PHYSICISTS AND MATHEMATICIANS IN THE POST CENSAL SURVEY OF SCIENTIFIC AND TECHNICAL PERSONNEL*

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The rapid growth of the scientific and technical occupations during the past decade has been well documented. However, the occupational explosion involving engineers, technicians and physical, natural and social scientists, has not been explored in sufficient detail to permit a comprehensive picture to emerge of the duties and job content, training history, patterns of mobility and social characteristics of persons in these scientific and technical occupations. To meet the need for this kind of information, the National Science Foundation has commissioned the series of post-enumeration studies of scientific and technical workers that is the topic of this symposium. A major portion of these studies, entitled "The Post Censal Survey of Technical and Scientific Manpower," was committed to the comparative analysis of some forty-five scientific and technical occupations classified in the 1960 Census of Population among "Professional, Technical and Kindred" workers under the three-digit occupational code.

This paper presents some of the preliminary findings for two of the forty-four titles selected for study: Mathematicians and Physicists. As you know, the 1960 Census classified one-fourth of the population by occupation and a number of other key characteristics. This listing provided the frame for drawing samples of one thousand to five thousand persons per occupation. Some 1,300 Mathematicians and 1,700 Physicists were sampled: the data presented in this paper are based on a take rate of 69 per cent for Mathematicians and 75 per cent for Physicists.

A special deck of punched cards was prepared by the Bureau of Census[1] for our use at NORC. Accordingly, I wish to stress that these findings are tentative and subject to revision at the time machine tabulations are provided by the Bureau of the Census. Furthermore, the data may be heavily skewed in the direction of Physicists employed in non-academic positions since Physicists also could be classified under the title "Professors and Instructors of Physics." When the data are weighted according to the sampling ratios employed in selection of respondents in each of the occupational titles, it will then be possible to merge the two sets of data and provide a more balanced portrait of Physicists. With these reservations in mind, let me begin.

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[1] I wish to thank Mr. Stanley Greene, Population Division, Bureau of the Census, for rendering this form of assistance. I also wish to acknowledge the able support provided by Sanford Abrams in preparing the tabular materials used in this paper.

Today we examine the composition of the two groups in terms of their ages, sex and educational attainment and then compare the two occupations on a number of items related to their 1962 occupation and 1962 employment in terms of these crucial demographic and social variables.

Age, Sex and Education

"Mathematicians" in the 1960 Census differ from "Physicists" as follows:

First, Mathematicians are in a more youthful occupational category with 59 per cent less than 35 years of age as compared with 41 per cent of the Physicists;

Second, while both are essentially male occupations, Mathematicians are in the more heterogeneous group; one out of four is a woman in contrast with one out of twenty Physicists; and

Third, both occupations recruit heavily from the ranks of college graduates. Fully 87 per cent of the Mathematicians have at least a Bachelor's degree as do 89 per cent of the Physicists, but the educational summit of higher education was reached more frequently by the latter: 28 per cent have a doctorate as compared with 11 per cent of the Mathematicians.

The distribution of men and women among the age-education segments of the sample of Mathematicians is presented in Table I.b. Younger Mathematicians with advanced degrees almost invariably are men; indeed, all Ph.D.'s under age 45 in this sample are males--while women almost equal their male counterparts among the older Mathematicians advancing no further by 1962 than the Bachelor's degree (only 50 per cent of the B.A.'s 45 years and older are male). Female Mathematicians hardly ever take advanced degrees. Furthermore, there is a hint of a life cycle effect: women appear in substantial numbers in the ranks of Mathematicians after age 44 when, presumably, child rearing tasks are completed.

Putting these findings together, one would conclude that the greater educational attainments of the Physicists as measured by the percentage holding the doctorate is accounted for by occupational differences in sex composition. Table I.c shows that this is not the case, however. Even when comparisons are made for men only, more Physicists hold the doctorate. As expected, the percentage of workers holding the Ph.D. increases among both groups in each successive age grade; but it is surprising that within each age grade, relatively more persons identified as Physicists in the 1960 Census should hold the doctorate. While explanations of this difference readily come to mind, suffice it to note that vital

differences do exist among the two occupations and need to be considered in subsequent analyses.

