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Attraction, Autonomy, and Reciprocity in the Scientist - Supervisor Relationship[1]

Barney G. Glaser, Ph.D., Hon. Ph.D.

Abstract

This paper explores the basis of work integration between the scientist and his supervisor in an organization devoted to basic research.[2] The analysis uses a three-dimensional model of role integration: 1) mutual attractiveness, why they get together; 2) reciprocity; and 3) autonomy, how they stabilize working together. The recognized competence in research of both parties is shown to be a source of mutual attraction, reciprocity in work and maintenance of autonomy.

Introduction

Shepard (1956) has noted that the "objective evidence" on the scientist-supervisor relationship is "meager." He suggests three sources of resistance by research laboratories to its study: (1) "The traditions of science organization prescribe formal, impersonal relations but give little direct guidance for close collaborative relations." (2) "A relatively low value is placed on collaboration in much scientific education: the student is taught to do independent work." (3) "Personal and group relations are regarded as peripheral considerations in research, so that it is something of an imposition, if not an indignity, to have to be concerned with them." In sum, "there is no room for the concept of supervision in the traditions of science organization. So little importance is attributed to personal and social matters as factors in scientific work that they are relegated to the category of ethics" (Shepard, 1956). To be sure, this notion was made in 1956; however, while there has been some subsequent research there is still meager objective detailed evidence on this strategic relationship, as a brief study of the comprehensive footnotes of two recent books on scientists will establish. (Kornhauser, 1962; Marcson, 1960).

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[1] Originally published in *Administrative Science Quarterly*, vol.8, no.3, 1963, pp.379-398.

[2] I am indebted to Alvin W. Gouldner for help in the preparation of this paper.

In contrast, the supervisor's relationship to his subordinates has been the object of much study in other types of organizations. In a recent consolidation of findings on the role of the supervisor in formal organizations, supervision of scientists is not mentioned, indicating again the meager evidence to date (Blau & Scott, 1962). One reason this relationship has been of much interest for research in other organizations is that the supervisor is potentially a "controllable variable." He can be taught appropriate styles of supervision. This may be another latent reason for resistance to its close study in research, since it conflicts with the value of autonomy in the institution of science. Beyond adding to the evidence on the scientist-supervisor relationship, my intent in this paper is to present a generalized model of the work integration between the scientist and his supervisor. It is my hope that this model will help guide further research and thought on the scientist-supervisor relationship as well as help consolidate what diverse evidence already exists.

Just as supervisors of scientists, because of their powers of evaluation, facilities procurement, protection, support, and sponsorship, are very important to their subordinates' research and careers, scientists, in their research as well as their successes, are important to their supervisors' research and careers.[3] At the core of this interdependence is the work that scientists and supervisors do, both for themselves and for one another. In attempting to formulate a basis of work integration between the scientist and his supervisor, this analysis employs a three-dimensional model: (1) mutual attractiveness, (2) reciprocity in work, and (3) maintenance of autonomy. According to this model, mutual attractiveness accounts for the initial establishment of a work relationship; reciprocity and autonomy explain how that relationship is stabilized to persist for a

[3] Most discussions on their scientist-supervisor relationship focus on the problems and plight of the scientist, not the supervisor. For the few discussions of the research supervisor's dependence on subordinates, see on the tender motivation of subordinates as a control over supervisors, Glenn D. Mellinger, *Interpersonal Factors in Research: Part II* (Ann Arbor, Mich., 1957), pp. 48-49.
On hedging, a mechanism by which the supervisor handles this dependence on subordinate's success, see Marcson, *op. cit.,* pp. 113-115. Hedging allows the subordinates to work on a pet idea part time. If the idea works out the supervisor receives credit for encouraging it; if it does not, the supervisor is not discredited since he has not risked much on it. On conditions preventing supervisors from engaging in "correct leadership styles," see Barney G. Glaser, *Organizational Scientists: Their Professional Careers* (Indianapolis, Ind.: Bobbs-Merrill, 1964), ch. 9.

sufficient time. I shall attempt to show that socially recognized competence in research, particularly for the subordinate, is a source of attractiveness, adequate reciprocity, and the maintenance of autonomy.

