Results of an Equity Study On Staff Salary and Promotion

To the University Community:

We wish to inform the Penn Community about the results of a study of salary equity among full-time A-1 and A-3 employees. The study was commissioned as part of the University's continuing effort to insure that all employees, especially persons of color and women, receive both fair and equal consideration in salary and promotion. To our knowledge, no other institution has carried out such an extensive survey.

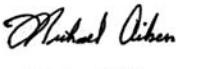
The University retained a nationally recognized consulting firm, Towers, Perrin, Forster & Crosby (TPF&C) to conduct the review, believing that an outside firm would draw the most objective conclusions. The data available to TPF&C were not as complete as we would have liked, especially data on the educational achievement and performance of individuals. Nevertheless, the information provided did allow TPF&C to make statistically valid findings.

TPF&C found that there was not a great deal of difference in the salary, promotion rate, and salary increases for persons of color and women when compared with other A-1 and A-3 employees. This reflects well on Penn, its policies, and the way in which members of the Penn community treat one another. We can all take some pride in this general conclusion. However, the study does point out some variations that deserve careful attention and further study. It appears that there are differences in average salary, average promotions and average salary increases among schools, and among some groups. These variations do not appear to be large, but they are important, and the University is committed to removing any inappropriate variations that may exist.

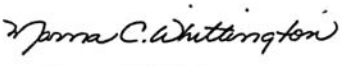
We will complete a thorough and detailed review of these variations so that we have a better sense of the extent of any problems and their causes. Meanwhile, we will begin to take immediate actions described in the Administrative Summary on page II to address some of the issues raised by the data in the study. We will also take immediate steps to improve our background information on employee educational achievement and performance.

We extend special thanks to the many members of the University community who contributed to the completion of the study.

Sheldon Hackney
President



Michael Aiken
Provost



Marna C. Whittington
Senior Vice President

For additional copies of this report and any exhibits (including Appendices I-IX) not in this presentation, please call 898-6884. There are also copies on reserve at the Van Pelt Reference Desk and the Rosengarten Reserve Desk (Van Pelt Library).

To the University Community: An Administrative Summary of the Staff Salary Equity Study

The Towers, Perrin, Forster and Crosby (TPF&C) study that follows represents a first step toward understanding the salary and promotion practices applied to University employees classified as A-1 or A-3. Because the TPF&C study is quite technical, we would like to talk about the methods used, the major findings of the report, and recommendations for future action.

The study is divided into two major sections. One section is a "snapshot" analysis of actual salaries earned by almost all 4,000 A-1 and A-3 employees as of March 15, 1988. Those who were included in the analysis held full-time, graded positions. Excluded from the study were those A-1 and A-3 employees who held either part-time, unionized, or faculty appointments.

The second major section of the study is an analysis of promotion rates, and pay increases, of about 1,400 A-1 and A-3 employees during the fiscal years 1983-1987. This group, like the previous one, was comprised of full-time employees. Its smaller size was due to the turnover rate among A-1 and A-3 employees during the five year period; only those who were continuously employed at the University during all five fiscal years were included in the study.

Regression analysis was used in both sections to measure the relationship between differences in either compensation, promotion rate, or pay increase, and factors (variables) such as age, gender (White women and Women of Color), race, and length of service. For example, if all employees aged 50 years or more were highly compensated, while all younger employees received low compensation, then one would expect the variable "age" to explain a large part, perhaps as much as 80 percent, of the variation in compensation. For the purposes of the study, TPF&C used a .05 (5%) level to indicate significant results.

In the case of the TPF&C study, the combination of all the factors tested did not account 45 percent or less of the variation observed in compensation, promotion rates, or pay increases. This would indicate that there are factors other than those analyzed in the study that may have had a significant impact on pay and promotion patterns. TPF&C researchers identified level of education, assignment to classification title and grade level, and performance as other potentially significant explanations. However, less than half of the A-1 and A-3 employees studied had educational data present in their employment records, and performance data were not available in electronic format for analysis. It is clear from the study that our full understanding of salary and promotion practices is hindered by incomplete or unavailable employment data.