Work Status, 1962

Virtually all persons identified as Physicists and Mathematicians in the 1960 Experienced Civilian Labor Force (ECLF) were still employed two years later. Among Physicists only three per cent were no longer in the ECLF at the time they returned their completed questionnaires to the Bureau of the Census and seven per cent of the Mathematicians were likewise removed from the labor force. While both are relatively youthful occupations, these low rates of withdrawal testify once again to the efficacy of formal education at and beyond the college level in securing and maintaining a position in the labor market. (Parenthetically, of the 92 Mathematicians no longer in the ECLF, 73 were women.)

Occupation, 1962

We now consider a major topic on occupational analysis, namely, how many persons identified as incumbents of an occupation at one point in time are identically employed and classified two years later? Changes in the occupational designation of workers may result from (1) a change in job and job content; (2) respondent error involving a change in label although the same work functions are performed; and (3) transcription error. Whatever the reason may be, let us for the moment document the amount of occupational change experienced by the two groups as indicated by the occupational classification employed and applied by Census personnel to responses to the question: "What kind of work were you doing (last week)?" The reference point at time 1 is April, 1960; at time 2 it is Summer, 1962. Table III shows that some 70 per cent of the workers classified as Physicists in the 1960 Census of Population were again classified as Physicists in the 1962 Post Censal Survey; only 56 per cent of the Mathematicians retained the same occupational label some 27 months later. I think we all agree that the amount of occupational change exhibited in this two-year follow-up survey is startling. Certainly, it raises questions about the system of classification currently employed to identify persons in these two occupations and perhaps in other scientific, technical and engineering occupations as well.

Tables III.a, b, and c suggest that changes in occupational affiliation found in these two samples are not simply a function of procedural vagaries in classification because age, sex and educational attainment all seem to be systematically involved. Table III.a shows that among male Physicists, occupational stability declines after age 45; for male Mathematicians, there are no age-associated differences in movement; and among female Mathematicians, occupational stability slightly increases with age. The second part of the table demonstrates the holding power of an occupation for men in both samples as they ascend the educational hierarchy, with Ph.D.'s the most likely to stay put occupationally.

The situation is further complicated when age and education are jointly considered. Among Physicists, age and education generate an effect such that young Ph.D.'s are least likely to switch occupations (90 per cent are still in Physics), old Bachelors' are much more likely to have moved out (only 55 per cent of those 45 years of age or more are still there) while only 34 per cent of the older men without a Bachelor's degree are still in Physics. In Mathematics, the picture is muddied because of the effect of sex on occupational stability. Note that among the Ph.D.'s--that exclusive domain of men insofar as these two occupations are concerned--occupational stability declined with age (the percentage distributions are almost identical in the two groups) while occupational stability increased with age among Mathematicians who are no further along than the Bachelor's degree.

Table III.c presents rates of occupational stability among Mathematicians when all three variables are taken into account. Among the men, age and education work together to provide a pattern similar to that found among the Physicists. Thus: 89 per cent of the young Ph.D.'s remain in the occupation; only 29 per cent of the older men lacking academic degrees do likewise. There is no coherent pattern among the women. Young women in the 1962 ECLF who lack degrees are least likely to remain in Mathematics (28 per cent) while older women holding the Bachelor's degree in three out of four cases are still there. In sum: relative youth and advanced degrees both promote occupational stability among men in Mathematics and Physics; for women in Mathematics, additional information on the life cycle and family formation should help us discern a pattern.

Employment Mobility: 1960-1962

The preceding analysis of occupational changes as measured by the three-digit Census occupational code raises as many questions as it answers. One of the first concerns the relationship between employment and occupation. Do persons who change employment also change occupations? Is the opposite true? Or do the two types of change occur independently? Let us begin by looking at the patterns of employment of workers classified as Mathematicians and Physicists in 1960. The relevant questionnaire item asked: "Were you working for the same company, business or organization in April, 1960 as you were in your major employment last week?"