The data for the analysis consist of answers to survey questionnaires in 1952 by the total resident research staff (332) of a large government medical research organization devoted almost exclusively to basic research.[4] Secondary analysis of data collected some years ago for other purposes is uniquely well suited for exploratory work of a theoretical intent. The resulting general properties can be applied to many current locations, while the specific descriptions of a particular place which yielded the properties, may since have changed. Thus, whether or not the specific descriptions to follow will have current relevance for the present members of the organization under consideration is questionable. However, the general formulation to be developed will undoubtedly have much current relevance to the members of many research organizations throughout the community of science.

To develop, not test, a model, it is sufficient to *explore* plausible relations between variables, and *not* necessary to build a strong case of hard fact. Accordingly, I shall use somewhat crude indices and consider many consistent and highly suggestive differences that lead to an integrated picture of the work relationship of the scientist and his supervisor. Since I am only suggesting, not testing, my language will be spared the qualification rhetoric required in more rigorous demonstrations, and my inferences will be designed to present a generalized formulation of a dynamic process rather than to describe a real situation in static detail. In my opinion, this generalized formulation has a high probability of applicability to current places of basic research.

In this analysis I deal primarily with paired responses for each of the 332 scientist-supervisor relationships: a scientist's response about himself or his supervisor is combined with a supervisor's response about himself or his subordinate scientist. Findings yielded by this type of "relational" data[5] are particularly

[4] I am indebted to Donald C. Pelz of the Survey Research Center, University of Michigan, for providing these data.

[5] "Relational properties of members are computed from information about the substantive relationships between the member described and the other members," Paul

compelling, since combining the responses of both supervisor and subordinate serves as a check on the accuracy of each party's view. It also rounds out the full meaning of the relationship, in contrast to studies whose total source of information on a social relationship is the perspective of only one participant (Blau & Scott, 1962, pp.145-148). Thus, these relational data allow one to operationalize better a core unit of sociological theory - the social relationship.

Two variable tables are not included simply because there are too many of them; however, I do present (after the statement to which they refer) differences in the text indicating both the direction and the magnitude of the relation between two variables. And insofar as direction and magnitude are sufficient for replication by other social scientists, knowledge of the proportions upon which differences are based is not essential. The base numbers for each relationship never vary: high recognition (144) and low recognition (188). All statements about scientists with recognition are comparative; that is, they are based on a comparison with scientists who have low recognition. Thus I take the grammatical liberty of saying "scientists with recognition" for "scientists who have achieved high recognition." I also use "scientist" interchangeably with "subordinate."

Mutual Attraction

Two essential aspects of role integration are (1) the attractiveness of each party for the other, and (2) whether or not attractiveness becomes a basis for association (Blau, 1960, p.546). Socially recognized competence in research is a basis for mutual attraction between scientist and supervisor under the following structural conditions. In the institution of science, recognition for research validates that one can live up to the exacting requirements of being a scientist by indicating past achievement, present competence, and potential future contributions (Merton, 1957, p. 640). The organizational career is contingent on achieving professional recognition (Kidd, 1952, p. 16). Thus this section demonstrates that the possession of this institutionally and organizationally valued quality accounts for the mutual attraction of both scientists and their supervisors for their current work.

F. Lazarsfeld and Herbert Mensel, "On the relations between Individual and Collective Properties," in Amitai Etzioni, ed., *Complex Organizations* (New York, 1961), p. 431; see also James Coleman, "Relational Analysis," in Etzioni, *op. cit.,* pp. 449-451.

Measure of Recognition

For the typical scientist, two major forms of professional recognition are supervisor evaluations and publications. Although the questionnaire did not include information on actual supervisor evaluation or on actual publications, it did include two items that measure *felt* recognition from supervisors and in publications.

They are:

How do you feel about the way your chief make *evaluations* about the *quality of work you are doing?* - (1) accurate, (2) partly accurate, (3) no attempt, and (4) no answer.

In scientific or other professional papers about work to which you have made some contribution, is *proper credit given to your own contribution* by means of authorship or acknowledgement? – (1) always, (2) usually, (3) seldom, and (4) no opinion.

