated by Norman W. Storer[28] and Gerald Gordon.[29]

Storer used a "three-item Guttman-type scale" to measure "relative interest in doing research which would be important to other scientists or to nonscientists." The former group were regarded as "basic scientists," the latter as "applied scientists."

While it is convenient to dichotomize research into basic-applied, some scientists deny the relevance of the

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[26] Gideon Sjoberg, "Science and Changing Publication Patterns," Phil. Sci., 1956, 23, 2, April, 90-96.

[27] Barney G. Glaser, "The Local-Cosmopolitan Scientist," American Journal of Sociology, 1963, LXIX, 3, November, 249-259.

[28] Norman W. Storer, "Research Orientations and Attitudes Toward Teamwork," I.R.E. Transactions of the Professional Groups on Engineering Management, 1962, E.M-9, 1, March.

[29] Gerald Gordon, "The Organization Designed to Produce Change." A working paper presented at the Seminar on Innovative Organization, University of Chicago, April, 1964.

distinction.[30] Such scientists may label their research "developmental," meaning it has theoretic significance and apparent practical implications for some group of nonscientists. Still other scientists conduct both basic and applied research, or maintain that while their research is essentially basic or applied, their findings have relevance to both scientific and nonscientific audiences. It appears that the relationship between type of research and apparent audiences of reports requires further qualification.

Publication rate is another commonly considered variable. Donald C. Pelz has reported a relationship between scientific performance and the scientist's interactive contacts. He found higher performance associated with:

> Frequent (daily) contact with several scientific colleagues who, on the average, have been employed in settings different from one's own, who stress values different from one's own, and who tend to work in scientific fields different from one's own; and at the same time, frequent contact with at least one important colleague who has similar professional values.[31]

These findings indicate the relevance of interpersonal communication to scientific activities as indexed by publication

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[30] L. C. Goldberg, F. Baker, and A. H. Ruberstein, "Local-Cosmopolitan; Unidimensional or Multidimensional," American Journal of Sociology, 1965, LXX, 6, May, 704-710.

[31] Donald C. Pelz, "Some Social Factors Related to Performance in a Research Organization," Admin. Science Quart., 1956, 1, 310-325.

frequency. Heterogeneity among others regularly interacted with was associated with higher publication rates as long as at least one of these others shared similar values. Pelz implied that all publications considered were directed to scientific audiences but made no direct statement to this effect.

In his M.A. thesis, Hawkins[32] reports considerable variability among agricultural scientists in publication rates of professional and lay reports. Forty-five percent of his respondents produced fewer than two lay reports in a three year period while only 24% produced fewer than two reports for other scientists. Conversely, while 53% of his respondents authored three-quarters of the professional reports, some 36% produced three-quarters of the lay publications. The mean number of lay publications per respondent was 3.4, and of professional reports 4.1. Approximately 20% of the sample had published 8 or more professional or lay publications during the sample period.

Hawkins also related publication type and rate to commitment indexes and to diversity of face-to-face channel usage. He found significant positive correlations between (a) commitment to the immediate organization and rate of lay

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[32] Hawkins, H. Stuart, Influence of Role Commitments, Perceived Role-Conflict, and Gregariousness on the Publication Behavior of Agricultural Scientists, Michigan State University, M.A. Thesis, 1964.

publication, (b) commitment to the profession and rate of professional publication, and (c) a significant negative correlation between rate of lay publication and diversity of face-to-face channel usage. The relationship between rate of professional publication and diversity of face-to-face channel usage was not significant. This latter finding is in apparent conflict with Pelz findings but different measurement techniques were used and Pelz reported no statistical tests.

The studies cited indicate some of the ways scientists differ in publication activity. They also suggest some correlates of this variable performance.

Statement of Theory

Communication is a central concern in the social psychology of George Herbert Mead.[33] In this orientation the individual human - a self - is regarded as a process of interaction in which the individual is both subject (I) and object (me). The individual comes to be an object to himself in social interaction via the significant (social) gesture. A language of significant symbols enables the individual to take the attitude (role) of another toward himself. He can thus

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[33] George H. Mead, Mind, Self and Society, Chicago, Ill.: University of Chicago Press, 1934; and Anselm Strauss, The Social Psychology of George Herbert Mead, Chicago, Ill.: University of Chicago Press, 1962.

regard or view himself from the standpoint or perspective of the other, i.e., as an object. But the "others" with whom an individual interacts (communicates) have somewhat different perspectives. By generalizing these various perspectives of others toward himself, the individual acquires a self. The self is maintained and modified through continued interaction.

Just as communication is the basic process in the formation and maintenance of the human individual, so it is the fundamental activity in the development of human social systems. The ability to interact symbolically with others is a prerequisite to coordinated activity, whether it be "just a game" or science or politics. This facility for interaction allows for the continued modification of planned outcomes while the activity is being performed.

Through communication, humans can take each other into account reciprocally. The outcomes of such interaction are jointly determined. Stable social relationships are evolved in the course of communicating, by the sharing of expectations of behaviors appropriate to the participants in an activity.

Thus social systems are seen to be formed, maintained and modified by communicative interaction among people. Most human activity occurs within the context of established role relationships.

Interaction - Role-taking - Communication

People affect others and are affected by them through

the significance or meaning they assign to the symbols they use. The effective meaning of symbols lies not in their physical configuration but in the significance which users mutually share toward them. To communicate effectively, the individual must accurately predict the meaning others will assign a set of symbols. He must share the receiver's meaning for the symbols.

The concept of role-taking refers to the process in which an individual takes a standpoint other than his own toward an object or event.[34] By role-taking the individual predicts the meanings of symbols to other senders or receivers. In ongoing face-to-face communication, participants frequently assume "same" meaning. Discrepancies are overcome as interaction continues. Frequent intense interaction among people enables them to develop consensual significance for a large set of symbols. Where prior interaction is extremely dissimilar for the parties, communication is restricted to an exchange of gestures such as the first meeting of Robinson Crusoe and Friday. Only with continued interaction do they acquire the ability to take the role or attitude of the other toward symbols. With shared meaning for a set of symbols people are able to communicate effectively.

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[34] Ralph M. Turner, "Role-taking: Process versus Conformity," Chapter 2 in Rose: Human Behavior and Social Processes, Boston: Houghton Mifflin, 1962.

A role-taking perspective suggests that reading-writing activity is not a simple extension of vocal face-to-face interaction. A lack of, or delay in, feedback with mediated communication makes the difference. The selection and ordering of vocal gestures is a rapid flowing process whereas the choice and arrangement of written symbols is usually a slow process with halts, retreats, revisions and not infrequently destruction and a new start. In normal vocal conversation, the role of speaker and listener are not separate; to converse is to perform both activities simultaneously. To read is analogous to the enactment of a listener-role in a formal audience sense. The reader (or listener) attends to the stimuli provided; he accepts a passive but willing role - that of respondent. So far as he shares significance for the symbols, the reader's response is determined by the writer's selection and presentation of symbols. Reading requires that the role of the writer be adopted but this need not be a "writer-role."

To write is a different process. The writer must assume the roles of reader-writer. He may assume his own standpoint and write to himself as in a private diary or he may role-take with some potential reader(s) and deliberately try to elicit certain responses. While spoken words can not be unsaid, the written word is subject to revision or suppression until deliberately transmitted to an audience.

Thus interaction is a prerequisite to role-taking which

in turn is prerequisite to mediated communication. Mediated communication follows from unmediated, but is not equivalent to it from the standpoint of interaction or role-taking.

Interaction, role-taking and communication are activities which occur within established social systems. These activities, and their interrelationships are crucial to the maintenance and modification of social systems. The distinctions between these activities and the relationships among them are more clear when written communication is emphasized.

Role - Self - Others - Evaluation

A role is the set of expected behaviors proper to an occupant of a particular position in a social system. The expectations are held and expressed by others enacting reciprocal roles to the role in question. Merton[35] refers to the role set as "that complement of role-relationships in which persons are involved by virtue of occupying a particular social status." Herein, the term role set will be used to refer to the set of others who "legitimately" hold expectations toward the occupant of a specific status or position. A role can only be defined in terms of other roles. Thus, role X consists of those behaviors the actor is consensually regarded as owing to actors M, N and O and the behaviors which M, N and O owe in turn to X.

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[35] Robert K. Merton, "The Role-Set: Problems in Sociological Theory," British Journal of Sociology, 1957, 8, 110.

The expectations which constitute a role are duties the actor owes to others and the obligations of these others toward him. Typically, the expectations encompass a limited set of behaviors and situations and a specified number of others. Roles are seldom static; rather, they are constantly modified in the course of continued interaction.

Any individual has many roles. Sarbin[36] has even suggested that the self consists of the repertoire of roles which the individual has played or could play. From this standpoint, the self conception is the organized (but interactive) cumulation of roles the individual sees himself as holding. The stability of this organized pattern of roles varies, as does the salience of a particular role across time and situations. An individual's conception of self in a given role is an important determinant of his performance or enactment of the role.

Reference group concepts have frequently been used to deal with the relationships between an actor and others.[37] The employment of the term "group" for such a purpose not only violates its traditional usage but raises troublesome distinctions,

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[36] T. Sarbin, "Role Theory," in Gardner Lindzey: Handbook of Social Psychology, Vol. 1, Reading, Mass.: Addison-Wesley, 1954, pp. 223-258.

[37] Manford H. Kuhn, "The Reference Group Reconsidered," The Sociological Quarterly, 1964, 5, 1, 5-22.

e.g., reference individual vs. reference group, membership vs. non-membership groups. Turner[38] clarified the issue by proposing the concept of audience to refer to the actor's perception of others observing his role performance. Such audiences may include persons or groups involved in, or beyond a particular set of role relationships.

Three types of others can be identified on the basis of their relationship to the actor. The types are not exclusive in that a specific other may be related to an individual in several or all of these ways.

Those involved in reciprocal relationships with a particular role will be termed Relevant Others. Relevant others play roles in the role set. The Significant Others of a role player are those regarded as important by the actor, whose expectations are taken into account in the enactment of the role. Some of the significant others of an actor must also be relevant others, but perfect correspondence is unnecessary and unlikely. Immediate Others are persons who are interacted with frequently in the course of performing a role. These are relevant necessarily.

If relevant others are represented by R, immediate others by I, and significant others by S, the relationships can be explicated as follows. All I must be R. Some S must be R. The

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[38]Ralph H. Turner, "Role Taking, Role Standpoint, and Reference Groups' Behavior," American Journal of Sociology, 1956, 61, 316-328.

other relationships vary according to the type of role and the individual orientation of each actor.

Roles differ in the extent to which the expectations of relevant others must be taken into account. Some roles are quite flexible in that the actor has much choice in selecting others to attend to and in establishing the nature and amount of significance to be assigned to each. Rigid roles, on the other hand, are clearly prescribed and deviation beyond the established norms is little tolerated by the powerful relevant others. However, an actor is seldom obliged to assign significance to all the so-called relevant others; they are not "equally" relevant. Generally, certain minimal combinations in the assignment of significance (expressed implicitly in role performance) will suffice for an actor to retain a role.

Couch and Murray investigated associations between the selection of significant others and administrative evaluation for performers of three different roles. They hypothesized that

> when surveillance is high and role prescriptions specific, no associations between "significant others" and evaluation can be expected. The acquisition of such roles involves a relatively high commitment to specific behavioral patterns. Subsequently, the performance of these fixed sets of acts provides the criteria for evaluation. On the other hand, when surveillance is low and the role expectations flexible, associations between "significant others" and evaluation can be anticipated. In these situations,

> variation in "significant others" affects the way the role is performed and the consequent evaluations.[39]

The actor is obliged to define relevant others as the prime audience for his performance, (i.e. - as significant), only where the role is clearly defined and role performance closely monitored by the evaluators.

Rationale

In this section, the communication situation will be re-examined in light of the theory. The synthesis will provide a basis for a subsequent statement of expected relationships.

The social system which is the agricultural experiment station can be viewed as a set of interrelated roles. Within this large set are many subsets of related or reciprocal roles. Some of these subsets are project teams, others are based in common methodologies or common types of research, e.g., basic-applied. The roles enacted by experiment station researchers may also be grouped by departments in the college of agriculture. Here the research roles are classed with teaching, extension and administrative roles by commonness of subject matter. The researchers may also relate themselves to scientists elsewhere on campus, on other campuses, with other agencies, or to nonscientists beyond the academic community.

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[39] Carl J. Couch and John S. Murray, "Significant Others and Evaluation," Sociometry, 1964, 27, 4, December, 502-509.

These subsets overlap in many instances. The boundaries of the role-sets are blurred and constantly changing. There is, however, considerable stability to these relationships. They are at least sufficiently stable that the overall system is maintained and that research does get done.

This is the context in which the individual station-scientists enact their researcher-role. Through ongoing interaction, these people plan, finance, and execute an organized search for knowledge. The immediate visible outcome of this activity is the published report. It is the report rather than the day-to-day activities of the researcher which is subject to surveillance by others. Information derived from published reports provides much of the basis for evaluation of role performance.

While reports of scientific findings have potential significance for the scientific community and society as a whole, this will be dealt with only implicitly in the proposed study. Rather, an attempt will be made to account for variation in the published material of researchers in terms of their self conceptions and their interactive relationships with others. Variation in evaluation will be regarded as a consequence of publication activity.

Self Concepts and Publication

The individual brings to the role ideas about himself in the role. He has conceptions of what kind of researcher he

is, what is appropriate and inappropriate for him to do, his competence as a researcher, and about the audiences for whom his findings should and do have relevance. The station researcher modifies these ideas in the course of continued interaction. However, these concepts are sufficiently stable to give coherence to the ongoing performance. The individual who regards himself as a competent applied researcher whose findings have relevance to farmers is unlikely to suddenly devote his energies to highly theoretic issues. Nevertheless, he may adjust his self-esteem or redefine his relevant audience (to a subgroup of farmers or another group of lay clients). Such modifications in self-concept may be made while maintaining essentially the same role.

Experiment station researchers commonly distinguish between basic and applied research. Applied research includes that which is presumed to have immediate practical relevance to nonscientists. The relevance of so-called basic research to nonscientists is less obvious. A researcher's conception of himself on a basic-applied continuum should be related to his performance as a source of scientific information. The more basic researcher would seem more likely to restrict his audience to other scientists. Similarly, the more applied researchers will probably direct the bulk of their reports to nonscientists. Researchers who define themselves close to midway or who deny the validity of the basic-applied distinction (by defining themselves as high or low on both basic

and applied) would be expected to have the greatest heterogeneity in their types of reports or apparent audiences.