Some 81 per cent of the Physicists and 80 per cent of the Mathematicians were with the same employer two years later. Sex-age rates of employment stability are given in Table IV.a. Chances of changing employers during the two-year

interval decline with age, and within each age group male Mathematicians are more likely to change than male Physicists, while female Mathematicians are the least likely to switch employers during the two-year interval. Among males, the occupational difference persists even when age grade is taken into account; and among Mathematicians, sex differences also persist when age is held constant up to age 45.

Differences among Physicists in rates of employment mobility in each age grade depend on educational attainment as well. Table IV.b shows that workers who hold the doctorate are more likely to move than those holding the Bachelor's: thus, 68 per cent of the young Ph.D.'s are still with the same employer in constrast with 91 per cent of the older Physicists taking the Bachelor's and 99 per cent of the older men without degrees. Among the Mathematicians, there is a pattern related to age but not to education. Once again, the sex composition of Mathematicians may be obscuring the relationship.

The effects of age and education on employment and occupation mobility among Physicists should be noted. Occupational stability and employment mobility seem to go hand in hand for the young Ph.D. (they stay with Physics but change employers) while the opposite is true of the older Physicist lacking postgraduate credentials (the latter stay with their employer but change Census-designated occupation).

Types of Mobility

The distinction between occupation and employment is one which we wish to consider in greater detail. Because of time limitations, the analysis is limited to Physicists. We have shown that the same socio-demographic variables have different effects on rates of occupational mobility and employment mobility among Physicists when each is treated separately. Our next step is to see what happens when they are put together.

A combination of the two types of mobility behavior yields the following classification of Physicists:

- --Stable Physicists maintain both occupation and employment affiliation during the two-year interval;
- --Itinerant Physicists move on to other, presumably greener, pastures but retain their occupational affiliation;
- --Organization Professionals maintain their employment ties but move out of Physics during the two-year study period into other professional occupational categories; and
- --Mobile Professionals are workers making a double switch.

Of course, this classification of the different modes of adapting to the world of work is somewhat arbitrary for in the long run everybody will have moved out of their occupation and employment. Nevertheless, after a twenty-seven month interval about six in ten Physicists remain stable, one in ten is an Itinerant, two in ten are no longer Physicists in the same organization and one in ten has changed both employer and occupation.

Reading across Table V.a we see that the probability of becoming an Itinerant is more than twice as great for the man with the doctorate as for the Bachelor's, but the chances of remaining in the same employing organization in a different occupation are more than twice as great for the 1960 Physicist with the Bachelor's degree than for the Ph.D. Furthermore, an advanced degree makes a difference for remaining a Stable Physicist but all are equally likely to become displaced occupationally and organizationally.

The importance of age grade and formal education for career patterns among types of Physicists is indicated in Table V.b. The upper panel identifies the Itinerant Physicists within each age-education segment of the 1960 sample. The young Ph.D. is most likely to have moved within the twenty-seven month period to another organization while remaining a Physicist (23 per cent did) in contrast with three per cent of the older Physicists who were Bachelor's recipients only and none among those lacking degrees. The probability of becoming an Organization Professional--one no longer identified as a Physicist --and a Mobile Ex-Physicist also become sharply differentiated when age and educational attainments are jointly considered. For example, only three per cent of the young Ph.D.'s remain in the organization but change occupations; 40 per cent of the older Bachelors' and 66 per cent of those without a four-year degree who were called Physicists in 1960 have now moved into other occupations within the employing organization.

While age and education are shown to be importantly linked to the prospects for a change in employment and/or a change in occupation, there are other factors as well. Consider the field of training for which the highest degree was obtained: Do Physicists who trained in the field of Physics show the same propensity for mobility as do 1960 Physicists whose highest degree was obtained in other fields? Since college and graduate training entail substantial investments of time, one would anticipate the emergence of a sense of commitment to the area of work for which training was secured. Table VI shows that Itinerant Physicists were most likely to have secured their highest academic degree in the field of Physics while Organization Professionals, of whom only one in three received their highest academic degree in Physics, were least likely to have the field of formal training correspond to their 1960 occupation.

Organizational Roles

Central to the entire problem of change of occupation given the current classifications is the nature of the work role within the employing organization. As a first, quick attempt to understand the substantial change in occupations describing the kind of work 1960 Physicists were doing in their 1962 employment, we examined responses to a question asking for a description of the work role in terms of the following:

Are you....(check one)

An administrator (concerned mainly with policy making, planning, overall supervision)?