The overall findings of the TPF&C study attest to the University's commitment to encourage compensation and promotion decisions based on substantive, job-related criteria. The study also highlights specific areas that require improvement or further investigation, as discussed at right.

March 15, 1988, "Snapshot" of Compensation of A-1 and A-3 Employees

1. Overall, Asian and Black A-1 and A-3 employees were paid less on average than Hispanic and White A-1 and A-3 employees after age, gender, length of University service, time in position, and school were taken into consideration.

2. Some variation in compensation was observed between schools. In the School of Nursing, A-1 and A-3 employees were paid more than other A-1 and A-3 employees who were comparable in age, time in position, length of service, and race. At the other end of the spectrum, A-1 and A-3 employees in the School of Veterinary Medicine were paid less on average than comparable A-1 and A-3 employees.

3. In addition, four job families showed a significant correlation between gender and variation in compensation. Job families are similar positions that are grouped together based on job content and required qualifications. Women in the Development/Fund Raising, General Administration, Specialized University, and Animal Care/Tech job families were paid less on average than other A-1 and A-3 female employees after the other factors were taken into consideration.

Analysis of Promotion and Pay Increases of A-1 & A-3 Employees, FY83-87

1. Overall, female A-1 and A-3 employees experienced a greater rate of promotion on average than comparable male employees. Female A-1 and A-3 employees also received higher pay raises on average, principally in the A-1 category.

2. Overall, A-1 and A-3 Black employees were promoted at a lower rate on average than comparable White employees. To the extent that educational attainment data existed, the lower promotion rate appeared to significantly correlate with this observation.

3. Variations in promotion and pay increases were also observed by school. For instance, A-1 and A-3 employees in the Wharton School received higher pay raises on average than other A-1 and A-3 employees. On the other hand, similar employees of the School of Dental Medicine received smaller pay raises on average than those in the comparison group.

As a community, we at Penn wish to pursue and resolve patterns of discrepancies that may affect any group of employees. We are committed to taking action before the end of this academic year as a result of the TPF&C study. The actions that will be taken follow.

1. The University is taking steps to update its employment files, including more on educational level and race for all A-1 and A-3 employees. This process will be completed for current employees before July 1, 1990.

2. The University will, at once, encourage greater use of its performance evaluation system for all A-1 and A-3 employees and sets a goal of storing such data in electronic format by January 1, 1991 and continue thereafter.

3. The University will reexamine internal promotion policies.

4. The University will immediately strengthen its education and consultation to school and center administrators responsible for planning compensation through the Salary Management Initiative program. This program provides a mechanism for addressing individual differences in compensation, promotion, or pay increases. Strong emphasis will be placed on internal equity based on race and gender. The University President, Provost, and Senior Vice President will receive a report of recommendations and actions by school and center as part of the Salary Management Initiative.

Other recommended actions will require a longer period of time to implement. They are no less important to the University than the preceding actions. These longer term actions follow:

1. The University will refine and strengthen its investigation and analysis of the reasons for A-1 and A-3 employee turnover.

2. The University will examine such compensation issues as whether any group tends to be misclassified and the degree to which job classification within grade is a significant explanatory factor in the regression analysis.

3. The University will identify steps it could take to increase the number of Asian, Hispanic, and Native American A-1 and A-3 employees relative to their availability as applicants in the marketplace.

4. The University will explore the impact of expanding educational opportunities to foster growth and career opportunities of A-1 and A-3 employees.

5. The University will repeat, during the 1992 fiscal year, the entire study that was conducted by TPF&C to monitor progress and highlight areas of continuing concern.

This internal equity study represents a reasonable first step for the University in illuminating possible inequities in compensation and promotion. As a community, we believe we may claim that our efforts over the years to minimize inappropriate pay and promotion differences are in general successful. At the same time, we must redouble our efforts to understand the facts that influence pay and promotion and provide an environment that assures these fair practices. We would like to encourage any groups or individuals with further questions to call 898-6884 to set up a meeting or to schedule a presentation.