Another dimension of self is self-esteem. This is the value an individual places on his own performance of a role. While self-esteem can be regarded as the resultant of evaluation by others, it also serves as a determinant of behavior in a role. Since publication is a required behavior of researchers and since self-esteem is based in part on adequacy of role performance, a positive relationship between self-esteem and frequency of publication appears necessary.

Significant Others and Publication

People assign significance to others; they care what certain others think of them. An individual's significant others are generally role-specific. For instance, a researcher may regard a coworker as significant to his role as researcher but consider him irrelevant to his husband or father roles. The assignment of significance to others indicates that the assignor acknowledges their expectations in organizing his behavior. He takes them into account when performing role-relevant acts. Roles differ in the extent to which significance must be assigned to specific others who enact reciprocal roles. The role of experiment station researcher seems flexible in this regard.

However, published research reports are available to others for inspection. Through the report, the researcher

presents himself to these others as a researcher. Their opinions of him as a researcher are largely based on his writings. To the extent that a researcher's significant others have consensual expectations toward him, his performance should be uniform. Where the expectations of significant others are heterogeneous, some variety can be expected in the performance.

A researcher who includes only similar researchers among his significant others is likely to direct all his reports to this audience. On the other hand, several types of reports are expected from a researcher who admits nonresearchers and nonscientists, as well as other researchers to his set of significant others.[40] Because the same set of findings can be presented from different perspectives and in differing idiom to several audiences, the researcher whose significant others are heterogeneous should publish more frequently. While "double publication" is frowned upon throughout much of the scientific community, it is condoned or encouraged in the college of agriculture.

Interaction and Publication

The individual allows Significant Others to influence his behavior. There are, however, other persons he must deal with regularly in performing his role. These, Immediate Others, influence an actor's behavior regardless of his intent to be

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[40] Hawkins, H. Stuart, op. cit., pp. 40-42.

influenced. His intent, of course, can modify the extent of this influence from immediate others.

A researcher may include no Immediate Others among his significant others. In such a case the effect of immediate others on the researchers would be minimal. Another researcher may have as significant others only those who are immediate - with whom he routinely interacts in playing his role. Here the effect of immediate others will be maximal, the researcher allows himself to be influenced by those who are generally available. This type of researcher will likely write less frequently (unless writing is an important group norm) because he can communicate his findings to his significant others without writing. Heavy use of limited distribution mimeo reports is also expected from this type of researcher.

As with significant others, heterogeneity among a researcher's immediate others will likely be associated with higher publication rates and a greater variety of apparent audiences. This may be a weak association because of the effects of other variables, e.g., self concept and significant others. Nevertheless, the possible effects of immediate others on publication activity should not be disregarded at a preliminary stage of investigation.

Publication and Evaluation

Role performance is evaluated both formally and informally. Average salary increment is an indication of formal

evaluation while reputation among peers is an informal index. These are not completely independent but are unlikely to be perfectly correlated.

Despite the publish or perish adage, it is likely that publication rate will correlate with evaluation only at the extremes; very low publication rates associated with low evaluation and very high publication rates associated with high evaluation. In the middle range, other factors such as quality of work, and competencies in other areas will likely soften the association between publication and evaluation.

Hypotheses

The public evidence of science is publication. Publication forms a large part of the basis upon which a researcher's role performance is evaluated. Self-esteem is an expression of the actor's perception of the adequacy of his performance. Therefore, those who have high self-esteem should be those who play the role well - publish relatively frequently.

Hyp. 1 Researchers with high self-esteem will have higher publication rates than those with low self-esteem.

Role conceptions differ among the actors of a common role. Research reported concerning basic-applied (cosmopolite-

localite) orientations provides evidence of this variation.[41] The conception an actor has of himself in a role should be expressed in his role performance. One aspect of role performance is the selection of audiences for publications. Self concept as a basic-applied researcher should be reflected in publication audience emphasis.

Hyp. 2 The more a researcher is oriented toward basic research, the higher the proportion of publications directed toward other researchers.

Hyp. 3 The more a researcher is oriented toward applied research, the lower the proportion of publications directed toward other researchers.

It was assumed earlier that "double publication" is acceptable behavior in the college of agriculture. Researchers who are oriented toward both basic and applied research seem more likely to publish several reports from a particular research project. It follows that a dual orientation toward basic and applied research will be associated with high publication rate.

Hyp. 4 The more a researcher is oriented toward both basic and applied research, the higher will be his publication rate.

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[41] Storer, Norman W., Science and Scientists in an Agricultural Research Organization: A Sociological Study, Cornell University, Ph.D. Thesis, 1961. Also Hawkins, H. Stuart, op. cit.

Among actors playing a flexible role, choice of significant others should be related to role performance. Those who claim a particular class of others as significant are more likely to direct their publications to them as audiences. The same expectation seems applicable to the relationship between orientation toward immediate others and audience emphasis.

Hyp. 5 The more peers a researcher claims as significant others, the higher the proportion of publications directed to other researchers.

Hyp. 6 The more peers a researcher claims as immediate others, the higher the proportion of publications directed toward other researchers.

Researchers who are oriented toward non-peers may publish more easily (and therefore more frequently) through commercial, popular or extension channels. Multiple audiences are likely to lead to "multiple publication" (and therefore higher rates) and this seems more likely to occur among researchers who admit some non-peers to their set of significant others. This is the specific rationale for hypothesis 7.

Hyp. 7 The more peers a researcher claims as significant others, the lower his publication rate.

Immediate others are defined as those who are interacted with frequently in the course of role performance. These persons have little need to rely on published output to evaluate

an actor's performance - they have direct and complete evidence. Thus, when an actor regards a high proportion of immediate others as significant, he is likely able to validate his role with less frequent publication. On the other hand, when none of a researcher's significant others are immediate, he seemingly must publish to insure that his significant others continue to regard him as a researcher.

Hyp. 8 The higher the proportion of immediate others claimed as significant by a researcher, the lower his publication rate.

The role performance of researchers is publicly expressed in the frequency of publication and in the audiences emphasized. This performance is evaluated formally by administrators and informally by local peers. The perspectives of the two sets of evaluators can be expected to differ somewhat because the researcher role is a flexible one. Nevertheless, the evaluations are not likely independent; a positive association should be found between the evaluations researchers receive from administrators and from peers. Both peers and administrators can be expected to evaluate positively publication for researcher audiences. A high publication rate will likely compensate for a non-researcher audience emphasis.

Hyp. 9 Emphasizing other researchers as publication audiences will be positively correlated with administrative evaluation, the association being stronger among researchers with below average publication rates.

Hyp. 10 Emphasizing other researchers as publication audiences will be positively correlated with peer evaluation, the association being stronger among researchers with below average publication rates.

Researchers should be in a better position to judge "quality" of research and can be expected to be less influenced in their evaluations by publication frequency and audience-emphasis than administrators. It is also assumed that peers are more closely associated with other researchers than are administrators and are therefore more likely to rely more on non-publication criteria for their evaluations. Furthermore, it seems that administrators should be more conscious of the political need for publication to lay audiences and evaluate such an emphasis more favorably than the researcher's own peers.

Hyp. 11 Publication rate will be positively correlated with evaluation, the association being stronger for administrative evaluation than for peer evaluation.

Hyp. 12 Emphasizing other researchers as publication audiences will be positively correlated with evaluation, the association being stronger for peer evaluation than for administrative evaluation.

Chapter II

Research Design

Data were collected at one Agricultural Experiment Station. Personal interviews, self administered questionnaires and organizational records were used.

Information from the reported research of Pelz,[42] Menzel,[43] Storer,[44] and Hawkins,[45] as well as from an exploratory investigation, was utilized in selecting and constructing the specific questions. No particular difficulties were encountered in data collection in these several studies. The interviewers in the exploratory study found that:

> The respondents talked freely and fluently about specific concerns and general issues; they treated each questionnaire item as a scientific question and were quick to point out ambiguities. They were most courteous and sincerely helpful.[46]

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[42] Donald C. Pelz, op. cit.

[43] Herbert Menzel, op. cit.

[44] Storer, Norman W., op. cit.

[45] Hawkins, H. Stuart, op. cit.

[46] Carl J. Couch, Mason E. Miller, and John S. Murray, Communicative Behavior of Agricultural Scientists: A progress report incorporating the results of a pretest conducted at the University of Connecticut, College of Agriculture. Institute for Extension Personnel Development, Michigan State University, East Lansing, Michigan, September, 1964.

The Sample

The sample consisted of 126 non-administrative scientists currently employed by the Michigan State University College of Agriculture who met the following criteria: (1) hold a Ph.D. degree[47] or its equivalent, (2) receive at least 50% of their current salary from the agricultural experiment station (research funds), and (3) were hired before July, 1961.

The sample was selected because of its proximity, and availability. It is not known to be unique in any significant respect from the remainder of the population of agricultural researchers at land-grant college experiment stations.

Operationalization of Variables

The key variables used in this study were:

1. Self Concept as a Basic-Applied Researcher
2. Self Esteem as a Researcher
3. Orientation toward Peers as Significant Others
4. Orientation toward Peers as Immediate Others
5. Significance of Immediate Others (overlap)
6. Publication Rate
7. Audience-Emphasis of Publications
8. Evaluation by Peers

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[47] This criterion is an educational control.

9. Evaluation by Administration

10. Frequency of Interaction with Lay Audiences[48]

Self-Concept

Storer reported a three item "Guttman-like" scale of basic-applied orientation to research.[49] The evidence he presented indicated that the scale was internally consistent and an apparently valid measure. However, the scale was not appropriate for this study because one item referred specifically to audience preference which is a main criterion variable.

Doubts concerning the unidimensionality of the basic-applied concept prompted the attempt to measure self concept as a basic researcher and as an applied researcher, separately. Each measure consisted of four items selected from responses to the pretest question - "Please make ten statements about yourself as a researcher." The statements selected appeared to represent the relevant dimensions. A typical typical basic orientation statement is: "I try to do research which will make an original contribution to the storehouse of knowledge." The reciprocal applied orientation statement is: "I try to do research which will provide practical solutions to 'real' problems that people have."

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[48] This variable was added after the proposal was submitted.

[49] Storer, Norman W., op. cit.

The response categories were (A) Agree-Disagree, and (B) 1-Just a little, 2-Quite a bit, 3-A great deal. The categories were assigned values from 0 to 5. Item values were summed for each set of four items providing a possible range of 0 to 20.

The two sets of items were intermixed and used consecutively in the personal interview, (Appendix A, p. 3).

The measures just described were developed to check the extent to which basic-applied orientation forms a continuum, and as the measures of Self-Concept.

Self-Esteem

The measure of self-esteem as a researcher took the following form. A set of nine characteristics of researchers was used by each respondent, first to construct a profile of his "Ideal Researcher" and second to construct an "Actual Self" profile. The characteristics of researchers used for this measure were selected from responses to the open-ended pretest question - "What are your criteria for an ideal researcher?" Some of the characteristics were:

"--keeps up to date in the literature."

"--is dedicated to the search for knowledge."

This instrument was self-administered. The instruction and format can be seen in Appendix B.

The following scoring method was used. The value 5 was assigned to the uppermost box (most important), 4 to the two boxes second from top, 3 to the three middle boxes, 2 to the

two boxes next to bottom, and 1 to the lowermost box (least important). Thus if an item appeared in the uppermost box it was scored 5, if in the middle row, 3, if in the lowermost box, 1, etc. All items were scored in this fashion for the ideal researcher profile and for the self researcher profile. The absolute difference was then calculated between the values obtained on each profile for every item. This difference value constituted the item score. These scores were summed across all 9 items and divided by 2[50] to provide an index of self esteem for each respondent.

For methodological interests, a self-rating on "competence as a researcher" was obtained. The respondents were asked to rate themselves from 1 to 9 on competence as a researcher in comparison to all the researchers they knew in the discipline. The verbal anchors for this scale were:

1 - among the few least competent

3 - definitely below average

5 - about average

7 - definitely above average

9 - among the few most competent

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[50] The procedure used in this index results in only even numbers on total score; dividing by 2 simplied presentation of results.

Significant Others

The basic item for this measure was:

"Whose opinion of you as a researcher is most important to you?" Probes were used in an effort to elicit five names from each respondent. The respondents were asked to weigh the significant others named by distributing 15 points among them. The individual responses were coded as peers, superiors and subordinates of the respondents. An index was constructed by counting the number of types of others used by the respondents. The three categories of heterogenity were: (a) one type - all responses either peers or subordinates or superiors; (b) two types; and (c) three types.

Several difficulties were encountered with this index. Thirty of thirty-two respondents who named only one type, named only peers, making the category one of peer orientation. Self references could not easily be classified according to this scheme. The index took no account of the weightings used by the respondents to indicate the relative significance of others to them. These considerations were taken into account in developing an alternate approach.

The new index of significant others can be regarded as a measure of the significance of peers. The weightings were used to trichotomize the sample. The categories were (a) Peers Only (15 points to peers), (b) Peers Major (8 to 14 points to peers), and (c) Peers Minor (7 or fewer points to peers). This

index was regarded as more satisfactory than that first proposed and was used throughout the analyses.

Immediate Others

The researchers were asked to identify five persons frequently dealt with in their researcher role. The basic question was: "Who are some of the people you talk to frequently about your research?" Originally it was proposed to index the heterogenity of immediate others as had been intended with significant others. This proposal was modified in accordance with the changes made in the operationalization of significant others. The responses were coded as peers or non peers. The index developed reflects the proportion of peers named as immediate others. The three categories were (a) peers only, (b) a majority of peers, and (c) a minority of peers.

Significance of Immediate Others

Some duplication was expected in the responses to significant other and immediate other items. The extent of this duplication provided an index of the significance of immediate others. High significance of immediate others was indicated by researchers who listed many same persons in response to the two questions. The values of this index could range from 5 (significance assigned to 5 immediate others) to 0 (significance assigned to no immediate others).

Publication Rate

Each researcher was asked to provide a list of his publications during the period September 1, 1961 to September 1, 1964. A simple count of publications constituted the index for publication rate. There are obvious inadequacies in this procedure; it does not reflect differences in single vs. multiple authorship nor in length or form (book chapter vs. research note vs. extension pamphlet). Initially, a weighting scheme was proposed. After additional discussion, thought and investigation, the weighting proposal was abandoned. No weighting system could be found or conceived which would obviously reflect "amount of individual published output" more adequately than counting the number of reports in which the individual is credited with authorship. The weighting schemes considered seemed only to alter the kinds of distortion present rather than improve the measure.

In this investigation, publication rate refers to the number of publications to which the respondent claimed at least partial authorship and provided citations.