A supervisor (concerned mainly with technical matters)?

A coordinator (concerned mainly with liaison)?

Other?

Administrator and Coordinator imply managerial roles at the periphery of the professions' core work. If this is the case, then workers changing occupations during the two-year interval may have been promoted to administrative positions. They are, perhaps, involved in managerial tasks that are no longer appropriately termed Physicist. Table VII supports this notion: reading down the table, we see that the Itinerant Physicist and the Stable Physicist are half as likely to designate themselves in managerial terms as are the other two types of workers. Thus, a change in occupation frequently appears to entail involvement in managerial tasks. On the other hand, technical supervision is more frequently related to employment stability: the Stable Physicist is most likely to be in technical supervision; the man who has made a double switch, least likely.

Work Activities in 1962 Employment

A closer approximation of the occupational roles of Physicists is afforded by a thirty-item inventory of work activities. Respondents were asked to check off all activities which "may be part of your major current position." The question that followed asked: "Of all these you checked above, which TWO did you spend the most time doing?" The analysis today is based on the responses to the latter question. Table VIII analyzes three of the "two-most-time-consuming" activities in the 1962 employment of 1960 Physicists by age, grade, and educational attainment.

The first panel shows that eight out of 10 young Ph.D.'s are engaged in "basic" research but only three out of 10 older Bachelors' consider basic research as one of their two-most-time-consuming activities. Young Bachelor's and Master's degree Physicists have relatively high levels of participation in "applied" research. In contrast, young Ph.D.'s are less likely to describe their work as applied but their older counterparts get increasingly involved in this type of work. The likelihood of applied research declines with age at the Master's level and there is a slight age-related decline among Bachelor's. Because our data are cross-sectional, not longitudinal, we cannot tell whether a pattern of work entailing applied and basic research represents a genuine transformation in occupational roles as one grows older or whether generational differences alone account for the higher incidence of basic research among young, highly trained Physicists. To describe the change in content of work would, of course, require that cohorts be followed over a period of time. Nevertheless the findings suggest that as young researchers seeking "basic" answers "burn out," they move into other roles. In addition to the presumably less arduous task of conducting applied research, Physicists of all academic stripes more frequently "administer and supervise research and development after age 35." These findings support the proposition that there is a career sequence in the occupational histories of Physicists, each career stage absorbing these professionals in its own distinctive round of activities.

Salary Rates

The final topic which is considered today concerns another key factor in mobility behavior: financial rewards. We do not know the 1960 salary rate of Physicists but this information was secured for the 1962 major employment. Before we look at the salary rates for "current major employment" among the four types of Physicists, I wish to show how age grade and educational attainment together with a change in occupation during the two-year interval affect salary rates for 1962 employment. Inspection of Table IX.a reveals that age grade and highest degree attained are almost equally predictive of the proportion of 1960 Physicists having salary rates of $12,000 or more in their 1962 major employment. An added advantage accrues to the 1960 Physicist who changes occupation during the two-year interval provided that he is less than 45 years of age. Beyond this point in the life cycle, a change in occupation appears to be irrelevant. Thus: one out of ten Physicists under 35 years of age with Bachelor's degrees earns $12,000 or more while nine out of ten Ph.D.'s in the older age brackets work for comparable salaries.

In Table IX.b data are given for salary rates by age and highest academic degree among the four types of Physicists. It contains a complicated story. Reading down each column, it is noteworthy that:

First, each group of Physicists (classified by type of mobility behavior) exhibits an orderly progression in salary by education and age. Invariably, 1960 Physicists 35 years of age and older who secured the doctorate are most likely to be earning $12,000 or more while the young

man without a Ph.D. is least likely to be at this level.

And second, we see that education is the primary variable accounting for salary differences, age always exercising a secondary influence. As a result the young Ph.D. more frequently earns this sum than the older man who stopped short of the vaunted academic mark. Parenthetically, we have already shown that the young Ph.D. hardly ever becomes an Organization Professional or makes the double switch; hence two cells in the table are almost vacant.