Over half the investigators feel they receive adequate recognition from the supervisor (53 per cent say "accurate") and in publications, whether by authorship or acknowledgement, (72 per cent say "always"). To form an index of felt professional recognition, I have dichotomized each item between the highest category and all others. This dichotomization occurs as close to the median as possible and at a statistical breaking point. In many cross-classifications of each item with other variables, the direction of association consistently changed between the highest category and the remaining categories. When the two variables are combined into an index of felt recognition, 44 per cent of the investigators are high on both items, 37 per cent of the investigators are high on one item and 19 per cent are low on both items.

For further analysis I dichotomize the index into high and low, distinguishing those who are high on both items from all others. There are three justifications for this: (1) in many cross-classifications checks the middle group proved to be more like those low on both items than those high on both items. Therefore, the index is reducible on statistical evidence;[6] (2) only

[6] On reduction see Allen Barton, "The Concept of Property Space in Social Research," Paul F. Lazarfeld and Morris Rosenberg, eds., *Language of Social Research* (Glencoe, Ill., 1955).

a dichotomized variable is necessary to establish general relations between variables; (3) the dichotomization is at the median, saving cases for necessary cross tabulation.

I have shown in other publications that this index of felt recognition approximates actual recognition to a degree sufficient for an exploratory analysis (Glaser, 1963a, 1963b). This is also substantiated by many relations between variables in this report. For example, a supervisor who chooses a scientist on the basis of recognition must be responding to the actual recognition that generated the scientist's felt recognition. Publication credits and current research are both visible and a standard basis in science for judgments of competence. On the other hand, one's feelings about his recognition, even if expressed to his supervisor, are surely not a basis for this kind of judgment.

The Supervisor's Viewpoint

Supervisors were asked to list in order of importance up to fifteen people within the organization with whom some contact is of greatest significance to them in their work. Within the first seven choices more of those subordinates with recognition are chosen by their supervisors (21 per cent);[7] this difference persists to the fifteenth choice.

Insofar as "some contact" means association, this finding also indicates that the supervisor follows through in associating with the subordinate who has the attractive quality of recognition. That this association takes place is substantiated by other data. According to supervisors, who were asked to report on how frequently they contact each subordinate and under what conditions most of these contacts occur, more of those scientists with recognition have daily contact with their supervisors (22 per cent) and have this contact in person (18 per cent). Moreover, more of the scientists with recognition have supervisors who say they are satisfied with the amount of contact they have with them (22 per cent) and who enjoy this contact very much (13 per cent).

[7] As a reminder to the reader of the meaning of this form of evidence notation (21 per cent) this difference indicates that more of the scientists with high recognition, as compared to the scientists with low recognition, are chosen by supervisors. Further, the relationship between choice and recognition is positive in direction and of a 21 per cent magnitude.

The Scientist's Viewpoint

For the competent scientist this work relationship with the supervisor is mutual. More scientists with high recognition choose supervisors, who have chosen them, as significant to them in their own work (21 per cent). Furthermore, the scientists with high recognition tend to choose those supervisors whom they judge to be professionally well qualified to make sound suggestions, comments, and judgments about their research. That this attractive quality of their supervisor is a criterion for their choice is indicated by the virtual disappearance of the relations between scientists' recognition and choice (12 per cent) when appraisals of qualification are removed (2 per cent and 0 per cent); the "choice" relation thus depends upon this intervening factor (Table 1).[8]

Table 1: The competent scientist chooses the competent supervisor

	Scientist's Recognition		
	High %	Low %	Difference %
The scientist chooses his supervisor as one of five significant people for his work	90 (144)	78 (188)	+12
Scientists who choose supervisor among first five people and judge supervisor as:			
Fully qualified	93(130)	91 (96)	+2
Less qualified	64(14)	64 (92)	—

Given this finding, we can readily understand that more of the scientists with recognition find contacts with their supervisor very enjoyable (32 per cent) and that more are satisfied with the number of these contacts (25 per cent).