Audience Emphasis

For each publication claimed, the respondents were asked to indicate the primary audience. The instructions and categories were:

Main Audience: Circle the one most appropriate:

A. Researchers - own speciality
B. Researchers - own discipline
C. Researchers - other disciplines
D. Teachers
E. Extension Specialists
F. Extension Agents
G. Other non-research Scientists
H. Graduate Students
I. Undergraduate Students
J. Administrators
K. Farmers or other non-scientists
L. (Other - please specify)_____

The original intent was to classify researchers on the basis of the diversity of their claimed audiences. However, other researchers were by far the most heavily emphasized audiences.

An alternate approach was used which indexed the extent of researcher audience emphasis. Researcher audience emphasis was defined as specifying researchers (A, B, or C above) as audiences for 90% or more of total publication output. About one-third of the sample met this criterion.

Peer Evaluation

Each respondent was provided with a list of names of persons in the sample. He was asked:

> "--who are some that, in your opinion, most deserve the reputation of outstanding researcher?"

Five nominations were requested. Four differently ordered lists were used to control for any "first page effect." In addition, the respondents were instructed to scan the complete list before

making any nomination.

The number of nominations received by each respondent was taken as the index of peer evaluation.

Administrative Evaluation

The average percentage salary increment for the preceding three years constituted the index of administrative evaluation. Annual salary increments are made in July. The method of calculation shown below controls for absolute salary level.

The method was:

$$\frac{\text{Annual Salary as of August'64 - Annual Salary as of June'61}}{\text{Annual Salary as of June'61}} \times 100$$

The values of this measure were used directly for correlational purposes. For other purposes, the sample was trichotomized on the basis of these values into High, Medium, and Low administrative evaluation.

Interaction With Lay Audiences

This variable was added to the list of theoretic variables. It is a measure of the extent to which the respondents communicate orally to audiences of non-researchers. The respondents were asked, "How frequently do you give talks or lectures to groups of non-scientists, non-students?" Probes were used to elicit the answer in terms of the "number of times of per year." On the basis of the distribution of responses, the sample was divided into low, medium and high frequency

categories. The low frequency category included respondents who gave fewer than four talks per year, medium, four to ten talks and high, eleven or more.

Data Collection

The director of the Experiment Station informed his personnel of the study. His message is presented as Appendix C.

Appointments for the personal interviews with the researchers were arranged by phone. The interviews took place in the respondents' offices, except for a few instances of shared offices where vacant seminar rooms or laboratories were used. The author conducted all but three of the interviews. These three were conducted by another graduate student in the department of communication who (like the author) had academic and work experience in a college of agriculture.

A self-administered questionnaire (Appendix B) was left with each respondent at the completion of the interview. They were asked to return the completed questionnaires via campus mail. A series of phone calls were made as reminders to those who were slow to return the questionnaires.

Data concerning percentage salary increments was obtained from administrative records.

Chapter III

FINDINGS AND DISCUSSION

Description of the Sample

The original sample consisted of 126 employees of Michigan State University. They held a Ph.D. degree, obtained at least 50% of their salary from the Michigan State Agricultural Experiment Station, and had been on staff for at least three years. One individual was added to the sample who received no salary from the Experiment Station but met the other two criteria. This person was nominated frequently as an outstanding researcher despite the fact that his name did not appear on the list of possible nominees. The disposition of the sample is presented as table 1.

Table 1: Response Rate

Original sample plus one addition	127
Off campus during interviewing period	8
Refusals	2
Number interviewed	117
Number unusable[51]	13
Final sample	104

[51] Reasons for discarding subjects were: 1 had no Ph.D., 2 interview schedules were incomplete, 6 failed to return the self administered questionnaire, 4 self administered questionnaires were incomplete.

One hundred and seventeen persons (92%) were interviewed. Reasonably complete information was obtained from the 104 (82%) researchers who constituted the final sample. Comparison of the 104 respondents with the remainder of the original sample indicated no consistent differences of rank, department, salary increment or peer evaluation. On the basis of these comparisons, it appears that the non-respondents were not a particular type or segment of the original sample, and that the respondents are representative of agricultural researchers at Michigan State University.

The findings reported here are based on the data collected from these 104 respondents, unless otherwise indicated.

General Characteristics of the Respondents

The intent in this study was to deal only with individuals who were well settled or established as researchers. Many of the findings presented in this section are intended to show the extent to which a sample of "mature researchers" was obtained. The pertinent data are summarized in table 2.

The chronological age of the researchers varied from less than 30 (1%) to more than 65 (4%), the median age was 45.5. Two-thirds of the sample were between 40 and 54, one quarter were under 40 and about one tenth were older than 55. The bulk of the researchers in the sample would be labelled as "middle-aged."

Table 2: Summary of General Characteristics

Variable	Range	Median	Categories	Percentage
Age	30 - 65	45.5	Under 40	25
			40-49	46
			Over 49	29
				100%
Time from Ph.D.	4 - 30	13.3	Under 11	35
			11-20	44
			Over 20	21
				100%
Time at M.S.U.	4 - 47	10.7	Under 8	33
			8-14	35
			Over 14	32
				100%
Rank		Assistant Professor		11
		Associate Professor		27
		Professor		52
				100%
% Salary Research	50 - 100	74.7[@]	Under 51	37
			51-79	34
			Over 79	29
				100%
Number of other professional positions	0 - 3	0.67	0	44
			1	34
			More than 1	22
				100%
Alma Mater		M.S.U.		25
		Other Land-Grant		63
		Non-Land-Grant		12
				100%

[@] N=103

Approximately one half of the respondents had obtained their Ph.D. degree six to fifteen years ago. None had held doctorates for less than four years, while two researchers had held Ph.D. degrees for more than 30 years. The median time from Ph.D. was 13.3. These findings provide an indication that the respondents meet the criterion of established researchers.

Tenure at M.S.U. ranged from four years (7%) to forty-seven years (1%), the median was 10.7. More than three quarters of the sample had been employed by Michigan State University for more than six years. The distribution of respondents on this measure is a further indication of the extent to which the respondents are established researchers.

A majority (52%) of the researchers held the rank of full professor, about a third (37%) were associate professors, the remaining one-tenth were assistant professors.

Almost two-thirds (63%) of the respondents obtained 70% or more of their salary from the agricultural experiment station. About one-fifth (17%) derived all their salary from this source. The median research salary was 74.7% for the sample (excluding the added individual). In general, the respondents appear to have validated their role as researchers. They have attained higher academic ranks and are still paid, for the most part, to do research.

Only six respondents obtained any salary for extension activity. For the remaining 98 respondents, the difference

between percentage salary for research and total salary was supplied from general (teaching) funds. There were no three way appointments among the respondents.

About one-third (34%) of the respondents have held one other professional position, while one-fifth (22%) have held more than one. For almost half the sample (44%), their present position is the only one they have held since obtaining their doctorate. The sample seems to represent a stable core of researchers associated with the agricultural experiment station. Not only are they long term employees, they have had few other employers. They appear to be career scientists, they have found an acceptable situation and maintained it.

Almost nine out of ten respondents held an earned Ph.D. from a land grant college or university. One quarter of the respondents had doctorates from Michigan State University.

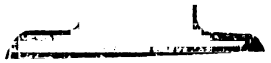
Eighteen administrative units were represented by the 104 respondents. A unit refers to a department within the College of Agriculture or to the College of Home Economics or to the College of Veterinary Medicine. The variability in number of respondents per administrative unit necessitated some categorization. The categories were developed on the basis of impressions obtained during interviews of the subject matter emphasis of the units. Among the units assigned to the agricultural emphasis category were Animal Husbandry and Agronomy. Biochemistry and Botany were assigned to the

category labelled "Conventional Scientific Emphasis" and units such as Food Science and Sociology were assigned to a "Mixed Emphases" category. The number of respondents from each unit and the outcome of the categorization is presented as table 3.

Table 3: Categorization of Administrative Units

Type of Subject Matter	Units Included	Percentage
Agricultural Emphasis	Animal Husbandry (2), Dairy (5), Agricultural Engineering (3), Crops (5), Horticulture (16), Poultry (2), Soils (6)	37
Mixed Emphasis	Agricultural Economics (10), Fisheries and Wildlife (3), Food Science (10), Forest Products (1), Forestry (1), Home Economics (4), Sociology (4)	32
Conventional Scientific Emphasis	Biochemistry (8), Botany (10), Entomology (1), Veterinary Medicine (13)	31
		100% (104)

Two units, Horticulture and Veterinary Medicine supplied one quarter (28%) of the sample. Less than three respondents were drawn from Animal Husbandry, Entomology, Forest Products, Forestry and Poultry. The sample represents the diversity of subject matter areas to be expected at a state agricultural experiment station. The variety is such that differences in basic-applied orientation and audiences for publications can be expected.



Description of the Sample in Terms of The Theoretic Variables

Self Esteem as Researcher

Two measures of self esteem were used for comparative purposes. The distribution of responses is shown in table 4.

Table 4: Response distributions on self-esteem measures

Score or Value	(rating scale)	(index)[b]
0 (Low)	a	1.0%
1	0.0%	1.9
2	0.0	4.8
3	1.0	17.3
4	1.0	20.2
5	15.4	27.9
6	7.8	6.7
7	42.3	4.8
8	15.4	9.6
9 (High)	13.5	a
No Response	3.8	5.8
	100.2% *	100.0%
	M = (104)	(104)

The correlations among the nine items of the self esteem index were quite high, the lowest being .76. All items correlated well with total score, the lowest of these was .82.

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[a] Score not present on this measure.

[b] This distribution was reversed for comparative purposes, actually a 0 score on the index represented high self esteem and was obtained by 10 respondents, etc.

* rounding error.

The correlation matrix is shown as Appendix D. These results suggest that the items tapped the same dimension.

Three-quarters of the respondents rated themselves as definitely above average (7, 8 or 9) on the nine-point self rating scale. The mean response value was 6.97, the median 7.45. On the self esteem index, two-thirds of the respondents fell in the middle score range (3, 4 or 5). On this measure the mean score was 4.61, the median 4.77.

Despite the apparent high level of esteem in the sample according to the self rating scores, it was hoped that the two measures would be closely associated. Table 5 indicates that this was not the case. The overall chi-square for this distribution did not approach statistical significance. The expected trends were simply not evident.

Table 5: Distribution of respondents by scores on the self-esteem measures.

		Self Esteem by Rating Scale		
		Hi (8-9)	Med (7)	Lo (1-6)
Self Esteem Index	Hi (5-8)	25.0%	23.3%	16.0%
	Med (3-4)	53.6	48.8	56.0
	Lo (0-2)	21.4	27.9	28.0
		100.0%	100.0%	100.0%
		(28)	(43)	(25)

Chi-square = 1.06, 4 d.f.; p greater than .05, two alternative test.

This was the first of a series of disappointments with the concept and/or measurement of self-esteem as researcher. Not only were the measures not related to each other, neither was associated with any other variable. The results presented in the following pages concerning self-esteem were obtained using the index. Similar non significant results from the rating scale are not presented.

Self Concept as a Basic-Applied Researcher

Separate measures were used to assess the researchers concept of himself as a basic and as an applied researcher. All respondents completed the four items of each measure. The distribution of respondents by score is presented in table 6 for both measures.

Table 6: Distribution of respondents on basic and on applied orientation measures.

Score Interval	Percentage on Basic	Percentage on Applied
0- 2	0.0%	4.8%
3- 4	0.0	3.8
5- 6	0.0	1.9
7- 8	0.0	6.7
9-10	2.9	19.2
11-12	5.8	11.5
13-14	13.5	11.3
15-16	26.9	18.3
17-18	35.6	9.6
19-20	15.4	7.7
	100.1% *	99.8% *
	(104)	(104)
Range	= 9 - 20	0 - 20
Mean	= 16.15	12.21
Median	= 16.56	12.72

*rounding errors

The inter-item and item-total correlations for the basic and applied measures are presented as table 7.

Table 7: Correlations Among Basic and Applied Items

	Basic Items			
	29	30	32	Total
27[a]	-.19	+.36	-.12	.26
29		+.04	+.04	.69
30			+.16	.68
32				.34

	Applied Items			
	31	33	34	Total
28[a]	+.51	+.26	+.44	.72
31		+.29	+.53	.77
33			+.39	.65
34				.80

[a] Identification numbers are those used in the questionnaire, appendix A, p. 3.

The items used to form the measure of basic orientation did "hang together" sufficiently to form a scale. Several items were negatively correlated with each other, most of the correlations were low.

In comparison, the items of the applied orientation measure were positively associated with each other and all contri-

buted satisfactorily to total score.

The cause(s) of the unexpected outcomes is not immediately obvious. The items were selected from responses to a single pretest item to represent two distinct and likely opposite dimensions. Poor item selection could certainly account for the findings but they could also result from different degrees of consensus among the respondents as to the nature of basic and of applied research. Possibly the respondents hold a widely shared meaning for applied research but several different meanings for basic. Impressions gained during the interviews would support this possibility. This speculation suggests that (a) the concept of basic-applied research may not be undimensional, and (b) the concept of basic research may also not be unidimensional. Exploration of such possibilities is beyond the scope of this investigation.

It was decided to use only the measure of applied orientation in subsequent analyses. This measure was regarded as having an acceptable degree of internal consistency and a satisfactory distribution. The sample was dichotomized on the basis of applied orientation scores to produce a low applied orientation category (N=50) and a high applied orientation category (N=54).

Significant Others

The researchers were asked to identify significant others by the question, "Whose opinion of you as researcher

is important to you?" Every individual in the sample made some response to this item. The types of responses are summarized in table 8.

Table 8: Percentage of response types to Significant Other question.

Response Type	Percentage
Some Self Reference	5.8%
Only Groups or Categories Named	5.8
Groups or Categories and Individuals Named	5.8
Only Individuals Named	82.7
	100.1%*
	(104)

*rounding error

Of the 86 respondents who named only other individuals as significant; 80 named five others, three named four and three named two. Five of the six respondents who named both individuals and groups made five responses each, two named one group and four individuals, two named two groups and three individuals, and one named four groups and one individual. The remaining individual who gave a combination response named one group and two individuals. None of the six respondents who named only groups made five responses, four named three groups, one named two, and one named only one. Two of the six respondents who made self references claimed no-one else's opinion of them as researchers mattered, two also named other individuals

and the remaining two named groups in addition to self.

The individual responses were coded as, peers or non-peers. The weightings assigned by the respondents to indicate the relative significance of the others named, were used to categorize the respondents according to the extent of their orientation toward peers. Thirty respondents assign significance only to peers, 39 were classed as having a major peer orientation (they assigned eight to 14 out of 15 points to peers) and the remaining 35 were placed in a minor peer orientation category. This index was used throughout the analyses as the measure of significant others.