Reading across the table, we see that within each age-education segment of the sample, differences obtain among the four types of Physicists in their ability to command salaries of $12,000 or more. Among old Ph.D.'s, everybody who changed occupation and employer is working at the higher salary rate, testifying perhaps to the efficacy of money in allocating manpower in short supply. Close to nine out of ten Stable Physicists and Organization Ex-Physicists do as well followed by eight out of ten in the remaining group. Among the young Ph.D.'s the direction in differences is similar with Stable Physicists having only a slight advantage over the Itinerant, suggesting in turn that career factors other than money are of greater significance in differentiating Itinerants and Stable Physicists at earlier stages in scientific careers. Among the older Physicists below the level of the doctorate, men who make the double switch again are the most likely to be earning higher salaries (66 per cent do) but there the similarity to their Ph.D. counterparts ends: the Stable Physicists among the latter rank well below the men who make the double change in the proportion who earn higher salaries, and the older non-Ph.D. who is occupationally mobile but organizationally stable is least likely to reach the higher salary rate. Among the younger men without the doctorate, the pattern is similar to the one described above: the Stable Physicist is least likely to be earning $12,000, the Itinerant most likely to make it.

In sum: Education and age group together tell a substantial part of the story on salary rates among Physicists while occupational change was found to provide an added increment up to age 45. When occupational change was combined with employment mobility to yield the four patterns of behavior during the twenty-seven month interval, it was found that at each age and education level the reward system operated differently among the four types of Physicists. Salary differences attributable to type of mobility were most substantial among the older non-Ph.D.'s; factors extrinsic to core professional work appear to be more salient at this career stage than is the case among young Ph.D.'s whose mobility behavior seems to have little influence on salary rates.

Summary

The purpose of this paper was to present some of the initial findings for two of the forty-four occupations included in the Post Censal Survey of Scientific and Technical Manpower. Our work to date suggests that a useful start can be made in explaining both inter- and intra-occupational variation by examining the age, sex and educational attainment components of occupations. The more detailed analysis of Physicists indicated that much can be learned about occupational life through an internal analysis of the data--a "case study" of the occupation, as it were--but the student of the sociology of occupations leans toward the comparative perspective. In the near future tabulations will be available for all forty-five occupations providing materials out of which we hope to fashion a broad, systematic analysis of scientific, engineering and technical occupations.

In the course of our inquiry into "the relationship between training and subsequent occupation,"[2] occupations are to be differentiated in terms of work roles, training patterns, mobility behavior and the like. To take one example, the distinctive age-education patterns of involvement by Physicists in basic and applied research, and in administering and supervising research and development probably do not obtain across the board. Empirically determined occupational differentiation, then, opens the way for constructing new typologies of occupations. The materials which were reported today illustrate the types of comparisons that we plan to extend across the entire spectrum of occupations in the sample.

[2] National Science Foundation, A Program for National Information on Scientific and Technical Personnel, NSF 58-28 (August, 1958), Page 6.

TABLE I.a

SEX, AGE, AND HIGHEST DEGREE ATTAINED BY PHYSICISTS AND MATHEMATICIANS

Occupation	Sex		N	NA	Total
	Men	Women			
Physics . .	95	5	1,704	6	1,710
Mathematics.	74	26	1,304	7	1,311

Occupation	Age			N	NA	Total
	Under 35	35-44	45 and over			
Physics . .	41	41	18	1,703	7	1,710
Mathematics.	59	29	12	1,302	9	1,311

Occupation	Highest Degree Attained				N	Other & NA	Total
	No Degree	Bachelors	Masters	Ph.D.			
Physics . .	11	37	24	28	1,689	21	1,710
Mathematics.	13	49	27	11	1,295	16	1,311

TABLE I.b

AGE AND HIGHEST DEGREE ATTAINED BY SEX

Age	Physics - % Male			
	No Degree	Bachelors	Masters	Ph.D.
Under 35	96 (49)	94 (321)	95 (180)	98 (146)
35-44	94 (66)	99 (233)	96 (163)	99 (227)
45 and over . . .	78 (73)	94 (72)	95 (57)	100 (97)