[8] To be sure, this finding also suggests that the competent supervisor helped the scientist achieve his recognition in the first place as well as being chosen for his competence, if we consider the judgment of qualifications an antecedent, not intervening, factor. However, the essential idea still remains that the supervisor was chosen for his competence by a competent subordinate who proved his merit by achieving recognition. For the original formulation of elaboration analysis of which this is the MI type, see Paul F. Lazarsfeld, "The Interpretation of Statistical Relations as a Research Operation," in Lazarsfeld and Rosenberg (1955, pp. 115-124).

In short, the mutual attraction and association that results in an integrated work relationship between supervisor and subordinate is based on each party's research competence. Moreover, both parties find this relationship enjoyable and engage in it, often daily, on a person-to-person basis. In general, research organizations tend to select supervisors on the basis of scientific competence only when institutional and organizational goals coincide (Kornhauser, 1962, pp.56-58). As we noted above, the organization in this study meets this condition, thus accounting for the existence of many competent supervisors with whom competent subordinates can establish integrated work relationships.

Reciprocity in Work

Once the work relationship of scientist and supervisor is established, the question arises as to how it is stabilized. One source of stability is reciprocity in work or mutual helpfulness;[9] another is the maintenance of individual autonomy in the context of mutual dependence. I will discuss reciprocity in this section and autonomy in the next.

Research competence attracts scientists and supervisors to one another because of the potential to engage in a work relationship of mutual benefit. This focus on competence means that the chances are maximized that each will help the other and that neither will nor can exploit the other, and that the end result of their individual and/or joint work will be interdependence of successes. If one party goes without the help of the other or tries to exploit the other, then reciprocity in work does not obtain, and the mutual attraction based on research competence will lead to an unstable work relationship. (I say unstable because one party, especially since he is competent, would have no reason to prolong the integrated work relationship if he is exploited or derives no help from it.) It is the purpose of this section to show that

[9] Shepard has shown that a university research group's "stability depends upon another condition…the possibility of reciprocation." In his case it was the exchange of technical information between engineers and their technicians. Herbert A. Shepard, The Value System of a University Research Group, American Sociological Review, 19 (1954), 456-462. See, on the "ethic of mutual aid" between scientists, F. William Howton, Work Assignment and Interpersonal Relations in a Research Organization, Administrative Science Quarterly, 7 (1963), 508-510. Howton discusses the general professional right of one scientist to ask another for information and counsel. In our case reciprocity in work emerges also from the interaction between scientist and his supervisor on the job. Whether it is also based on a general ethic is a moot point.

reciprocity does exist between scientists with recognition and their supervisors.

The Supervisor's Viewpoint

Supervisors indicate in several ways that integration with scientists with recognition is useful in their own work. They report that the activities of more of those subordinates with recognition are usually very helpful to them (18 per cent), and more of the subordinates' activities or decisions have a direct or indirect effect on their work (18 per cent). Consistent with these data is the slight tendency of supervisors to view these competent scientists as familiar with the everyday aspects and problems of their job (11 per cent). This familiarity, probably gained in daily, personal contact, would increase the subordinates' ability to be helpful. Supervisors also view these subordinates with confidence, that is, as people whose sincerity, motives, and intentions are to be trusted.

The Scientist's Viewpoint

In comparing the reports of scientist and supervisor on whether or not the other is helpful, more scientists with recognition are involved in a mutually helpful work relationship with their supervisor (26 per cent: See Table 2). Other data reported by subordinates further indicate the helpfulness of their supervisor. More scientists with recognition say that their supervisor's activities and decisions have a direct or indirect effect on their work (18 percent): more find their supervisor very stimulating for their work (45 per cent); more think their supervisor is thoroughly familiar with the everyday aspects of their job (40 per cent). These data reinforce the above finding that competent scientists try to choose professionally well-qualified supervisors to be involved in their research. More scientists with recognition also report that they have confidence in the sincerity, intentions, and motives of their supervisor (35 per cent), and that they can rely on their supervisor to back them up effectively in getting approval from higher-ups for expenditures and projects (28 per cent). This latter finding also indicates that the supervisor actively becomes the subordinate's organizational work sponsor rather than merely fulfilling the formal requirement of making references.