Immediate Others

The data for this measure were collected by asking the researchers, "Who are some of the people you talk frequently to about your research?" Ninety-nine respondents gave five responses, as requested, to this question, two gave two responses and one gave only one response. Ninety-seven respondents named only individuals; of these, 95 named five, one named three and one named one. Two respondents named only groups, both named two groups. Three of the five respondents who named both groups and individuals gave four individuals and one group, one named one individual and two groups and one named one individual and four groups as immediate others.

These data are summarized in table 9.

Table 9: Percentage of response types to immediate other question.

Response Type	Percentage
Only Groups or Categories Named	1.9%
Groups or Categories and Individuals Named	4.8
Only Individuals Named	93.3
	100.0%
	(104)

As in the case of significant others, the individual responses were coded as peer or non-peer. The proportion of peers named as immediate others provided the basis for the development of three categories of respondents: peers only (31); peers majority (50); peers minority (23).

Significance of Immediate Others

This measure indexes the amount of overlap between significant others and immediate others. The possible range is from 0 to 5, the actual range was 0 to 4. Seven individuals were dropped from this measure; they had given a self-only response to the significant other question or a combination (groups and individuals) response to the immediate other question. The distribution of researchers on this variable is presented in table 10.

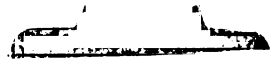

Table 10: Distribution of Respondents according to the number of Immediate Others who were also Significant.

Number Immediate also Significant	Percentage
0	30.9%
1	26.8
2	24.7
3	13.4
4	4.1
	99.9%*
	(97)

*rounding error

Almost one-third of the sample named no immediate others significant, about one quarter named one, another one quarter named two and the remaining one fifth named three or four immediate others as significant. The researchers in this sample showed considerable variability in the extent to which they regarded their immediate others as significant. The measure turned out to be no more predictive than that of self esteem.

Publication Rate

This measure is simply the number of publications to which an individual claimed authorship during a three year period. The number ranged from a low of zero (1%) to a high of 56 (1%). Table 11 is a summary of the number of researchers authoring different numbers of publications. About one third (32%) authored seven or fewer, another third (39%) authored

between eight and 14, while the rate for the final third (29%) ranged from 15 to 56 publications. The median number of publications was 10.75, the mean was 13.3.

The 10 highest producers authored more than 13 times as many publications as the 13 lowest producers during the three year period.

Table 11: Distribution of respondents by publication rate.

Number of publications	Percentage
0 - 2	4.8%
3 - 5	14.4
6 - 8	16.3
9 - 11	17.3
12 - 14	18.3
15 - 17	6.7
18 - 20	3.8
21 - 23	7.7
24 - 26	1.0
27 or more	9.6
	99.9%*
	(104)

*rounding error

Audience Emphasis

Each publication claimed by the respondents was classified as having or not having a researcher audience. As far as

possible, the respondent's indication of publication audience was used. Seventy respondents indicated one and only one audience for each publication. Twenty-seven respondents made at least one multiple response and seven failed to specify audiences for any publication. The bulk of the multiple responses were within or beyond the three categories of researchers. The remaining multiple responses and citations from the seven respondents who did not specify any audiences were classified according to the apparent form of the publication. For example, journal articles were considered to be for researcher audiences and commercial publications for non-researchers. Doubtful cases were coded as not for researchers.

The percentage of publications directed to researcher audiences was then calculated for each respondent. The thirty-three respondents who directed 90% or more of their publications to other researchers were classified as having a researcher audience emphasis, the remaining seventy as having a non-researcher audience emphasis. The one respondent who was dropped from this measure had no publications.

Peer Evaluation

Each respondent was provided with a list of names of those persons who constituted the original sample and asked to nominate five whom he regarded as outstanding researchers. Ninety-nine respondents made five nominations, two made two and three refused to answer. The number of nominations received by

each respondent constitutes the measure of peer evaluation. The number of researchers nominated is presented in table 12.

Table 12: Percentage of Researchers Receiving Various Numbers of Nominations for Outstanding Researcher.

Number of Nominations	Percentage
0	30.8%
1	19.2
2	11.5
3	11.5
4	6.7
5 or more	20.2
	99.9%*
	(104)

*rounding error

The number of nominations received ranged from 0 (31%) to 39 (1%). The mean number was 3.8, the median 1.5. The distribution was severely skewed, only one tenth of the respondents received more than 10 nominations.

Administrative Evaluation

This measure is the percentage salary increment received by each respondent over the previous three years. The increments ranged from 1.1% (1%) to 18.9% (1%). The mean increment was 7.8%, the median 7.2%. Data were not available for three respondents. Table 13 presents the distribution of respondents

by salary increment intervals of three percent. About one quarter (25%) of the respondents received increments of more than 10%, one tenth received 4% or less. More than one-third of the sample (37%) received increments of 4.1 to 7% and 87% of the sample received between 4.1 to 13% increments.

Table 13: Distribution of Respondents by Salary Increment Intervals.

Salary Interval	Percentage
1.1 - 4.0	9.9%
4.1 - 7.0	36.6
7.1 - 10.0	27.7
10.1 - 13.0	21.8
13.1 - 16.0	2.0
16.1 - 19.0	2.0
	100.0%
	(101)

The distribution on this measure makes it quite acceptable as a criterion.

Frequency of Interaction with Lay Audiences

The respondents were asked how often they gave talks to audiences of non-researchers, non-students. Low, medium and high frequency categories were made considering the overall distribution. Forty-nine respondents who reported fewer than four talks per year to lay audiences were placed in the low frequency category; 27 who reported four to 10 talks were classified

as moderate frequency and the remaining 28 (11 or more talks) as high frequency.

Tests of Hypotheses

A significant positive correlation between self-esteem index scores and publication rate was predicted in hypothesis 1. The Pearson Product Moment correlation for 98 respondents did not approach significance.[51] Hypothesis 1 was not confirmed.

The second hypothesis stated that researchers with a high orientation toward basic research would emphasize other researchers as audiences. This hypothesis could not be tested because of the lack of internal consistency in the measure of orientation to basic research.

Hypothesis 3 predicted a negative association between orientation toward applied research and proportion of publications to researcher-audiences. The relevant distribution is presented as table 14.

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[51] $r = -.07$; an $r = .21$ was required for significance at .05 level, two tailed test.

Table 14: Orientation to applied research and researcher audience emphasis.

		Orientation to applied research	
		Lo	Hi
Proportion of publications to researchers	90% or more	42.9	22.2
	less than 90%	57.1	77.8
		100.0%	100.0%
		(49)	(54)

Chi-square = 4.12; 1 d.f.; p less than .05, two alternative test, with Yates' correction.

Researchers classified as having a low degree of orientation to applied research were more likely to emphasize other researcher audiences than were those with a high applied research orientation. Hypothesis 3 was confirmed.

A dual orientation to basic and applied research was predicted to be associated with high publication rate in hypothesis 4. The inadequacy of the measure of basic orientation made it impossible to test this hypothesis.

The expectation that orientation toward peers as significant others would be positively associated with emphasizing researcher-audiences was stated as hypothesis 5. The data used to test this hypothesis are shown in table 15.

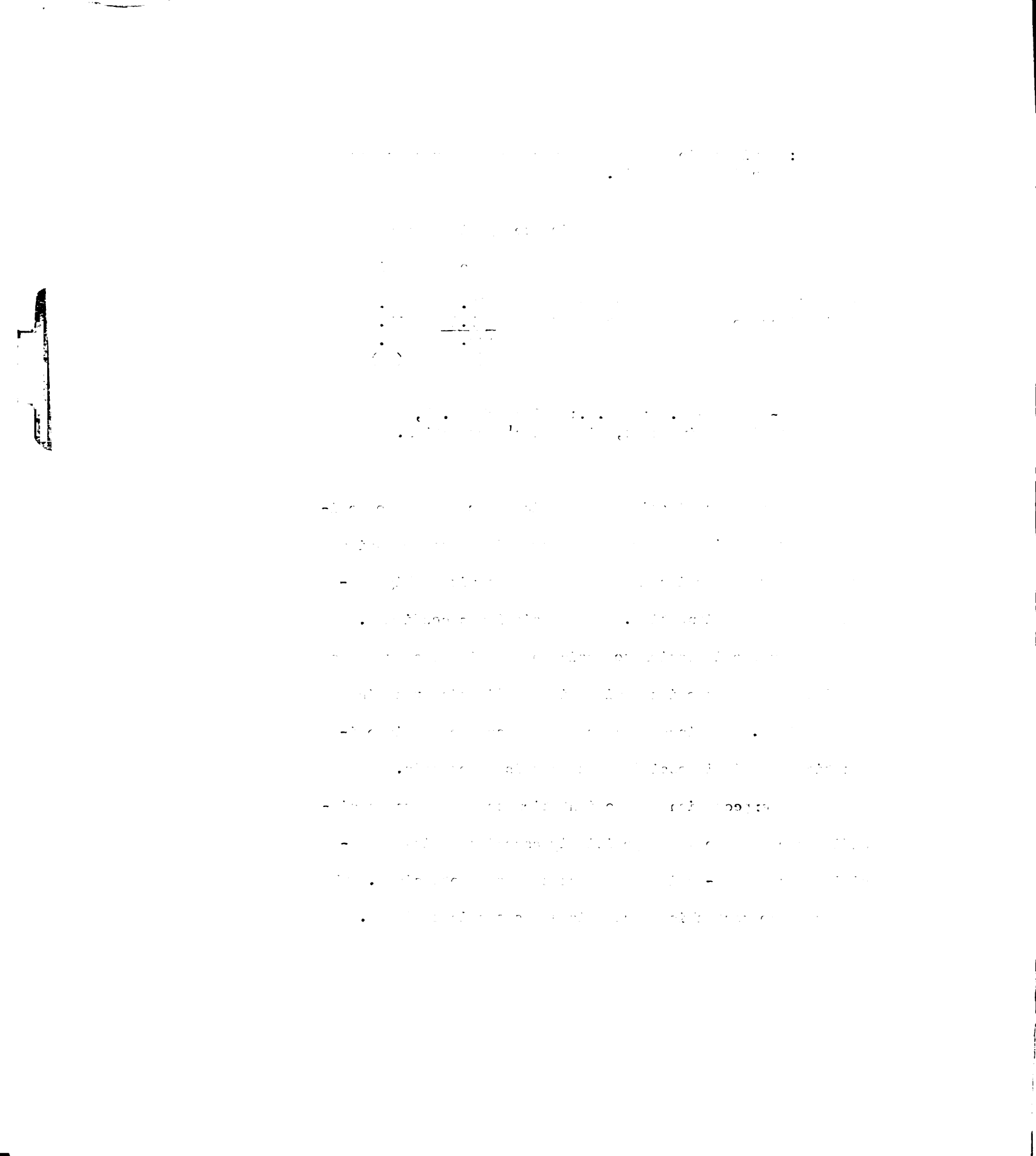

Table 15: Significant other orientation and researcher audience emphasis.

		Significant other orientation		
		Peers Only	Peers Major	Peers Minor
Proportion of publications to researchers	90% or more	46.7	30.8	20.6
	less than 90%	53.3	69.2	79.4
		100.0%	100.0%	100.0%
		(30)	(39)	(34)

Chi-square = 5.03; 2 d.f.; p greater than .05, two alternative test.

While the trends were in the predicted direction, the chi-square test was not significant. Hypothesis 5 was not confirmed.

Hypothesis 6 was a restatement of hypothesis 5 in the case of orientation toward immediate others. The data are presented in table 16.

Table 16: Immediate other orientation and researcher audience emphasis.

		Immediate other orientation		
		Peers Only	Peers Majority	Peers Minority
Proportion of publications	90% or more	51.6	26.5	17.4
	less than 90%	48.4	73.5	82.6
		100.0%	100.0%	100.0%
		(31)	(49)	(23)

Chi-square = 8.42; 2 d.f.; p less than .05, two alternative test.

As predicted, the more peers a researcher claimed as immediate others, the more likely he was to direct 90% or more

of his publications to researcher audiences. The results confirm hypothesis 6. The confirmation of this hypothesis and lack of confirmation of hypothesis 5 may be due to measurement differences or may be an indication that immediate (interactive) others is a more powerful predictor of audience emphasis than is significant others. Evidence to support the latter possibility will be presented later.

Hypothesis 7 stated that the more peers a researcher claimed as significant others, the lower his publication rate. The data presented in table 17 show no evidence of the predicted association. Hypothesis 7 was not confirmed.

Table 17: Significant other orientation and publication rate.

			Significant other orientation		
			Peers Only	Peers Major	Peers Minor
Publication Rate	Lo	(0- 7)	30.0	41.0	22.9
	Med	(8-14)	33.3	33.3	51.4
	Hi	(15 or more)	36.7	25.6	25.7
			100.0%	99.9%*	100.0%
			(30)	(39)	(35)

*rounding error

Chi-square = 4.79; 4 d.f.; p greater than .05, two alternative test.

It was predicted in hypothesis 8 that the more immediate others a researcher claimed as significant, the lower his publication rate. The relevant distribution is presented as table 18.

Table 18: Significance of immediate others and publication rate.

		Number of immediate others who were also significant		
		0	1 - 2	3 - 4
Publication Rate	Lo (0- 7)	43.3	26.0	35.3
	Med (8-14)	33.3	42.0	41.2
	Hi (15 or more)	23.3	32.0	23.5
		99.9% *	100.0%	100.0%

*rounding error

Chi-square = 2.76; 4 d.f.; p greater than .05, two alternative test.

The chi-square test of these data was not statistically significant. However, there appeared to be some tendency for researchers who had one or two immediate others as significant to have higher publication rates. This possibility was explored by means of an analysis of variance. The test for homogenity of variances indicated that the assumption of homogeneous variances was not tenable.[52] However, the analysis of variance was still conducted, following Norton's interpretation of non-homogeneous variances as summarized by Lindquist.[53] The analysis of variance indicated that the differences in publication rate between the categories of "significance of

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[52] F max = 5.59; K = 3, n = 30 and 50; p greater than .01.

[53] Lindquist, E., Design and Analysis of Experiments, Boston: Houghton Mifflin, 1953, pp. 78-86.

immediate others" were not statistically significant.[54] Both the chi-square test and the analysis of variance failed to demonstrate the presence of an association between significance of immediate others and publication rate. Hypothesis 8 was not confirmed.

Hypotheses 9 and 10 stated that the correlations between researcher audience emphasis and evaluation from administration (Hy. 9) and from peers (Hy. 10) would be higher for researchers with low publication rates than for those with high rates. The sample was dichotomized using a median cut on publication rate. Point biserial correlations were then calculated between researcher audience emphasis and peer evaluation and between researcher audience emphasis and administrative evaluation for the high and low publication rate categories. These correlations are shown in table 19.