Total = ... 1,684
NA + Other Degree 26
Total Physics 1,710

Age	Mathematics - % Male			
Under 35	58 (95)	69 (429)	88 (185)	100 (54)
35-44	64 (39)	70 (152)	85 (123)	98 (58)
45 and over . . .	59 (37)	50 (52)	74 (38)	92 (25)

Total = ... 1,287
NA + Other Degree 24
Total Mathematics 1,311

TABLE I.c

SEX BY AGE BY DEGREE

Sex	Age	Per Cent				N
		No Degree	Bachelors	Masters	Ph.D.	
		Physics				
Men	Under 35	7	45	26	22	663
	35-44	1	34	23	33	672
	45 and over . . .	21	25	20	35	276
Women	Under 35	6	58	27	9	33
	35-44	24	18	41	18	17
	45 and over . . .	70	17	13	0	23
					Total = ...	1,684
					NA + Other Degree	26
					Total Physics	1,710
		Mathematics				
Men	Under 35	10	52	29	9	568
	35-44	9	37	35	19	293
	45 and over . . .	22	26	29	23	99
Women	Under 35	21	68	11	0	195
	35-44	18	57	24	1	79
	45 and over . . .	28	49	19	4	53
					Total = ...	1,287
					NA + Other Degree	24
					Total Mathematics	1,311

TABLE II.a

WORK STATUS

Occupation	In Labor Force	Out of Labor Force	Total		NA	N
			Per cent	N		
Physics . .	97	3	100	1,707	3	1,710
Mathematics	93	7	100	1,310	1	1,311

TABLE II.b

SEX BY WORK STATUS

(Per cent Out of Labor Force)

Occupation	Men	Women	N	NA	Total
Physics . . .	2 (1,624)	22 (77)	1,701	9	1,710
Mathematics .	2 (970)	22 (333)	1,303	8	1,311

TABLE II.c

AGE BY WORK STATUS

(Per cent Out of Labor Force)

Occupation	Under 35	35-44	45 and over	N	NA	Total
Physics . .	4 (702)	1 (695)	6 (303)	1,700	10	1,710
Mathematics	9 (771)	4 (375)	4 (155)	1,301	10	1,311

TABLE II.d

DEGREE BY WORK STATUS

(Per cent Out of Labor Force)

Occupation	No Degree	Bachelors	Masters	Ph.D.	N	Other and NA	Total
Physics . . .	7 (189)	3 (626)	4 (400)	2 (471)	1,686	24	1,710
Mathematics .	12 (172)	9 (635)	3 (348)	0 (139)	1,294	17	1,311

TABLE III

OCCUPATION - 1962

Occupation - 1960	Same as 1960	Engineering	Other Profession	All Other	Total		Out of Labor Force	Total
					Per cent	N		
Physics . .	70	16	12	4	100	1,654	56	1,710
Mathematics	56	6	31	4	100	1,223	88	1,311

TABLE III.a

AGE, SEX AND OCCUPATION - 1960

(Per cent Occupation Same - 1962)

Occupation - 1960	Sex	Age		
		Under 35	35-44	45 and over
Physics	Men	71 (650)	71 (669)	61 (266)
	Women	71 (21)	53 (19)	20 (20)
Total				1,645
Out of Labor Force				56
NA + ...				9
Total Physics				1,710
Mathematics . . .	Men	54 (562)	62 (290)	54 (98)
	Women	54 (139)	61 (71)	61 (51)
Total				1,211
Out of Labor Force				88
NA + ...				12
Total Mathematics				1,311

TABLE III.b

AGE BY DEGREE BY OCCUPATION - 1960

(Per cent Occupation Same in 1962)

Occupation - 1960	Age	Highest Academic Degree			
		No Degree	Bachelors	Masters	Ph.D.
Physics	Under 35	52 (46)	63 (310)	75 (168)	90 (144)
	35-44	42 (65)	69 (230)	72 (162)	82 (226)
	45 and over	34 (63)	55 (69)	73 (55)	71 (94)
Total					1,632
Out of Labor Force + . . .					56
Other Degree and NA + . . .					22
Total Physics					1,710
Mathematics . .	Under 35	36 (81)	50 (383)	61 (179)	89 (54)
	35-44	46 (37)	53 (145)	66 (120)	81 (58)
	45 and over	33 (33)	65 (51)	62 (37)	64 (25)
Total					1,203
Out of Labor Force + . . .					88
Other Degree and NA + . . .					20
Total Mathematics					1,311