Dr. Barbara Sale Butterfield, Vice President for Human Resources

Dr. Richard C. Clelland, Deputy Provost

From TPF&C: University of Pennsylvania Salary Equity Study [Full-time A-1/A-3]

Executive Summary

In November 1987, the University of Pennsylvania requested proposals to conduct a salary equity study. In January 1988 the study contract was awarded to Towers, Perrin, Forster & Crosby (TPF&C), a management consulting firm specializing in compensation and related human resources issues. Three TPF&C principals (stockholders) conducted the study: Cheryl D. Fells, Richard F. Meischeid and Stephen F. O'Byrne. Biographical sketches of Ms. Fells, Mr. Meischeid and Mr. O'Byrne are contained in Exhibit I-1. The objective of the study was to determine whether sex or racial bias exists in recent history in the University's salary payment or promotion of its more than 4,000 nonacademic employees who are not members of a bargaining unit.

Prior to the preparation of this report, the study team held several progress meetings with University staff members to review data questions and interpretations and discuss preliminary study findings. A draft of the report was also reviewed by members of the Department of Statistics.

Current salaries as of 15 March 1988 and promotions and pay increases during 1983-1987 are analyzed.The studies describe the influence of age, time in position, length of University service, sex, race, education, and school (or center) affiliation. The use of information about education was limited to only some of the analyses, since data on education were not available for more than 40 percent of the employees. Multiple regression analysis is employed and the five percent level is used to establish statistical significance. Models are constructed for all employees and for the A-1 and A-3 groups separately.

For the analysis of current salaries some modest differences are found for the sex and race categories, and some differences among the schools are evident. Education is not a significant factor. Most of the statistically significant findings involve small pay differentials. Moreover, some group sizes are small (e.g., several racial groups contain only a few employees), and therefore, interpretation of the statistically significant results requires further evaluation.

With respect to gender, females experience a higher promotion rate than males. With respect to race, Whites experience a higher rate than Blacks, particularly Black males. The differential for Blacks is related to their level of education.

We recommend that the University undertake the following steps in light of this study:

- — Pay and promotional group differences which were found to be statistically significant should be explored in detail.
- — Reasons for the school differences should be investigated.
- — A concerted effort should be made to expand the educational achievement information in the data base.
- — This type of study should be performed in the future periodically.

I. Introduction

In November 1987, the University of Pennsylvania requested proposals to conduct a salary equity study. In January 1988, the study contract was awarded to Towers, Perrin, Forster & Crosby (TPF&C), a management consulting firm specializing in compensation and related human resources issues. Three TPF&C principals (stockholders) conducted the study: Cheryl D. Fells, Richard F. Meischeid and Stephen F. O'Byrne. Biographical sketches of Ms. Fells, Mr. Meischeid and Mr. O'Byrne are contained in Exhibit I-1. The objective of the study was to determine whether sex or racial bias exists in recent history in the University's salary payment or promotion of its more than 4,000 nonacademic employees who are not members of a bargaining unit.

TPF&C undertook the following steps to achieve the study objective:

- — We interviewed 11 members of the University community to develop our understanding of the University's salary management and promotion practices and the key concerns of members of the University community about the conduct and possible findings of the study. The interviewees are listed in Exhibit I-2.
- — We reviewed recent employment discrimination case law to familiarize ourselves with current legal standards of statistical proof of discrimination.
- — We analyzed the compa-ratio, defined to be salary as a percentage of grade midpoint (at the University the salary grade midpoint is also the hiring maximum), for all employees in graded positions and formulated a statistical (multiple regression) model to determine if sex or racial bias exists in salary levels after controlling for differences in age, service, time in position, education, and school. The results of this analysis are presented in Section IV.1.
- — We analyzed promotions and salary increases over the period 1983-1987 and developed statistical models to determine if sex or racial bias existed in promotions or salary increases after controlling for differences in age, service, education, and school. The results of this analysis are presented in Section IV.2.
- — We held several progress meetings, prior to the preparation of this report, with University staff members, to review our data questions and interpretations and discuss the preliminary findings of our analyses.

We reviewed a draft of the final report with the Office of the General Counsel and members of Department of Statistics.