Table 2: The mutual helpfulness in work relationships

Helpfulness*	Scientist's Recognition		
	High %	Low %	Difference %
Mutual	65	39	+26
Scientist only helps	2	9	-7
Supervisor only helps	30	33	-3
None	3	19	-16
	(144)	(188)	

* Scientist and supervisor report on each other

Only 20 out of the 332 scientists are possibly exploited by their supervisors ('scientist only helps': Table 2); and this potential is not related to recognition. The chances are small that unfair gain from a subordinate's talents exists, and, if it does exist, it is not based on the socially recognized competence of scientists. Insofar as competence is a visible and attractive quality, and since the competent scientist is likely to be in demand by other supervisors, it is a likely source of control over exploitation. The scientist with recognition, should his present relationship not be going well, could readily establish another of greater reciprocity.

Thus, mutual attraction based on competence results in a stable research work relationship between scientist and his supervisor because of mutual helpfulness and the absence of exploitation. This reciprocity in work results in and is supported by each party's familiarity with the other's work and by mutual trust.

Autonomy

Stability in this integrated work relationship depends also on the autonomy that both the supervisor and the subordinate are able to maintain while allowing themselves and their work to become interdependent. The importance of autonomy for insulating the research scientist from the undue influence of others (both within and outside science), thereby insuring the highest levels of motivation, performance, and creativity, is attested to by the emphasis it receives in the literature on the

institution of science and by the extensive research on this problem.[10] It is thus important to investigate the conditions under which a competent scientist can participate in an integrated work relationship with his supervisor (and vice versa) without a crippling sacrifice of autonomy.

Supervisor's Viewpoint

It seems likely that, concomitant with the subordinate's access to and impact on his supervisor's work, some controls limiting the supervisor's vulnerability should exist. According to the supervisors, such controls over subordinates do exist. They report that more of their subordinates with recognition can be influenced by them with respect to work-related activities (18 per cent); and these are precisely those scientists who, because of their integrated work relationship, most affect their supervisors. This specific influence, while deriving, in part, from the many general controls supervisors have over their subordinates' fate in career and work, may also derive from the charisma of the supervisor.[11] This controlled helpfulness of the integrated

[10] On the value of independence or autonomy in the institution of science see Robert K. Merton, *Social Theory and Social Structure* (Glencoe, Ill., 1957), p. 453: Bernard Barber, *Science and the Social Order* (Glencoe, Ill., 1952), p. 89; Charles V. Kidd, Basic Research-Description versus Definition, *Science*, 13 (1959), 369. With respect t the problem of autonomy applied specifically to the scientist-supervisor relationship, both Shepard , Superiors and Subordinates…, and Marcson, Organization and Authority in Industrial Research, *Social Forces,* 40 (1961), 80 *et passim,* devote themselves to bringing out the differences between the traditional supervisory relationship in organization and that type required for maintaining the scientist's autonomy. For research on the autonomy problem in this relationship, Robert C. Davis, "Factors Related to Scientific Performance," *Interpersonal Factors in Research: Part I* (Ann Arbor, Mich., 1957), pp. 14-26; Donald C. Pelz, Some Social Factors Related to Performance in a Research Organization, *Administrative Science Quarterly,* 1 (1956), 310-317; Kornhauser, *op. cit.,* pp. 62-73; and Marcson, *The Scientist in American Industry.*

[11] The personal charisma of the supervisor of a scientist is an aspect of this relationship that bears research. Since the world of science is studded with charismatic models, it is important to know to what degree the typical supervisor is charismatic. Modifying somewhat Weber's classic definition to apply to lesser leaders, Etzioni defines charisma as "the ability of an actor to exercise diffuse and intense influence over the normative orientations of other actors," Amitai Etzioni, *A Comparative Analysis of Complex Organizations* (New York, 1961), p. 203. Research on this area may be usefully stimulated by Etzioni's chapter 9 and 10. For a discussion of "evokers of excellence" in science, a type of charisma, see Robert K. Merton, "'Recognition' and 'Excellence': Instructive Ambiguities" in *Recognition of Excellence* (New York, 1960), pp. 314-320. For other points on charismatic role models in science, see Bernice T. Eiduson, *Scientists Their Psychological World* (New York, 1962), ch. 5; and Lawrence Kubie, Some Unsolved

subordinate thus explains the supervisors' granting of trust and familiarity with their work.