TABLE III.c

AGE BY SEX BY DEGREE, MATHEMATICIANS - 1960

(Per cent Occupation Same - 1962)

Sex	Age	Highest Academic Degree			
		No Degree	Bachelors	Masters	Ph.D.
Men . .	Under 35	32 (53)	47 (291)	62 (161)	89 (54)
	35-44	37 (24)	51 (106)	67 (102)	81 (57)
	45 and over	29 (21)	56 (25)	68 (28)	61 (23)
Women .	Under 35	28 (43)	66 (82)	53 (17)	(0)
	35-44	62 (13)	61 (38)	61 (18)	- (1)
	45 and over	42 (12)	73 (26)	44 (9)	- (2)

Total	1,206
Out of Labor Force	88
Other Degree and NA	17
Total Mathematicians	1,311

TABLE IV

EMPLOYMENT MOBILITY, 1960-1962

Occupation 1960	Same Job	Different Job	Total		Out of Labor Force	NA	Total
			%	N			
Physics	81	19	100	1,650	56	4	1,710
Mathematics	80	20	100	1,220	88	3	1,311

TABLE IV.a

SEX BY AGE BY EMPLOYMENT MOBILITY, 1960-1962

(Per cent Same Job)

Occupation 1960	Sex	Age		
		Under 35	35-44	45 and over
Physicists	Men	74 (649)	83 (669)	92 (266)
	Women	70 (20)	74 (19)	95 (20)
	Total = ...			1,643
	Out of Labor Force			56
	NA			11
	Total Physicists			1,710
Mathematicians	Men	69 (562)	77 (290)	87 (98)
	Women	72 (139)	86 (71)	95 (51)
	Total = ...			1,211
	Out of Labor Force			88
	NA			12
	Total Mathematicians . . .			1,311

TABLE IV.b

AGE BY DEGREE BY EMPLOYMENT MOBILITY, 1960-1962

(Per cent Occupation Same in 1962)

Occupation - 1960	Age	Highest Academic Degree			
		No Degree	Bachelors	Masters	Ph.D.
Physicists . . .	Under 35	76 (46)	78 (308)	66 (168)	68 (142)
	35-44	88 (65)	89 (230)	85 (162)	77 (226)
	45 and over	99 (63)	91 (69)	93 (55)	87 (94)
	Total			1,628	
	Out of Labor Force			56	
	Other Degree and NA			26	
	Total Physicists			1,710	
Mathematicians	Under 35	66 (81)	72 (383)	68 (179)	67 (54)
	35-44	76 (37)	76 (145)	82 (120)	76 (58)
	45 and over	88 (33)	90 (51)	92 (37)	92 (25)
	Total			1,203	
	Out of Labor Force			88	
	Other Degrees and NA . . .			20	
	Total Mathematicians . . .			1,311	

TABLE V

EMPLOYMENT AND OCCUPATION MOBILITY, 1960-1962, AMONG 1960 PHYSICISTS

Occupation Change	Employment Change	Type	Per cent
No	No	Stable Physicist	58
Yes	No	Organization Professional	23
No	Yes	Itinerant Physicist	11
Yes	Yes	Mobile Ex-physicist	8
Total . .			100

N = ...	1,623
Out of Labor Force, 1962 . . .	56
NA	31
Total	1,710

TABLE V.a

MOBILITY TYPE BY HIGHEST ACADEMIC DEGREE, 1960 PHYSICISTS

Highest Academic Degree	Mobility Type				Total	
	Stable	Organization	Itinerant	Mobile	Per cent	N
No degree	38	51	3	8	100	173
Bachelors	57	26	8	9	100	599
Masters	61	18	12	8	100	377
Ph.D.	66	11	16	6	100	455