Table 19: Correlations between researcher audience emphasis and evaluation by publication rate categories.

	Publication Rate	
	Lo	Hi
Hy. 9		
Researcher-audience emphasis X administrative evaluation	+.12	+.02
Hy. 10		
Researcher-audience emphasis X peer evaluation	+.19	+.30

r = .29; 45 d.f.; necessary for significance at .05, two tailed test.

[54] F = 1.02; d.f. = 2 and 94; F.95 = 3.11.

Neither of the correlations used in hypothesis 9 were statistically significant and no test of the differences between them was made. In hypothesis 10, the correlation between researcher-audience emphasis and peer evaluation was statistically significant. However, the direction of the difference between the correlations was opposite to that hypothesized. Hypotheses 9 and 10 were not confirmed.

Hypothesis 11 stated that the correlation between publication rate and administrative evaluation would be larger than that between publication rate and peer evaluation. The Pearson product moment correlation between publication rate and administrative evaluation was +.15 and between publication rate and peer evaluation was +.41.[55] The direction of the difference between the correlations was opposite to that hypothesized and no test of the hypothesis was made. Hypothesis 11 was not confirmed.

Hypothesis 12 predicted that the correlations between researcher audience emphasis and evaluation would be stronger for peer evaluation than for administrative evaluation. Point biserial correlations were used. The values of the correlation was +.18 in the case of peer evaluation and +.05 with administrative evaluation. The trend of the difference was that predicted but the correlations were not statistically

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[55] $r = .21$; 90 d.f.; necessary for significance at .05, two tailed test.

significant so no difference test was used. Hypothesis 12 was not confirmed.

The objectives of this study were to search for and examine certain relationships between self-other-interaction variables and publication activity; and between publication activity and evaluation.

But the process of research is seldom straightward. In science, the characteristics of the material, the appropriateness of methods, and the explanations of outcomes are uncertain. They must be constantly questioned and examined. Variables and relationships at the periphery of the area of study may have profound implications for the interpretation of results.

These considerations prompted the systematic investigation of relationships among all the variables used.

These additional findings have been organized into the following two sections: relationships among the theoretic variables and interrelationships between general characteristics and theoretic variables.

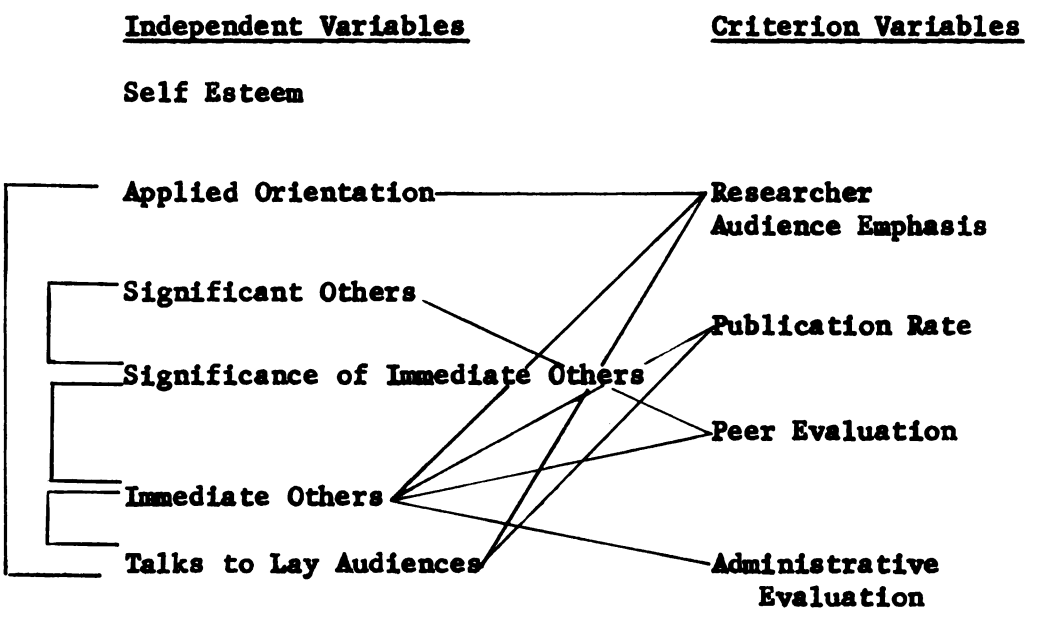
Additional Findings

Relationships among the theoretic variables

The results of the chi-square tests of these relationships are shown in appendix F. The associations which were statistically significant are represented by the lines in

figure 1. The figure is intended only as a summary of the relationships; the absence of lines between variables indicates that the association was not statistically significant at the .05 level.

Figure 1. Summary of relationships among the theoretic variables.



Relationships among the independent variables will be presented and discussed first, followed by the relationships between independent and criterion variables.

The manner in which "significance of immediate others" was related to the two variables from which it was constructed is shown in table 20.

Table 20: Significance of immediate others with significant others and with immediate others.

		Number of immediate others also significant		
		0	1	2+
Significant Other Orientation	Peers exclusively	46.7	3.8	34.1
	Peers major	23.2	57.7	34.1
	Peers minor	30.0	38.5	31.7
		100.0%	100.0%	99.9%*
		(30)	(26)	(41)

Chi-square = 13.84; 4 d.f.; p. less than .05, two alternative test

Immediate Other Orientation	Peers only	46.7	15.4	29.3
	Peers majority	46.7	61.5	46.3
	Peers minority	6.7	23.1	24.4
		100.1%*	100.0%	100.0%
		(30)	(26)	(41)

Chi-square = 10.84; 4 d.f.; p less than .05, two alternative test.

*rounding error

Respondents who named only peers as significant and as immediate were likely to have either none or two or more immediate others as significant, almost none fell in the middle category. Those who named only researchers as immediate others were also likely to have little or considerable overlap between significant and immediate others. Almost two-thirds of the respondents who named a minority peers as immediate others claimed at least two of them as significant.

No explanation of these outcomes was immediately obvious. Further thought and inspection of individual interview schedules

suggested that the variable "significance of immediate others" was partially confounded by the location of peers. Researchers who named only non-local peers as significant generally did not claim these same peers as immediate others while those who named local peers as significant others frequently named some of them as immediate others. Rather than a "clean" index of significance of immediate others, the variable seems also to reflect the location of a specific category of significant others - namely peers. The utter lack of predictive power of this variable appears attributable to inadequate operationalization and/or conceptualization.

Respondents who frequently gave talks to lay audiences were more likely to have a high orientation toward applied research and to claim non-peers as immediate others. These trends can be observed in table 21.

These results are consistent with the theory in that self definition in a role was demonstrated to be directly related to role relevant interactive patterns. The findings could be stated as follows: role performance (frequency of talks to lay audiences) is a function of self definition (applied research orientation) and interactive patterns (proportion immediate others who are peers).

The negative association between orientation toward applied research and researcher audience emphasis was predicted in hypothesis 3 and was discussed earlier.

Table 21: Frequency of talks to lay audiences with applied research orientation and with immediate others.

		Talks per year to lay audiences		
		0 - 3	4 - 10	11+
Applied Orientation	Lo	61.2	37.0	35.7
	Hi	38.8	63.0	64.3
		100.0%	100.0%	100.0%
		(49)	(27)	(28)

Chi-square = 6.41; 2 d.f.; p less than .05, two alternative test.

Immediate Other Orientation	Peers only	42.9	29.6	7.1
	Peers majority	42.9	59.3	46.4
	Peers minority	14.3	11.1	46.4
		100.1%*	100.0%	99.9%*

Chi-square = 18.94; 4 d.f.; p less than .05, two alternative test.

*rounding error

Several hypotheses concerned relationships between orientation toward peers as significant others and publication activity. None of these hypotheses were confirmed. However, researchers who assigned high significance to peers were more frequently nominated as outstanding researchers by peers. This distribution is presented as table 22.

Table 22: Significant other orientation with peer evaluation.

		Significant other orientation		
		Peers Exclusively	Peers Major	Peers Minor
Number of Nominations Received	0	10.0	35.9	42.9
	1-2	40.0	23.1	31.4
	3(+)	50.0	41.0	25.7
		100.0%	100.0%	100.0%
		(30)	(39)	(35)

Chi-square = 10.37; 4 d.f.; p less than .05, two alternative test.

Half of the researchers who assigned significance exclusively to peers received high peer evaluation whereas only one-quarter who assigned minor significance to peers were this highly evaluated by them. The relationship is even more evident in the low peer evaluation (o nominations) category.

The immediate others variable was associated with all four criterion variables. The higher the proportion of peers a researcher named as immediate others, the more likely he was to (a) emphasize researcher audiences (Hypothesis 6, confirmed and discussed earlier), (b) have lower publication rates, (c) be highly evaluated by peers, and (d) be highly evaluated by administrators. The distributions for the last three of these associations are shown in table 23.

Table 23: Immediate other orientation with publication rate; peer evaluation and administrative evaluation.

		Immediate other orientation		
		Peers Only	Peers Majority	Peers Minority
Publication Rate (Median Cut)	Lo	67.7	46.0	30.4
	Hi	32.3	54.0	69.6
		100.0%	100.0%	100.0%
		(31)	(50)	(23)

Chi-square = 7.70; 2 d.f.; p less than .05, two alternative test.

Number of Nominations Received	0	32.3	22.0	47.8
	1-2	12.9	44.0	26.1
	3(+)	54.8	34.0	26.1
		100.0%	100.0%	100.0%
		(31)	(50)	(23)

Chi-square = 13.01; 4 d.f.; p less than .05, two alternative test.

Percentage Salary Increment	Lo and Med	48.4	75.5	81.0
	Hi	51.6	24.5	19.0
		100.0%	100.0%	100.0%
		(31)	(49)	(21)

Chi-square = 8.41; 2 d.f.; p less than .05, two alternative test.

Interactive pattern, indexed as the proportion of peers named as immediate others, was the most useful independent variable in the study, in terms of its ability to predict both publication activity and evaluation. The associations between immediate others and evaluation are probably direct because the associations between publication activity and evaluation generally

fell short of statistical significance.

That the proportion of peers named as immediate others was negatively associated with frequency of talks to lay audiences was established earlier in this section. In table 24 it can be seen that researchers who frequently gave talks to lay audiences were likely to emphasize non-researcher publication audiences and to have high publication rates. These findings are consistent with those presented earlier and suggest that frequency of talks to lay audiences indexes the reciprocal interactive pattern of proportion of peers named as immediate others.

Table 24: Frequency of talks to lay audiences with audience emphasis and publication rate.

		Talks per year to lay audiences		
		0 - 3	4 - 10	11 (+)
Percentage of Publications to Researchers	90% or more	52.1	22.2	7.1
	less than 90%	47.9	77.8	92.9
		100.0%	100.0%	100.0%
		(48)	(27)	(28)

Chi-square = 18.02; 2 d.f.; p less than .05, two alternative test.

Publication Rate	0 - 7	49.0	25.9	7.1
	8 - 14	32.7	37.0	53.6
	15(+)	18.4	37.0	39.3
		100.1%*	99.9%	100.0%
		(49)	(27)	(28)

Chi-square = 15.80; 2 d.f.; p less than .05, two alternative test.

*rounding error

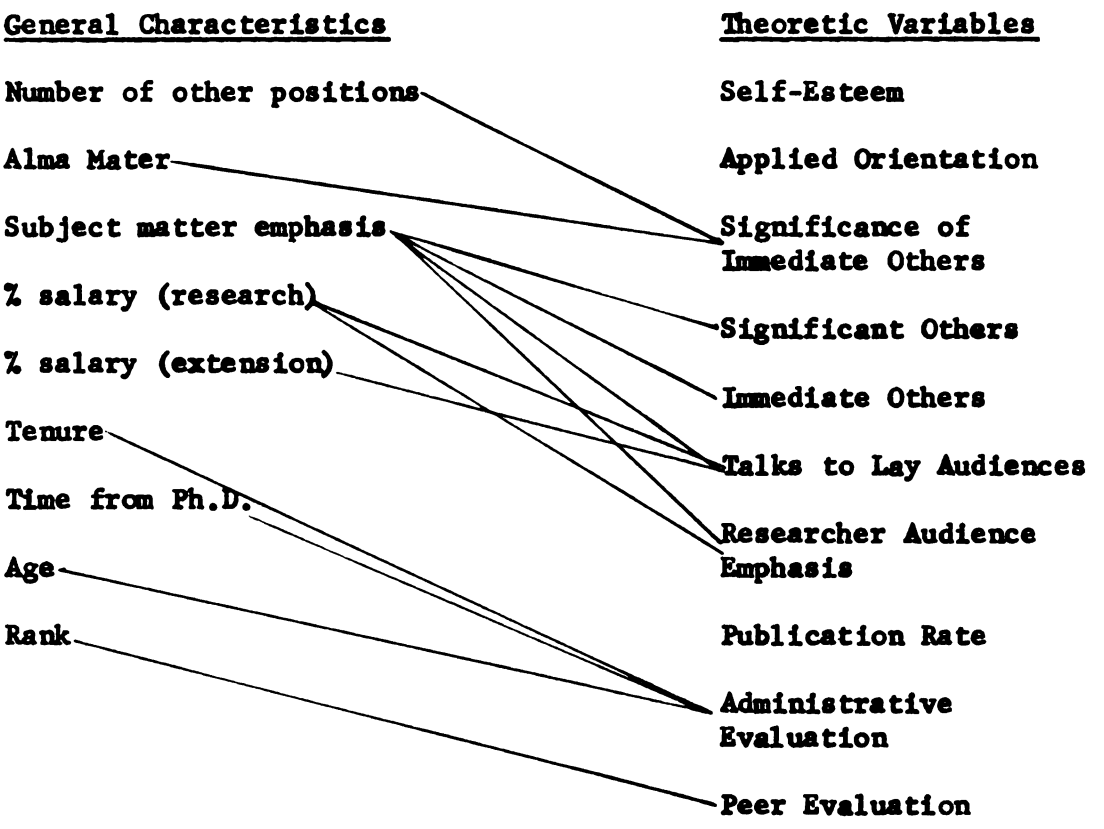
Half of the researchers who had low frequency of talks to lay audiences emphasized researcher-audiences and had low publication rates, compared to less than 10% of those who had high frequency of talks to lay audiences. These results and those presented with respect to immediate others indicate that researchers who interact frequently with non-researchers are more likely to write for them and to have high publication rates.

The findings presented in this section demonstrate the relevance of interactive patterns to publication activity and evaluation. Immediate others appeared as a key independent variable.