These various findings on attraction, reciprocity, and autonomy indicate that supervisors see integration with subordinates having recognition as useful for their work, and that they feel good about the ensuing relationship. Insofar as these consequences are anticipated by supervisors, they may also motivate their choice of these competent subordinates for a work relationship.[12] This, then, means that these anticipated consequences are additional reasons why recognition is an attractive quality of scientists.

Scientist's Viewpoint

We already have some answers to the question of how the subordinate maintains his autonomy. Insofar as his recognition will also make him attractive to other, especially higher-ranking, scientists, he has a measure of control over his supervisor; should the present relationship be too constraining, he can readily enter into another. Another potential course of subordinate control is the impact he has on the supervisor's research; in order to maintain his autonomy, the scientist has the possibility of either increasing, withdrawing, or otherwise changing that impact.

However, the scientist's autonomy is specifically vulnerable (more so than that of the supervisor) when the supervisor helps him. How can he accept this help without its curbing his own bent of mind? On the other hand, why should the supervisor continue to help him if he is not accepting the help? To answer these questions, I have endeavored to trace out a few of the factors enabling the competent subordinate to utilize the supervisor's help without either constraining his autonomy or rendering the help ineffectual.

First, scientists with recognition do not tend to render their supervisor's help ineffectual in order to maintain autonomy. More of those subordinates with recognition get effective help (37 per cent: Table 3), which, I suggest, is an important benefit of their integrated work relationship. Since the supervisors' helpfulness is interrelated with their effect on their subordinates'

Problems of the Scientific Career, *American Scientist*, 41 (1953), and 42 (1954); and Glaser, *Organizational Scientists: Their Professional Careers*, ch. 12.

[12] On anticipated consequences and motives, see C. Wright Mills, Situated Actions and Vocabularies of Motive, *American Sociological Review,* 5 (1940), 905-506.

work (Coefficient of Association= .45), this means both that their helpfulness tends to have much effect and that having much effect is very helpful.

Table 3: The effect of the supervisor's help

		Scientist's Recognition		
		----------		Difference
Scientist says supervisor is:		High %	Low %	%
Helpful	Effective			
+	+	66	29	+37
+	-	16	11	+ 5
-	+	13	32	-19
-	-	5	28	-23
		(144)	(188)	

Second, one way that subordinates with recognition tend to maintain their autonomy while allowing their supervisor to affect their work is to influence him with respect to precisely those activities that will affect their own research. This is illustrated by the tendency of the relationship between scientist's recognition and supervisor's effect (18 per cent) to diminish when influence over supervisor is removed (10 per cent and 13 per cent); indicating that the "effect" relationship depends upon this intervening factor (Table 4).[13]

This influence over the supervisor, a product of the scientist's integrated work relationship with him, becomes a mechanism for controlling any undue effect that the supervisor's help may have on the scientist's research.[14] If the integrated work relationship did not yield this control, it would not be as stable, since fewer subordinates with recognition would allow their supervisor to affect their research when they lack a sufficient measure of counter-acting control. And, to carry this to its logical conclusion, if the supervisor has no effect on the subordinate's work, there could be no help and hence no mutual

[13] This in MI type elaboration, see footnote 11.

[14] This type of influence has been shown to be associated with high-quality performance by Davis, *op. cit.,* and Shepard, Superiors and Subordinates…, p. 266. It has also been shown to be a crucial factor in communication accuracy between the scientist and his immediate supervisor, Mellinger, *op. cit.*

helpfulness; this means that mutual attractiveness would have led to naught, and the relationship might dissolve.