II. Data and Background

This study examined the records of more than 4,000 University employees. Those included in the analysis were required to be active (which excludes leaves and terminations) and fully-salaried, and to have a benefits base greater than zero. (The Human Resources information system field for fully-salaried status is not completely accurate,and the restriction to a benefits base greater than zero was designed to provide accurate selection of only fully-salaried employees.) Further, only employees with primary appointments in A-1 and A-3 positions were included. Those in the former category are professional and administrative personnel and are exempt under the Fair Labor Standards Act. A-3 employees are not exempt under the Fair Labor Standards Act. The restriction to those with a primary appointment in an A-1 or an A-3 position excludes faculty who carry secondary administrative appointments, e.g., the President and Deans. This study examined regular nonacademic employees who are not members of a bargaining unit.

A-1 employees fall into 12 salary grade categories and A-3 employees into 11 salary grade categories. For both categories there are personnel who are above grade, that is, who have salaries which exceed the maximum for their grade, and personnel who are not in a grade (typically these are A-1 employees who hold high salary positions, but they also include part-time employees and some who have not yet been assigned a grade). At the time data were provided for this study, approximately 200 persons were in ungraded positions. Each employee is assigned to a job class (e.g., Research Specialist I, Accountant/ Financial Analyst I, Secretary III), and the job class determines the grade (for those employees who are graded). In addition, each employee is assigned to a center or a school and to a department, and belongs to a job group (for purposes of affirmative action record-keeping) and to a job family (for purposes of compensation review).

The University supplied TPF&C with three data files. The first was a current file which presented a snapshot of 4,360 current employees as of 25 January 1988. The file included personnel identification data and the following variables:

- center or school
- department
- job class
- employee type (A-1 or A-3)
- job group (affirmative action)
- job family (compensation)
- grade
- standard hours (A-3 employees only)
- hourly rate (A-3 employees only)
- appointment salary (A-1 employees only)
- total administrative salary (the sum for all jobs held for an A-1 employee, and total salary for an A-3 employee)
- fiscal year-to-date gross pay
- fiscal year-to-date unrestricted pay (to distinguish between University dollars and grant dollars)
- date of birth
- date of University employment
- date assigned to current position
- sex
- race

Subsequently the University provided an updated version of the first file with information about education (highest degree) added. This current file was a snapshot as of 15 March 1988 and contained 4,378 employees. Educational achievement data, however, were not available for more than 40 percent of the employees. The third file was historical, covering the fiscal years 1983 through 1987. It contained fiscal year-end data (i.e., as of June 30th for each of the years) giving school, department, job class, grade, employee type, total A-1 salary, and total salary (for the indicated fiscal year). Only persons employed on June 30th for at least one of the five fiscal years were included. Salary values in this historical file were actual salaries paid during the fiscal year, not annual rates of pay as in the current files. We subsequently reduced this historical file to include only those employees who were present for all of the five fiscal years.

Performance appraisal ratings are not kept on the personnel payroll system. Therefore, we were unable to use job performance information in the statistical analyses described below. As noted above, educational data were also not available for many employees. Some of the statistical analyses were performed with education as a variable included, using only those employees for whom such data were present.

Three issues were addressed statistically in this study:

(1) Current salary levels as of 15 March 1988 are examined. To control for occupational differences we use salary grade as a proxy for occupational market rate and examine compa-ratio, defined to be the ratio of actual pay to salary grade midpoint.
(2) Promotions during the five fiscal years 1983-1987 are studied.
(3) Pay increases during the five fiscal years 1983-1987 are analyzed.

Early in our study we met with Adrienne Riley, now Director of Human Resources and then Compensation Manager, and Gary Truhlar, now Director of Human Resources Information Management and then Director of Human Resources Systems, University Management Information Services, to describe a preliminary salary equity analysis and to review the current file to ensure that we were not misinterpreting data or using erroneous data.