Relationships between General Characteristics and Theoretic Variables

Despite the seeming consistency of the findings in the previous section, the possibility that the results were influenced by the general characteristics was explored. The chi-square values and degrees of freedom for the tests appear in appendix G. Only associations which were statistically significant will be discussed. These are sketched in figure 2. It shows that every general characteristic was associated with at least one theoretic variable. The lines represent associations which were statistically significant, no line indicates absence of statistically significant chi-square.

Figure 2. Summary of relationships between general characteristics and theoretic variables.



Because of the large number of statistically significant associations, only those concerning the theoretic criterion variables will be discussed. Some of the relationships among general characteristics (appendix E) and between general characteristics and theoretic independent variables will be referred to for interpretation.

Both subject matter emphasis and percentage salary for research were associated researcher audience emphasis. Researchers from convention scientific subject matter areas and those who obtained a high percentage of their salary for

research were more likely to emphasize researcher audiences. (These were frequently the same individuals; the chi-square between subject matter emphasis and percentage salary for research was statistically significant.) The distributions are shown in table 25.

Table 25: Subject matter area and percent salary for research with audience emphasis.

		Subject matter area		
		Agriculture	Science	Mixed
% publications to researchers	90% or more	15.4	67.7	18.2
	less than 90%	84.6	32.3	81.8
		100.0%	100.0%	100.0%
		(39)	(31)	(33)

Chi-square = 26.04; 2 d.f.; p less than .05, two alternative test.

		% Salary research		
		50@	51-79	80 (+)
% publications to researchers	90% or more	23.1	25.7	51.7
	less than 90%	76.9	74.3	48.3
		100.0%	100.0%	100.0%
		(39)	(35)	(29)

Chi-square = 7.25; 2 d.f.; p less than .05, two alternative test.

@ the individual who received no salary from the experiment station was included in this category.

Such findings could be easily anticipated, but subject matter emphasis was also associated with significant other orientation, immediate other orientation and frequency of talks to lay audiences. The last two of these variables have already been shown to be associated with researcher audience emphasis. Very few respondents from the agricultural areas named only peers as immediate others or had a high frequency of talks to lay audiences compared to those from the science or mixed subject matter areas. The patterns of interaction corresponded to audience emphasis in agricultural and science but not in the mixed subject matter areas. However the respondents from the mixed areas were unique in their orientation toward significant others; only 12% assigned significance exclusively to peers compared to one-third in agricultural and almost one-half in science subject matter areas.

Despite their relatively infrequent face to face interaction with non-peers, respondents from mixed areas express the significance they assign to these audiences by writing for them. Respondents from agricultural areas direct some of their publications to lay audiences almost regardless of the claimed significance of these audiences to them. The researchers in the science subject matter areas seem to have the consistent arrangement; few of them interact with, assign significance to, or write for non-researchers.

The immediate social situation (indexed here as subject

matter area) appears to influence audience emphasis in conjunction with interaction patterns and significant other orientations. The interdependence among this set of variables may explain the lack of confirmation of several hypotheses concerning audience emphasis. The relationships involved are apparently more complex than those hypothesized.

None of the general characteristics was associated with publication rate at a statistically significant level.

Three "age variables" (tenure at M.S.U., time from Ph.D., and chronological age) were negatively associated with administrative evaluation. These three were positively associated with each other, thus only the association between tenure at M.S.U. and administrative evaluation is presented in table 26.

Table 26: Tenure and administrative evaluation.

		Tenure		
		0 - 7	8 - 14	15 +
Percentage	Lo	23.8	19.1	54.5
Salary	Med	33.3	40.4	33.3
Increment	Hi	42.9	40.4	12.2
		100.0%	99.9%*	100.0%
		(21)	(47)	(33)

Chi-square = 14.47; 4 d.f.; p less than .05, two alternative test.

*rounding error

The general tend is for percentage salary increment to decrease with longer tenure. This may reflect stronger competition for younger men or may indicate that administrative evaluation is reflected more by absolute rather than percentage salary increment. The latter possibility could not be investigated because absolute salary information is considered privileged by administration.

Academic rank was positively associated with peer evaluation and was the only general characteristic related to this criterion. The distribution is presented as table 27.

Table 27: Academic rank with peer evaluation.

		Rank	
		Non-professor	Professor
Number of Nominations Received	0	50.0	13.0
	1-2	32.0	29.6
	3(+)	18.0	57.4
		100.0%	100.0%
		(50)	(54)

Chi-square = 22.11; 2 d.f.; p less than .05, two alternative test.

This finding suggests that the older researchers have proven themselves and have had sufficient time to achieve public recognition. The fact that rank was positively associated with all three "age variables" supports this interpretation. However, none of the age variables were associated with peer evaluation at a statistically significant level.

Alternate interpretations would be that higher rank is granted to those who come to be consensually defined as outstanding by their peers or that researchers rely on a public criterion such as rank when asked to evaluate their peers. No data were collected which could be used to further investigate these speculations.

The findings in this section showed the relevance of subject matter area to audience emphasis, tenure to administrative evaluation (as percentage salary increment) and academic rank to peer evaluation.

In the discussion section of the following chapter, both general characteristics and theoretic variables will be used in a reexamination of the hypothesized associations. The intent is to assess the relative importance of various variables as predictors of publication activity and evaluation.

Chapter IV

DISCUSSION, SUMMARY AND CONCLUSIONS

Discussion

Findings already presented demonstrate that variation in publication activity and evaluation can not generally be accounted for with a single predictor. For the most part, these criterion variables were found to be associated with several theoretic variables as well as with several so called general characteristics. The hypotheses, most of which were statements of simple relationships, were generally not confirmed. Even where the predictions were confirmed for the whole sample (hypotheses 2 and 6) subclasses were located where the trends did not appear or were reversed.

The purpose of this section is to explore and discuss more complex relationships involving publication and evaluation, in an attempt to account for observed variations. A series of three way tables will be presented as evidence and to facilitate discussion. The section is comprised of four parts. In the first two, publication activity will be considered; in the latter two, evaluation.

Audience Emphasis

Respondents who directed 90% or more of their

publications to other researchers have been shown to be more likely to (a) have a low orientation toward applied research, (b) name only peers as immediate others, (c) give more than three talks per year to lay audiences, and (d) to represent conventional scientific subject matter areas. In table 28, subject matter is used in conjunction with each of the other three variables to ascertain their joint effects on audience emphasis.

Most respondents from agricultural and mixed subject matter areas emphasized non-researcher audiences while those from science areas emphasized researcher audiences. The orientation of the researchers toward applied research seemed to have influence on these trends except in the case of agricultural and mixed areas, where a high orientation toward applied research was almost invariably associated emphasizing non-researcher audiences.

High frequency of talks to lay audiences was closely associated with non-researcher audience emphasis across all subject matter areas. However, low frequency was associated with researcher emphasis only among respondents from the science areas.

Similarly, naming only peers as immediate others was associated with researcher-audience emphasis only in the science areas while naming a minority of peers as immediate others was associated with non-researcher-audience only in agricultural

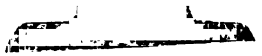


Table 28: Subject matter area and applied orientation, frequency of talks to lay audiences and immediate other orientation with audience emphasis.

		Subject Matter Area					
		Agriculture		Science		Mixed	
Applied Orientation:		Lo	Hi	Lo	Hi	Lo	Hi
% publications to researchers	90% or more	28.6	8.0	75.0	60.0	26.3	7.1
	less than 90%	71.4	92.0	25.0	40.0	73.7	92.9
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(14)	(25)	(16)	(15)	(19)	(14)

Talks per year to lay audiences:		0-3	4-10	11+	0-3	4-10	11+	0-3	4-10	11+
% publications to researchers	90% (+)	33.3	18.8	5.9	80.0	0.0	15.0	17.6	33.3	0.0
	less than 90%	66.7	81.2	94.1	20.0	100.0	75.0	82.4	66.7	100.0
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(6)	(16)	(17)	(25)	(2)	(4)	(17)	(9)	(7)

Immediate other orientation:		Po	P+	P-	Po	P+	P-	Po	P+	P-
% publications to researchers	90% (+)	50.0	9.5	8.3	80.0	60.0	50.0	10.0	27.8	0.0
	less than 90%	50.0	90.5	91.7	20.0	40.0	50.0	90.0	72.2	100.0
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(6)	(21)	(12)	(15)	(10)	(6)	(10)	(18)	(5)

and mixed areas.

The findings suggest that there is no obviously best predictor of audience emphasis among these variables. Each one seems to have its greatest effect under certain specific conditions of the others. Audience emphasis is not a simple expression of self-concept as an applied researcher or of orientation towards others (hypothesized in Hy. 2, 3, and 5). It depends also on interactive patterns (Hy. 6) and on the immediate social situation.

Publication Rate

The joint influence of immediate other orientation and frequency of talks to lay audiences on publication is shown in table 29. Naming non-peers as immediate others and giving talks frequently to lay audiences are associated with high publication rate. Several categories were collapsed to better illustrate the relationship.

Table 29: Immediate other orientation and frequency of talks to lay audiences with publication rate.

		Immediate other orientation					
		Peers Only		Peers Majority		Peers Minority	
Number of talks per year:		0-10	11+	0-10	11+	0-10	11+
Publication Rate	0-7	48.3	50.0	35.1	0.0	40.0	7.7
	8(+)	51.7	50.0	64.9	100.0	60.0	92.3
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(29)	(2)	(37)	(13)	(10)	(13)

Inspection of the citations provided by the respondents indicates that "double publication" is at least partly responsible for these findings. However, the extent to which "multiple publication" is reflected in overall publication rate could not be accurately determined from the citations. The inspection did suggest that multiple publication was more common among respondents who named non-peers as immediate and frequently gave talks to lay audiences than among those who named only peers as immediate and seldom gave talks to lay audiences. To some extent, it appears that publication rate is a function of immediate other orientation and frequency of interaction with lay audiences and that this relationship may be, in part, attributable to the number of reports (to different audiences) a researcher makes from a particular project. Respondents who frequently interact with lay audiences are apparently more likely to see their research findings as relevant to both clients and other researchers.

The results indicate that interactive patterns were the only predictors of publication rate. However, these "interaction" variables were not independent of the immediate social situation (subject matter area). Thus publication rate could be regarded as the outcome of continuous interplay among a number of social factors, although less obviously so than audience emphasis.

Peer Evaluation

A basic assumption of hypotheses 9 and 10 was that researcher audience emphasis would be positively associated with peer evaluation. Evidence presented earlier indicated that the assumption was not tenable. Peer evaluation was however shown to be positively associated with (a) rank, (b) publication rate, (c) orientation toward peers as significant others, and (d) otientation toward peers as immediate others. Table 30 shows the effect of rank on peer evaluation in conjunction with each of the other three variables.

Most of the non-professors who had a low publication rate received no nominations as outstanding researchers while only half of those with a high publication rate were never nominated. Publication rate appeared to have little effect on peer evaluation.

Among non-professors, respondents who assigned significance exclusively to peers were highly evaluated by peers while those who assigned minor significance to peers were lowly evaluated by them. These trends were not evident among professors.

The more non-professors were oriented toward peers as significant others, the more highly they were evaluated by peers. The trends were sharp and consistent. No such trends appeared among professors.

Non-professors who named a minority of peers as immediate others were very seldom highly evaluated by peers. The

Table 30: Academic rank and publication rate, significant other orientation, and immediate other orientation with peer evaluation.

		Rank					
		Non-professor			Professor		
Publication rate:		0-7	8-14	15(+)	0-7	8-14	15(+)
Number of	0	0.0	56.5	75.0	15.8	6.3	15.8
Nominations	1-2	54.5	26.1	25.0	31.6	18.7	36.8
Received	3+	45.5	17.4	0.0	52.6	75.0	47.4
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(11)	(23)	(16)	(19)	(16)	(19)
Significant other orientation:		Po	P+	P-	Po	P+	P-
Number of	0	42.9	40.9	71.4	23.5	7.1	11.1
Nominations	1-2	28.6	40.9	21.4	0.0	46.4	33.3
Received	3(+)	28.6	18.2	7.1	76.5	46.4	55.5
		100.1%*	100.0%	99.9%*	100.0%	99.9%*	100.0%
		(14)	(22)	(14)	(17)	(28)	(9)
Immediate other orientation:		Po	P+	P-	Po	P+	P-
Number of	0	63.2	38.1	50.0	14.3	20.0	5.0
Nominations	1-2	31.6	33.3	30.0	21.4	35.0	30.0
Received	3+	5.3	28.6	20.0	64.3	45.0	65.0
		100.1%*	100.0%	100.0%	100.0%	100.0%	100.0%
		(19)	(21)	(10)	(14)	(20)	(20)

*rounding error

association did not hold for professors.

These data show that the associations between peer evaluation and publication rate, significant others and immediate others were present only among non-professors. These variables do not seem to account for variation in peer evaluation of professors. Non-professors who wish to be highly evaluated by peers would seem well advised to restrict their interaction and assignment of significance to peers and to generate a high publication rate. The ease with which this may be done is likely influenced by subject matter area, because this was associated with both significant and immediate other orientations.

Administrative Evaluation

In previous sections, the lack of dependence of percentage salary increment on publication activity was demonstrated, contrary to the assumptions implicit in hypotheses 11 and 12. The associations between salary increment, the "age" variables and orientation toward immediate others were discussed. The question was raised regarding the utility of percentage salary increment as an index of administrative evaluation in this social system, in light of its close association with tenure.

Use of the publication variables in 3 way tables in conjunction with immediate other orientation failed to provide clear evidence of the relevance of publication activities to

salary increment. In a few instances, there seemed to be some slight tendency for high rate and researcher audience emphasis to be associated with higher salary increments. The table dealing with tenure and orientation toward immediate others displayed much more distinct trends. The distributions are presented in table 31.

Percentage salary increment decreases as length of tenure increases. In the middle and long tenure categories, part of the variation in percentage salary increment appears attributable to the extent of orientation towards peers as immediate others. In the middle tenure category, more than half the respondents who fell in the high percentage salary class named only peers as immediate others. Among respondents employed 15 or more years 80% of those who named a minority of peers as immediate others received low percentage salary increments compared to 50% or less in the other categories (of immediate other orientation).

Orientation toward peers as immediate others appears to compensate at least to some extent for increased tenure. Apparently the orientation need not be reflected in publication activities. Respondents from the various subject matter areas differed in orientation toward immediate others. It seemed possible that the apparent influence of orientation toward others on salary increment could be as well explained in terms of preferential administrative treatment of (or

Table 31: Tenure and immediate other orientation with administrative evaluation.