Table 4: The scientist's influence over his supervisor's effectiveness

	Scientist's Recognition		
	High %	Low %	Difference %
The scientist says the activities of his supervisor affect his work	79 (144)	61 (188)	+18
Scientists who supervisor's activity affects their work and whose influence over these activities is::			
A great deal or quite a bit	86(66)	76 (38)	+10
Moderate, little or no	70(78)	57 (150)	+13

The existence of this influence over the supervisor is corroborated by other data. More of those scientists with recognition report that the actual relationship they have with their supervisor with regard to work problems or assignments (26 per cent) and to substantial new expenditures for equipment or assistance (26 per cent) is either one of the supervisor's consulting with the subordinate before he makes his own decision or one of joint decision. Consultation and joint decision, products of an integrated work relationship, are thus two ways in which scientists can exert influence over the supervisor's effect on their research.[15] Moreover, more of those subordinates with recognition state that the relationship they have with regard to work problems or assignments (21 per cent) and new expenditures (21 per cent) is the one they prefer, indicating that the actual relationship is, in part, a result of influence over their supervisor.

In summary, the following process may be inferred from the scientist's viewpoint. The subordinate with recognition tends to establish an integrated work relationship with his supervisor, resulting in the supervisor's being very helpful and having a substantial effect on his research. This effect does not threaten

[15] See Marcson, *The Scientist in American Industry*, pp. 78-84, for a full discussion of the importance to the scientist of participation with his supervisor in decisions affecting his research.

the subordinate's autonomy. He can considerably influence, particularly through joint decision and consultation, the very activities of the supervisor that will affect his research, especially those activities regarding work assignments or problems and new expenditures. Joint decision and consultation, as mechanisms of control, also derive from his integrated work relationship.

Subordinates with Low Recognition

By no means does this integrated work relationship take place in a vacuum. It is potentially highly visible to the other subordinates of the same supervisor. No matter how many subordinates a supervisor may have (two to fourteen); he still has an equal or nearly equal number of scientists with high and low recognition. Most scientists with recognition (130 of 144), while tending to enjoy an integrated work relationship with their supervisor do not have an exclusive relationship with him.

Tables 2 and 3 suggest what happens to subordinates with low recognition while the supervisor more fully devotes himself to working with the scientist with high recognition. First, 32 per cent of the scientists, irrespective of recognition, report that their supervisor is very helpful, while, according to their supervisor, they do not give help in return (Table 2). This suggests that such formal elements of supervision as guidance and support of research occur independently of degree or recognition and work integration.

Second, more of the subordinates with low recognition give no help to and receive no help from their supervisors (16 per cent: Table 2). This indicates that the lack of work integration of those subordinates with low recognition with their supervisors can have an element of mutual work rejection within the formal framework of guidance and support. Also indicated by the finding is an independence of the scientist from his supervisor (such as it may be) based on mutual rejection.

Of note in Table 3 is that subordinates with low recognition are affected by their supervisor's activities and decisions while receiving little to no help (19 per cent) or are neither affected nor helped (23 per cent). Whereas the former pattern implies an element of dominance in their supervisor's guidance and support, the latter implies an element of rejection by their supervisor, as well as the possibility of forced independence.

However, subordinates with low recognition - whether

rejected by, dominated by, or independent of their supervisor - are always present and possibly competing with prestigious subordinates for the time and help of the same supervisor. As these subordinates gain sufficient recognition or find other bases to attract their supervisor into a work relationship they will fare better in the competition. In this sense, the integrated work relationship with a supervisor must be continuously maintained by the subordinate with recognition in a context of proximate competitors making legitimate demands on the same supervisor and potentially becoming just as attractive to him for a mutually advantageous work relationship. On their side, all but the most attractive supervisors of scientists are continually competing for the most competent available junior colleagues.

Discussion

In this exploratory research I have developed a three-dimensional model of stable work integration between the scientist and his supervisor, both of whom are engaged in basic research. This model accounts for why they get together - (1) mutual attractiveness - and why they stay together - (2) reciprocity in work, and (3) maintenance of autonomy.[16] In this case, the principal source of all three dimensions is acknowledged competence in research: it makes a scientist or supervisor attractive, forecasts his ability to be helpful to the other, and gives him a lever of control over his own research and career.