— Frequently distributions for all the variables were reviewed.
— We presented "data checking" reports that had been generated showing all employees (i) with extreme compa-ratios, (ii) in ungraded positions and (iii) with salary discrepancies (where appointment salary did not equal total administrative salary for A-1 employees; and where the product of hourly rate, weekly hours, and 52 did not equal total administrative salary for A-3 employees).
— We reviewed an individual case listing of large prediction errors in a preliminary multiple regression analysis of compa-ratios. In this analysis, predicted values were calculated by treating all persons as White males in order to accent unexplained compa-ratio differences for females and minorities. In addition, we examined a similar individual case listing of all Asian employees showing prediction errors which arose from classifying all Asians as White males.

Our investigations of data in the current file led to the following conclusions and modifications:

—We agreed that it was not feasible to include employees in ungraded positions and those with a missing race code. There were 187 employees in ungraded positions and 111 with missing race codes, with 56 overlaps. This resulted in the deletion of 242 persons.
— For purposes of analysis we decided to group the 19 nonacademic responsibility centers into two broad categories, academic support and other administrative. The 12 school categories were retained.
— We agreed that all high compa-ratios (including values as high as 192%) were valid. Many were attributable to special hiring requirements.
— We decided that five employees with compa-ratios below 70%, two coaches and three coordinators, were probably part-time employees and should be excluded.
— Differences exist between appointment salary and total administrative salary for some A-1 employees. We decided that these discrepancies were attributable to employees holding more than one A-1 appointment and that appointment salary (which stems from the primary appointment only) should be used in the analysis.
— The source of the discrepancy between total administrative salary and the product of hourly rate, weekly hours, and 52 for some A-3 employees could not be determined (in 45 out of 47 cases the former was lower). However, we concluded that there was no reason to question the hourly rates which were the basis of the compa-ratio calculations, since the A-3 hiring maxima are expressed in terms of hourly rates.

In subsequent phone conversations and a second progress meeting we conducted a similar review of the historical file. We made the following decisions:

— Since part-time and full-time coding were not available in this file, we agreed to delete all employees for whom the 1987 salary or grade was lower than the 1983 salary or grade, respectively. This was intended to exclude persons who had switched from full-time to part-time work.
— For analysis of salary increases during the fiscal years 1983-1987 we agreed to exclude all employees hired after 30 June 1982, in order to eliminate partial year salary values for fiscal year 1983.
—Total administrative salary for some A-1 employees included compensation for a faculty appointment. We decided to use only A-1 salary for these employees for the analysis of the 1983-1987 salary increases. In the case of A-3 employees total administrative salary was used to study the increases.

III. Methodology

Current salaries and promotions and pay increases are studied in this report by comparison of group averages and by multiple regression analysis. In the regression analyses we shall test hypotheses about the values of coefficients describing the influence of sex, race, and other variables. These analyses utilize categorical variables for school (or center) affiliations of employees. The twelve schools and their codes are displayed in the computer output comprising each of the nine appendices in Section IV. In addition, there are two aggregations of nonacademic centers, called "Academic Support" and "Other Administrative" (the latter is the base for comparison of the school/center set of categorical variables when all independent variables are retained in the regression model).

The regression models used are described in detail in Sections IV-1 and IV-2. In fact, the data were analyzed using several types of models, but not all such findings are presented in detail. See Section IV-3 for a discussion of alternative models.

Compa-ratio is defined as the ratio of actual pay to salary grade midpoint. It is often used as a marker for salary relationships because many organizations, including the University of Pennsylvania, use the midpoint of the salary range to represent the desired competitive level in the salary market for positions assigned to a particular grade. Each classified position is assigned, based on its duties and responsibilities, to a salary grade. Each salary grade has a midpoint. Therefore, compa-ratio provides a base line for measuring the relationships between individual salaries in different ways: within grade, within job title, within job family, and across salary grades.

Our regression analysis of compa-ratios shows that some sex and race variables are statistically significant at the conventional 5% level, but in only two cases (both in job family models; see Exhibit IV-3) do the compa-ratio differentials exceed 10% (and in one of the two cases only three employees are involved).

IV. Results of Statistical Analysis

This section describes multiple regression analysis of salary levels as of 15 March 1988 , and of promotions and pay increases during the fiscal years 1983-1987. The aim of the study is to investigate the influences upon salary levels and upon promotions and pay increases of a number of explanatory variables, with the sex and race variables being of particular interest.