		Tenure								
		0-7			8-14			15+		
Immediate other orientation:		Po	P+	P-	Po	P+	P-	Po	P+	P-
Percentage	Lo	30.0	25.0	0.0	6.7	29.2	12.5	50.0	41.2	80.0
Salary	Med	30.0	37.5	33.3	20.0	45.8	62.5	33.3	41.2	20.0
Increment	Hi	40.0	37.5	66.7	73.3	25.0	25.0	16.7	17.6	0.0
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		(10)	(8)	(3)	(15)	(24)	(8)	(6)	(17)	(10)

emphasis on) certain subject matter areas. The distribution for rank (associated with 3 age variables), subject matter areas and salary increment can be examined in table 32.

There appears to be a clear tendency for non-professors from science and mixed areas to receive higher percentage increments than from agriculture. On the other hand, professors from agriculture appear more likely to receive low percentage increments than those from the other areas. The available data provide no firm basis for inferring whether these apparent trends are a deliberate administrative emphasis or merely an unconscious response to "non-normative" orientations. The 3-way table of subject matter, immediate others and salary (not presented) provided some evidence that immediate other orientation is related to salary in agriculture and science but not in the mixed subject matter areas. In any event, it seems clear that percentage salary increment is a measure of more than age or tenure and need not be abandoned as a measure of administrative evaluation. The best predictors of percentage salary increment were immediate other orientation and length of tenure but each of these were related to several other variables.

* * *

Self esteem and significance of immediate others were not predictive of publication rate (hypotheses 1 and 7) even when other variables were used as controls. The confounding

Table 32: Academic rank and subject matter area with administrative evaluation.

		Rank					
		Non-Professor			Professor		
Subject matter area:		Agriculture	Science	Mixed	Agriculture	Science	Mixed
Percentage	Lo	30.0	15.4	26.7	55.6	29.4	27.8
Salary	Med	45.0	30.8	20.0	27.8	35.3	55.6
Increment	Hi	25.0	53.8	53.3	16.7	35.3	16.7
		100.0%	100.0%	100.0%	100.1%*	100.0%	100.1%*
		(20)	(13)	(15)	(18)	(17)	(18)

*rounding error

of overlap with other variables seems responsible for its failure as a predictor. The only explanation that can be offered for the complete lack of performance by self-esteem, is that the generally high level of self esteem in this sample[56] of established researchers, makes the variable irrelevant.

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[56]Self-esteem has been found to be a useful predictor (or correlate of) role performance in other studies, e.g. Morris Rosenberg, Society and the Adolescent Self-Image, Princeton University Press, Princeton, New Jersey, 1965, pp. 206-239.

Summary

This study was exploratory in several respects. The central topic - publication activity - has been little examined. The subtopic - relevance of publication activity to evaluation - has been researched even less.

A frequent criticism of symbolic action theory is that its utility has not been demonstrated for empirical purposes. Social scientists who have conducted empirical studies in this tradition have generally emphasized self and/or other variables to the virtually exclusion of the interaction concept. In this study, these several classes of variables were employed together in an attempt to sort out their relative utility and redundancy.

Although industrial scientists have been recipients of considerable attention from social scientists in recent years, researchers at agricultural experiment stations have been virtually ignored.

For these several reasons, there was little background methodology in which to base the study. So certain methodological innovations were developed and a few methodological comparisons were built into the study. These innovations were made with awareness of the high failure rate of such attempts.

Because of relative virginity (most everything is

relative these days) of the area, the hypotheses were restricted, for the most part, to apparently obvious and simple relationships. Despite intentional conservation in formulating the hypotheses, most failed to be confirmed at statistically significant levels. Such a high failure rate could readily be attributable to inadequacies of (a) conceptualization, (b) operationalization and measurement and (c) control.

Reanalysis was undertaken to locate the variables associated with each criterion and to explore more complex relationships than those originally hypothesized.

The reanalysis indicated that two interaction variables (number of peers talked to frequently about research and number of talks per year to lay audiences) had major significance in accounting for variation in publication activity (rate and audience emphasis). The relevance of the social situation (indexed as subject matter area) and social status (rank) to publication behavior was also demonstrated. The interactive effect of both classes of variables was explored and it was concluded that both sets must be used simultaneously in order to obtain a useful understanding of the process of source behavior.

The dependence of peer evaluation on total role performance was inferred from its associations with a set of mixed variables. Two of the most powerful predictors of peer evaluation appeared to be immediate other orientation and rank.

It was also demonstrated that administrative evaluation - indexed as percentage salary increment - was a function of interactive patterns as well as of tenure.

A considerably larger study is required to confirm the assertions made in this summary. The small sample size of the present study prevented the use of standard statistical tests of the more complex relationships.

Conclusions

Audience Emphasis

Researcher-audience emphasis is most likely to be found among researchers who: -are located in conventional science subject matter areas; do not define themselves as applied researchers; claim mainly peers as immediate others; and seldom if ever give talks to lay audiences. The extent of the influence of any of these variables on audience emphasis appeared to be determined by the particular values of the others.

The audiences to which researchers direct their publications are a function of their situation, their status and their interactive patterns. The findings strongly suggest that self conceptions and orientation toward others are, by themselves, not adequate predictors of audience emphasis. In this study some of the complexities were uncovered and the relative importance of certain variables to audience emphasis was speculated upon.

Publication Rate

In this study, high overall publication rate was positively associated with the number of talks to lay audiences and to the proportion of non-peers named as immediate others. These interactive patterns were found more frequently among respondents from agricultural and mixed subject matter areas than among those from conventional science areas.

Situation, and interactional patterns appear to determine the number of audiences available to or perceived by the researcher. Multiple audiences are associated with "multiple publication" which tends to make for high publication rate. Overall publication rate was not predictive of either peer evaluation or percentage salary increment. The number of journal articles and book chapters and the number of "other" types of publications might be more useful indexes of publication rate for predicting evaluation.

Peer Evaluation: What constitutes an "outstanding researcher" seems to have many facets. Interactional patterns, rank and significant other orientation appear to be components of total performance reflected in peer evaluation. Generally, high peer evaluation seems to depend on assigning significance to peers and acting out this orientation in all things. Interacting with or writing for clients is apparently not expected of (or found among) outstanding researchers.

Most professors were highly evaluated regardless of the

proportion of peers named as immediate others or the significance assigned to peers. Among non-professors, respondents who were oriented toward peers as significant others and as immediate others were more highly evaluated by peers. Possibly the use of higher cutting points on peer evaluation categories for professors would uncover the same relationships as were found among non-professors.

Administrative Evaluation

Although tenure was the major determinant of percentage salary increment, orientation toward immediate others accounted for many of the exceptions to the association between tenure and salary increments. Short tenure and orientation toward peers as immediate others were associated with high salary increments. Publication activity seemed to be of little direct relevance to administrative evaluation.

Implications for Measurement

Self-Esteem Index: The attempt to develop a measure of self-esteem was successful from the standpoint of internal consistency of the scale items. But it is silly to praise a measure which was not associated with other variables. Work on this problem could proceed on several fronts: use of the scale in its present form with a more heterogeneous sample; development of a system of item weightings (from total sample item

ranks) to refine the measure. Several of these options could be explored from the existing data. A decision to pursue any or all of these alternatives would assume a positive answer to the question: is it worth it? Such an answer is not obvious in view of the apparent predictive power of other variables. Further efforts with the concept of self esteem among agricultural researchers could be justified on methodological or theoretic grounds.[57]

Significance of Immediate Others: Some measure of the relative significance of immediate others should be a useful predictor of role performance. It might also have utility in specifying the flexibility of specific roles and as distinguishing characteristic of social systems. The performance (or lack of performance) the measure used in this study does not prove the impotence of the concept. Three alternate approaches immediately seem plausible: investigation of overlap within specific categories of others i.e. peers, non-peers; consideration of the frequency of interaction in the operationalization of the concept; and utilization of (a) category of others, (b) location of others and (c) frequency of interaction in pursuit of localite-cosmopolite typologies. The existing data would be sufficient for exploration of these possibilities. Until such exploration has been done, the

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[57]Rosenberg, Morris, op. cit.

concept of significance of immediate others should perhaps not be dismissed.

Basic-Applied Orientation: The work done in this study was a beginning step toward the explication of the basic-applied distinction. Considering the overall results, it might be inferred that the measurement of basic-applied orientation may not have great utility. Interactive patterns and situational variables are more easily observable (therefore measurable) and appear to be better predictors of publication activity and evaluation. Scaling basic-applied may simply not be worth the trouble.[58]

Implications for Research

A set of interactive patterns which were not considered in this study, but which may have considerable relevance are those involving administrative personnel. Possibly the interactive patterns of administrators (or those they allow or foster among their staffs) would account for some differences herein labelled "subject matter area". It might also be interesting to develop a rank/tenure index of administrative evaluation. Such an index might be used to evaluate administrative evaluation. Such an index might be used to evaluate

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[58] Goldberg, L. C. et al, op. cit.
Gordon, Gerald, op. cit.

administrative performance as well as that of researchers.

A larger study is needed to rigorously test and explore the many associations and relationships uncovered or suggested in this study. If a less restrictive criterion were used for identifying respondents, sociometric techniques might be usefully employed. A larger study would necessarily involve the investigation of researchers at several colleges of agriculture. This would allow comparisons of interactive patterns between institutions and between conventional administrative units. The consistency of interactive patterns within specific disciplines and across the other classifications could be explored.

A further research implication is the general relevance of the primary group and interactional variables in the study of communicative behavior. It should not be necessary to continually rediscover the primary group and interaction as crucial variables. Investigations of the relationships between face to face communication and reading-writing behavior should be especially productive.

The need for methodological refinements of the interactionist approach was clearly demonstrated in this study. Hopefully, the attempts made here will encourage others to try.

Implications for Practice

Despite the small sample and absence of statistical

verification, tentative inferences can be drawn from this study for several categories of people.

Administrators in the college of agriculture may wish to reflect on the fact that a high proportion of their established researchers (the core of the knowledge generating unit) are oriented toward peers and seldom write for or talk to client audience. They may also wish to consider that a client orientation appears to be associated with low peer evaluation and in some situations with lower salary increments. They may also be interested in the fact that the M.S.U. graduates they hire almost invariably express a dual orientation toward basic and applied research but that whether the researchers publish for both client and researcher audiences depends largely on their interactive patterns.

The researchers interviewed may be interested in examining their own claimed orientations and actual performances in light of the findings.

Researchers who are considering employment in the college of agriculture might ask whether the situation they are contemplating will in fact permit them to express their personal orientations and still provide the evaluations they wish to receive.

Extension personnel may ask - how can these findings help me get more information from more researchers? The answer would seem to be - get them involved, talk to them, invite them

to meetings, let them know you need them and appreciate their efforts. It might also be wise to reserve judgment as to whether they've "got anything to offer" because it may take some time for them to understand your concerns and then see their findings from this standpoint. In summary, we would encourage extension workers to be patient, to be available and to be persistent. The researcher who interacts with you is decreasing his chances of being nominated as an "outstanding researcher".

Implications for the Theory

According to Mead, interaction is the basic social process. The key to the development, maintenance and modification of shared expectations is role-taking. Interaction is prerequisite to role-taking. The resulting shared expectations form the social mattrix which allows for the continuance of interactive (social) behavior.

In recent years, interactionists have focused increasingly on dimensions of self and others (reference relationships). Perhaps the focus of attention has been unnecessarily restricted in the struggle for operationalization and measurement. Perhaps too, modest success in measurement prompts a researcher to expanded efforts to demonstrate the worth of (what is by then) his concept and instrument.

In any event, the broader perspective was gradually

discarded and the more central concept of interaction (which is less obviously amenable to measurement) was neglected. In this study an attempt was made to use self, other and interactional variables together in the face of measurement and methodological difficulties. While the main efforts at measurement were devoted to self conceptions, the crude measures of interaction still allowed this concept to emerge as the single best predictor of publication activity and evaluation.

In the discussion of role-taking, interaction and communication (p. 19-20), it was stated that a writer must assume the standpoint of the reader toward the symbols in order to communicate with the reader. It is implicit in the statement that an individual must have interacted with members of the audience in order to take their role when writing for them. In this study, it was found that researchers write for those they interact with frequently concerning the topic, and almost invariably fail to write for audiences that they do not interact with concerning their research.

This is interpreted as strong though indirect confirmation of the theory. More specifically it is a reminder of the relevance of interaction and role-taking to studies of mediated communication.

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Appendix A

(Interview Schedule)

SCIENTIST COMMUNICATION STUDY

Project Number (1-3)

Phase Number (4)

Department and Subject Number_____ (5-8)

Locale: Building_____ Room_____

Time: Hour_____ Date_____ (9-11)

* * *

First of all, a few vital statistics....

Q 12. How old are you?

1 - under 30	6 - 50-54
2 - 30-34	7 - 55-59
3 - 35-39	8 - 60-64
4 - 40-44	9 - 65 and over
5 - 45-49	0 - _____

Q 13. What is your academic rank?

1. Assistant Professor
2. Associate Professor
3. Professor
4. _____

Q 14. What is your subject matter specialty?...that is...when you introduce yourself to persons in your discipline, how do you define yourself?

_____

_____

Q 15. When did you obtain your doctorate?_____

Q 16. Where did you obtain your doctorate?

1. M.S.U.
2. Other Land-Grant_____
3. Other_____
4. _____

Q 17. Did you have professional employment before coming to this station?

1. Yes 2. No

If YES, ask: Q 18 If NO, skip to: Q 27.

Q 18. What kind of work did you have before coming to this station?

1. Research
2. Teaching
3. Research-Teaching
4. (Other)_____

Q 19. With what type of agency were you employed?

1. Other Experiment Station_____
2. Industry_____
3. U.S.D.A._____
4. College of Agriculture_____
5. (Other)_____

Q 20. How long did you work there?_____

1. less than 2 years
2. more than 2 years, less than 5 years
3. more than 5 years, less than 10 years
4. more than 10 years

Q 21. Did you have other professional employment prior to the position just discussed?

1. Yes 2. No

If YES, ask Q 23. If NO, skip to Q 37.

Q 22. What kind of work was it?

1. Research
2. Teaching
3. Research-Teaching
4. Other_____

Q 23. With what type of agency were you employed?

1. Other Experiment Station
2. Industry_____
3. U.S.D.A._____
4. College of Agriculture_____
5. Other_____

Q 24. How long did you work there?_____

1. less than 2 years
2. more than 2 years, less than 5 years
3. more than 5 years, less than 10 years
4. more than 10 years

Q 25. Did you have other professional employment prior to the position just discussed?

1. Yes 2. No

If YES, ask Q 26. If NO, skip to Q 27.

Q 26. How many other professional jobs have you held?_____

* * *

Now I'm going to read some statements that Agricultural Experiment Station Researchers have made about themselves and their research.