This model of the integrated work relationship is a generalized formulation. For the parties involved it is a relationship in process. Both supervisors and subordinates will be continually engaged in its inception, establishment,

[16] This paper was begun in January, 1958. Hence, this research was conducted independently, but simultaneously with Alvin W. Gouldner's important theoretical work on functional autonomy, functional reciprocity, and exploitation, in which he called for empirical research on these ideas. It is important to compare the system model of interdependence I have developed through research with that developed by Gouldner through theoretical inquiry. To account for its persistence he uses two dimensions of an interdependent system: "functional autonomy," enabling a party "to resist total inclusion into the system" and "functional reciprocity," "a system of interdependent parts engaged in mutual interchanges." To these dimensions I add another for the study of interdependence: mutual attractiveness, accounting for initiation and establishment of interdependence. See Gouldner, The Norm of Reciprocity: A Preliminary Statement, *American Sociological Review*, 25 (1960), 161-178; and "Reciprocity and Autonomy in Functional Theory" in Llewellyn Gross, ed., *Symposium on Sociological Theory* (New York, 1959), pp. 241-270.

maintenance, and termination. The relationship may be linked in time with a specific piece or series of research. Any one party may be involved in more than one integrated work relationship, and each relationship may take place at different stages of development. This probability applies to supervisors who are also subordinates and who have many subordinates, as well as to subordinates who have more than one superior.

The integrated work relationship is most likely a property of supervision in other organizations devoted to basic research. I suggest this because it is compatible with the "colleague authority" system of science that "emphasizes a relationship of association, alliance and working together, and, at the same time, accepts whatever inequality in status may be present";[17] and, too, because organizations whose research goal is the same as that of the institution of science tend to select supervisors on their scientific competence (Kornhauser, 1962, p.58). Supervisors competent in research appear necessary for this relationship.

Since "the dominant pattern in industry is not to select research administrators on the basis of scientific competence," (Kornhauser, 1962, p.58)[18] the applied research and development organization may not support such a relationship between supervisors and subordinates. In industry, management seeks research supervisors who are primarily oriented toward the organization rather than toward the profession, whose competence is primarily administrative, not scientific, and who exercise tight control over work. This type of supervisor engages most comfortably in "executive authority" - direct, arbitrary, and paternalistic - in which he does not need to consider the view of subordinates or to defer to the competencies of people in lower-ranking positions (Marcson, 1961). Since scientists generally resent and resist this type of supervision, the possibility of developing the kind of integrated work relationship described in this paper would, therefore, be blocked. However, it remains for future research to establish to what degree and on what basis

[17] Marcson, Organization and Authority in Industrial Research, p. 75. For the original formulation of colleague authority see Talcott Parsons and A. M. Henderson, eds., *Max Weber: The Theory of Social and Economic Organization* (New York, 1947), pp. 58-60, n. 4, and p. 402.

[18] *Ibid.* On the debate "whether or not the administrator has to be a scientist," see Norman Kaplan, The Role of the Research Administrator, *Administrative Science Quarterly,* 4 (1959), 24-25; and Research Administrator, Administrative Science U.S.S.R. and U.S., *Administrative Science Quarterly,* 6 (1961), 56-59.

integrated work relationship obtains between scientists and supervisors in applied research organizations.

I have analyzed the source, nature, and existence of the integrated work relationship in this paper. It remains for further research to show its consequences for each party and for the research organization. For example, in the beginning of the paper I suggested that a scientist and his supervisor are, in part, dependent on each other's successes with respect to advancing their own careers and research conditions. The integrated work relationship described here will most likely feed back to more interdependence of research and career successes for the subordinate with recognition and his competent supervisor. This will probably enhance their chances for receiving further recognition of achievements; and hence for becoming more "attractive" to each other (although they may part after one or a few mutual successes) and to other scientists and significant laymen.

This cumulative process of individual successes then increases the scientific creativity and output of the research organization, hence its prestige in science. Another important question is whether or not this output is greater than the output of research organizations depending upon an integrated work relationship of a kind that is more compatible with "executive authority."

Other possible consequences of this relationship for the subordinate are to develop further career and research endeavors, and if the supervisor is a "great man," to allow him better to internalize the values and standards of his field from an "ideal" role model. With respect to the supervisor, those successes of his subordinate in which he shares help him remain in the organization in the later stages of a career, with full research support, with continued promotion potential, and, moreover, if he has enough such subordinates, in command of a prestigious tiny empire.

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