Total	1,604
Out of Labor Force	56
Other Degrees and NA	50
Total Physicists	1,710

TABLE V.b

AGE BY HIGHEST ACADEMIC DEGREE BY MOBILITY BEHAVIOR

Age	Academic Degree			
	No Degree	Bachelors	Masters	Ph.D.
	Per Cent Itinerant			
Under 35 . . .	4 (46)	9 (302)	22 (161)	23 (135)
35-44	5 (64)	9 (229)	5 (161)	15 (225)
45 and over .	0 (62)	3 (68)	5 (55)	7 (94)
	Per Cent Organization Professional			
Under 35 . . .	28	25	15	3
35-44	53	24	19	11
45 and over .	66	40	25	23
	Per Cent Stable Physicists			
Under 35 . . .	48	55	53	69
35-44	36	60	67	66
45 and over .	34	53	67	64
	Per Cent Mobile Ex-Physicists			
Under 35 . . .	20	11	10	5
35-44	6	7	9	8
45 and over .	0	4	2	5

TABLE VI

TYPE OF MOBILITY BY ACADEMIC FIELD OF HIGHEST DEGREE ATTAINED, 1960 PHYSICISTS

(% Highest Degree in Physics)

Mobility Type	Per Cent Physics
Itinerant	79 (175)
Stable	68 (928)
Mobile	50 (115)
Organization	31 (368)
N = ...	1,596
Out of Labor Force 1962. . . .	56
NA	58
Total Physicists	1,710

TABLE VII

MOBILITY BEHAVIOR AND ORGANIZATIONAL ROLE

(Per Cent Organizational Roles)*

Mobility Type	Organizational Role					Total	
	Administrator (1)	Coordinator (2)	Total (1) + (2)	Supervisor (3)	Other	%	N
Stable	8	4	12	49	39	100	846
Organizatior	13	10	23	43	34	100	324
Itinerant	7	4	11	39	49	100	163
Mobile	20	8	28	31	42	100	115

Total	1,448
NA	206
Out of Labor Force	56
Total Physicists	1,710

*Multiple choice item.

TABLE VIII

AGE BY DEGREE BY WORK ACTIVITIES IN 1962 EMPLOYMENT, 1960 PHYSICISTS

Age	Degree	Basic Research	Applied Research	Administer R & D	N
Under 35	No Degree	32	22	4	46
	Bachelors	28	48	10	304
	Masters	40	55	12	165
	Ph.D.	80	27	15	142
35 - 44	No Degree	25	41	11	64
	Bachelors	18	43	27	223
	Masters	29	44	29	159
	Ph.D.	57	38	39	222
45 and Over	No Degree	17	26	6	53
	Bachelors	17	38	27	66
	Masters	25	49	28	53
	Ph.D.	46	39	42	92

Total	1,589
Out of Labor Force	56
Other Degree & NA	65
Total Physicists	1,710

TABLE IX.a

AGE, HIGHEST ACADEMIC DEGREE AND
SALARY RATE, 1960 PHYSICISTS
(% $12,000 or MORE)

Age	No Degree	Bachelor	Masters	Ph.D
Under	13 (46	12 (305)	23 (163)	65 (139)
35 - 44	27 (62)	39 (225)	61 (160)	86 (220)
45 and Over	30 (53)	55 (66)	55 (53)	90 (89)

Total	1,580
Out of Labor Force	56
Other Degree & NA	74
Total Physicists	1,710

TABLE IX.b

ACADEMIC DEGREE, AGE AND MOBILITY BEHAVIOR OF 1960 PHYSICISTS

(Per cent 1962 Salary Rate of $12,000 or More)

Academic Degree	Age	Type of Mobility			
		Mobile Ex-Physicist	Stable Physicist	Itinerant Physicist	Organization Ex-Physicist
Ph.D.	35 and over	100 (20)	88 (104)	82 (39)	87 (45)
	Under 35	- (7)	67 (90)	65 (31)	- (4)
No Ph.D.	35 and over	66 (38)	44 (357)	64 (36)	41 (185)
	Under 35	21 (57)	12 (268)	28 (64)	14 (111)

Total	1,556
Out of Labor Force	56
NA	98
Total Physicists	1,710