PROVIDE CARD A

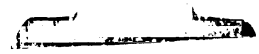
Agree - Disagree
1 - just a little
2 - quite a bit
3 - a great deal

For each statement I'd like you to indicate how you feel about it, that is, how true it is in your own particular case. When I read each statement, first, tell me whether...in general... you agree or disagree with it...and then tell me a number...one, two, or three...to indicate how much you agree or disagree.

Q 27. _____ _____I try to do research which will make an <u>original</u> contribution to the storehouse of knowledge.

Q 28. _____ _____The research I do may <u>directly</u> affect a large number of people in a way important to their welfare.

Q 29. _____ _____It would bother me to have other <u>scientists</u> in my field (specialty) regard my research as insignificant or inconsequential.



Q 30. _____ _____My research deals with fundamental scientific questions.

Q 31. _____ _____I try to do research which will provide practical solutions to "real" problems that people have.

Q 32. _____ _____The research I do is regarded as important by other scientists in my field (specialty).

Q 33. _____ _____It would bother me to have nonscientists regard my research as impractical or ivory towerish.

Q 34. _____ _____My research deals with immediate problems of Michigan producers-processors-consumers.

* * *

The next questions concern those persons who are important to you as a researcher. I would like you to tell me who some of these persons are....and then a little bit about them.

* * *

Q 35. Whose opinion of you as a researcher is important to you? (request 5 names)

1._____ _____

2._____ _____

3._____ _____

4._____ _____

5._____ _____

Now consider that the amount of importance of these persons to you as a researcher is equivalent to 15 points. Distribute or assign the 15 points among these persons according to their relative importance.

* * *

(The names provided are now written at the top of "Significant Other" sheets, and the remaining information solicited for each.)

* * *

Q 36. Now, considering all the researchers you know in your discipline...

PROVIDE CARD B

How do you rate yourself on competence as a researcher? What number? Where 1 means among the few least competent and 9 means among the few most competent?

_____

* * *

Now a few questions about the writing you do as a researcher.

* * *

Q 37. First, considering all the things you do as a researcher, how do you feel about writing research reports?

Dislike most of all	_____
Dislike somewhat	_____
Not different from other activities	_____
Like somewhat	_____
Like most of all	_____

Q 38. Again, considering all the things you do as a researcher, how difficult do you find the writing of reports?

Most difficult activity of all	_____
Somewhat difficult	_____
Not different from other activities	_____
Somewhat easy	_____
Easiest activity of all	_____

* * *

Now let's consider for a moment the set of persons you deal with most frequently in your work as a researcher.

* * *

Q 39. Who are some of the people you talk to frequently about your research?
(elicit five names)

1._____

2._____

3._____

4._____

5._____

* * *

(The names provided are now written at the top of "Immediate Other" sheets, and the remaining information solicited for each.)

Q 40. How frequently do you give talks or lectures to groups of non-scientists (non-students)?

No._____per year

Q 41. Which professional journals do you subscribe to?

1._____

2._____

3._____

4._____

5._____

If more than 5, give total number_____.

Q 42. Which non-professional periodicals (farm magazines, trade magazines, popular magazines) do you read regularly (read more than two-thirds of the issues).

1._____

2._____

3._____

4._____

5._____

If more than 5, give total number_____.

Q 43. **In all groups of people, some gain a reputation for superior performance. Here is a partial list of the researchers at this Experiment Station; who are some, that in your opinion, most deserve the reputation of outstanding researcher? (list_____)**

1. _____

2. _____

3. _____

4. _____

5. _____

I. O. S.

Subject Number:_____

Other Named:_____ (as Sig. too: Y____ N____)

What does he do? (elicit primary work role)

Research	_____	Administration	_____
Teaching	_____	Other	_____
Extension	_____		_____

If a scientist, is he of your ----

discipline Y____ N____ Specialization Y____ N____

Where does he work?

This Dept.	_____	U.S.D.A.	_____
This Campus	_____	Other Campus	_____
Other	_____		

What is the basis of your relationship with this person? How come you talk to him more than to others?

Graduate Student	_____	Technician	_____
Conduct Related Research	_____	Supervisor	_____
Share Facilities	_____	Colleague	_____
Other	_____		

What aspects of your research do you talk about with this person?

General Direction	_____	Findings	_____
Methodology	_____	Application to practice	_____

How frequently do you communicate with this person? (talk to, phone, write)

More than daily	_____	Twice a week	_____
Daily	_____	Weekly	_____
Every other day	_____	Less than weekly	_____

Appendix B

(Self Administered Questionnaire)

S.T.I.T.

A. If you had to choose between reporting your research in a popular publication where laymen would see it and perhaps use your findings, or reporting it in a scientific journal, which would you prefer?

Definitely popular publication	_____
Somewhat popular publication	_____
I can't make up my mind	_____
Somewhat scientific journal	_____
Definitely scientific journal	_____

B. How many brothers and sisters did you have who were:

a) older than you_____? b) younger than you_____?

C. How important to you in a job is the chance to serve people -- to help solve their problems?

Of utmost importance	_____
Very important	_____
Somewhat important	_____
Not very important	_____
Unimportant	_____

D. Where did you live until you finished high school?

Farm_____
Town (less than 1,000 people)_____
Town (more than 1,000, less than 50,000)_____
City (more than 50,000)_____

E. If it ever came to a choice between working on the practical problems of agriculture (problems important to the farmer and processor), or contributing to the development of a body of scientific knowledge, which would you prefer to do?

Definitely practical problems	_____
Somewhat practical problems	_____
I can't make up my mind	_____
Somewhat scientific knowledge	_____
Definitely scientific knowledge	_____

I.-R.

Subj. No._____

Here are some characteristics that have been attributed to good researchers. Read over the list. Then, select that characteristic which, in your opinion, is most important for an ideal researcher to have. Enter the corresponding number in the uppermost box. Then indicate the next two most important characteristics by entering the appropriate numbers in the second row of boxes. Then reverse your perspective, and select the least important characteristic for an ideal researcher and enter the number in the lowest box. Fill in the two remaining rows by selecting the next two least important characteristics from the remaining five and entering these numbers in the second bottom row of boxes, and then enter the remaining three numbers in the middle row. It may help to strike out each statement after it has been used.

The Ideal Researcher:

1. - keeps up to date in the literature.

2. - is dedicated to the search for knowledge.

3. - sees the other fellows point of view, is easy to work with.

4. - willingly accepts long hours and hard work.

5. - has an ability to choose the important questions.

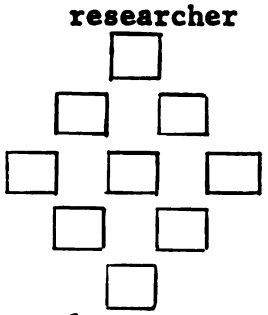
6. - is fair in exchanging ideas and criticism with others.

7. - is analytical in that he is able to sort out relevant relationships.

8. - uses sound methodology, is accurate and precise in data collection and analysis.

9. - writes up findings with clarity, and with sufficient but not too much detail.

most important to an ideal researcher



least important to an ideal research

S.-R. Subj. No._____

Now using the same characteristics and the same procedure, indicate how these characteristics apply to <u>You</u> as a researcher. As before, select first those which apply most, then those which apply least and finally fill in the middle row.

1. - I keep up to date in the literature in my field.

2. - I am dedicated to the search for knowledge.

3. - I see the other fellow's points of view and am easy to work with.

4. - I am hard working and willing to accept long hours.

5. - I have the ability to choose important questions.

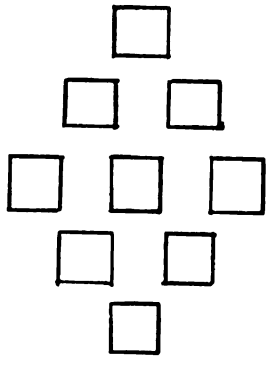
6. - I am fair in exchanging ideas and criticism with others.

7. - I am analytical in that I am able to sort out relevant relationships.

8. - I use sound methodology, am precise and accurate in data collection and analysis.

9. - I write up my findings with clarity and with sufficient but not too much detail.

applies most to me



applies least to me

Publications

Sept. 1/61 - Sept. 1/64

Subject Number:_____

* * * * *

Title_____

_____

Citation: (usual additional information provided for reference purposes)

_____

_____

_____

Authorship: (check one): Sole Author_____ Coauthors_____

Form: Circle the one most appropriate:

A. Book
B. Chap. in Book
C. Journal Article
D. Exper. Sta. Bulletin
E. Extension Bulletin
F. Extension Pamphlet
G. Extension Folder
H. Conference Proceedings
I. Popular Magazine
J. Commercial Publication
K. Department Mimeo
L. Other Mimeo
M. Press Release

N. (other - please specify)_____

Main Audience: Circle the one most appropriate:

A. Researchers - own speciality
B. Researchers - own discipline
C. Researchers - other disciplines
D. Teachers
E. Extension Specialists
F. Extension Agents
G. Other non-research scientists
H. Graduate Students
I. Undergraduate Students
J. Administrators
K. Farmers or other non-scientists

L. (other - please specify)_____

Appendix C

Letter of Legitmation

February 15, 1965

Memorandum

TO: Department Chairmen, Agricultural Experiment Station

FROM: L. M. Turk, Director

SUBJECT: Study on Communication of Research Finds

Jack Murray, a Graduate Student in the Department of Communication under the direction of Dr. Carl Couch of the Institute for Extension Personnel Development and Dr. H. Kumata of the Department of Communication, has planned a study to be carried out among Experiment Station Personnel dealing with communication of research findings and social-psychological factors.

It is hoped your staff members will cooperate in this study. Only those staff persons who have the PhD and are 50% or more on Experiment Station time will be contacted. The Administration will not know who does or does not respond. All data will be exclusively confidential to the researchers.

The reports derived from this study will not concern answers given by particular individuals but will deal only with group characteristics.

Appointments for the interviews will be arranged in advance, to suit the schedules of the individuals involved.

LMT

/la

Appendix D

Correlation* mattrix for self-esteem index

Item**	2	3	4	5	6	7	8	9	Total
1	.86	.83	.86	.80	.85	.79	.79	.78	.85
2		.84	.85	.78	.86	.82	.82	.80	.86
3			.78	.78	.84	.77	.77	.76	.82
4				.79	.86	.81	.82	.81	.86
5					.81	.87	.89	.89	.94
6						.81	.82	.82	.86
7							.93	.90	.96
8								.92	.96
9									.95

*These are pearson-product moment correlations.

**The item numbers correspond to those shown in appendix B.

Appendix E

Relationships among the general characteristics[a]

	Age	Time from Ph.D.	Tenure	Alma Mater	No. of other positions	% Salary Research	% Salary Extension	Subject Matter
Rank	20.61*	45.07*	14.89*	8.68*	5.93	1.28	0.01	0.84
	2	2	2	1	2	2	1	2
Age		71.96*	54.76*	0.87	5.78	2.19	0.97	4.94
		4	4	2	4	4	2	4
Time from Ph.D.			38.10*	9.31*	11.54*	0.19	0.64	3.56
			4	2	4	4	2	4
Tenure				1.90	7.13	7.97	0.83	0.44
				2	4	4	2	4
Alma Mater					6.42*	0.82	0.24	0.46
					2	2	1	1
Number of other positions						2.51	0.96	4.77
						4	2	4
% salary research							3.28	17.01*
							2	4
% salary extension								0.30
								2

(a) In each cell, the upper figure is the chi-square value, the lower is the degrees of freedom.
* Chi-square value significant at .05 level, two alternative test.

Appendix F

Relationships among the theoretic variables[a]

	Basic-Applied	Significant Others	Immediate Others	Overlap	Publication Rate	Audience Emphasis	Peer Evaluation	Salary Increment	Talks to Lay Audiences
Self-Esteem	3.27 6	1.04 4	4.98 4	3.90 4	3.09 4	0.04 2	0.49 4	4.99 4	0.46 4
Basic-Applied		2.73 2	2.87 2	0.85 2	4.82 2	4.12* 1	3.94 2	1.16 2	6.41* 2
Significant Others			4.15 4	13.84* 4	4.79 4	5.03 2	10.37* 4	9.47 4	2.87 4
Immediate Others				10.84* 4	7.70* 2(md'n) cut	8.41* 2	13.00* 4	8.41* 2	18.94* 4
Overlap					2.53 4	2.59 2	3.17 4	6.24 4	8.43 4
Publication Rate						5.39 2	4.56 4	2.97 4	15.80* 4
Audience Emphasis							4.59 2	0.09 2	18.02* 2
Peer Evaluation								2.78 4	9.04 4
Salary Increment									2.33 4

(a) In each cell, the upper figure is the chi-square value, the lower is the degrees of freedom.
* Chi-square value significant at .05 level, two alternative test.

Appendix G

Relationships between general characteristics and theoretic variables[(a)]

	Rank	Age	Time from Ph.D.	Tenure	Alma Mater	No. of other Positions	% Salary Research	% Salary Extension	Subject Matter
Self-Esteem	3.87 2	7.79 4	7.64 4	4.40 4	1.78 2	6.08 4	3.22 4	2.20 2	1.11 4
Basic-Applied	0.01 1	0.13 2	0.58 2	2.33 2	0.06 1	1.04 2	2.64 2	0.56 1	3.83 2
Significant Others	3.49 2	10.27* 4	5.09 4	4.77 4	1.81 2	2.48 4	2.60 4	1.30 2	10.05* 4
Immediate Others	1.93 2	1.89 4	2.86 4	5.58 4	1.73 2	1.22 4	2.43 4	0.55 2	9.86* 4
Overlap	4.76 2	1.03 4	2.88 4	0.65 4	11.99* 2	12.00* 4	6.58 4	1.83 2	5.82 4
Publication Rate	3.95 2	3.11 4	3.01 4	2.07 4	1.83 2	7.28 4	9.02 4	1.30 2	8.43 4
Audience Emphasis	0.35 1	0.43 2	0.93 2	0.24 2	0.95 1	2.64 2	7.25* 2	3.00 1	26.04* 2
Peer Evaluation	22.11* 2	5.62 4	8.11 4	2.72 4	4.80 2	2.68 4	4.40 4	0.36 2	4.28 4
Salary Increment	4.44 2	19.44* 4	18.38* 4	14.47* 4	0.79 2	3.72 4	6.70 4	2.26 2	5.00 4
Talks to lay audiences	3.14 2	5.38 4	1.76 4	4.46 4	0.18 2	7.20 4	10.11* 4	7.44* 1	31.50* 4

(a) In each cell, the upper figure is the chi-square value, the lower is the degrees of freedom.
* Chi-square value significant at .05 level, two alternative test.