1. Current Salary Data Analysis

Exhibit IV-1 gives the distribution of employees by race and sex groups, separately for A-1 and A-3 employees and for both groups combined. It is the purpose of the regression analysis described here to analyze differences among compa-ratios of current salaries for the race and sex groups while making adjustments for the influence of variables such as age, occupation, experience, service, time in position, education and performance appraisal. The distributional profiles of the race and sex groups do differ considerably according to measures provided by these variables. As noted above, however, current performance appraisal ratings were not available for many employees and data on education were missing for more than 40 percent of them. Education is employed as an explanatory variable in some of the analyses to be described, but performance data were too sparsely available to permit their use.

Three multiple regression models with compa-ratio as the dependent variable were constructed, one for A-1 and A-3 employees combined and others for the types separately. In each case a stepwise regression procedure was used and those independent variables which were statistically significant at the 5% level were retained in the final version of the model. Independent variables initially entered were age, time in position (in months, as of 1 March 1988), length of University service (in months, as of 1 March 1988), race, sex, and school (or one of the two aggregations of nonacademic centers, for those employees not in a school). Detailed

results of the regression analyses are displayed in Appendices IV-1, 2, 3.

For each regression model linear and quadratic terms were initially entered for age, time in position, and length of University service. Categorical variables were used for female and for Asian, Black,and Hispanic races. Thus, male and White are initially the bases for comparison. (The six employees classified as Native Americans constituted too small a group to be given a separate categorical variable, and they were combined with Whites in all of the regressions.) In addition, the models employ categorical variables for each of the 12 schools and the aggregation of nonacademic centers labeled "Academic Support", so that the base for comparison for these variables is initially the aggregation labeled "Other Administrative". Job responsibilities, size, and pay practices do vary among the schools. We shall see that inclusion of the school variables in the models contributes in a statistically significant manner to their fit to the data.

The analysis for A-1 and A-3 employees combined is shown in Appendix IV-1. The independent variables in the final version of the model explain 41% of the variation in compa-ratios (R-squared value), and the standard deviation of 12.8). The statistically significant variables are age, time in position, length of University service, Asian and Black races, and eight of the school variables. The variables which singly best predict compa-ratio are age, service, and time in position. Each has a correlation with compa-ratio approximately equal to .5. For all other variables the correlation with compa-ratio is less than .1 in magnitude. The sex and Hispanic variables are not statistically significant. The base for comparison of the Asian and Black race findings is the aggregation of Hispanics and Whites. For example, Asians and Blacks have compa-ratios 3.6 and 1.5 percentage points, respectively, lower than the aggregation of Hispanics and Whites of the same age, time in position, length of service, and school. The base for comparison of the school variable findings is the aggregation of five groups: Graduate Fine Arts, Social Work, Annenberg, Law, and Academic Support. It is evident that pay practices vary by school. The results show that Nursing and Veterinary Medicine have compa-ratios 5.2 points higher and 2.0 points lower, respectively (these are the most extreme cases), than employees in the base for comparison of the same age, time in position, length of service, and race. For all tests the bases for comparison may be determined from the right-hand side of page 4 of Appendix IV-1, where the nonsignificant independent variables are listed. The p-values, indicating the levels of significance for the independent variables, are given under the column labeled "Sig T" on the same page.

Correlations among the independent variables are displayed on pages 2-3 of Appendix IV-1. For age, time in position, and service the pairwise correlations are in the range .50-.65. All other correlations among the independent variables (with the exception of the linear and quadratic forms of the same measurement) are modest, with the vast majority being less than .1 in magnitude. Thus, the inferences provided by the t-tests for the sex, race, and school variables are reliable.

The separate regression models for the A-1 and A-3 employees are shown in Appendices IV-2 and IV-3. The results indicate that while females are not paid significantly different from males in the combined model, they are paid significantly more than males among A-3 employees and significantly less than male A-1 employees. Sex is the only variable that is statistically significant in one of the separate models but not in the combined model.

To compare the results of the three regressions, we formed a modified set of models for the A-1 and A-3 groups alone, using only those variables which are statistically significant in the combined A-1, A-3 model, plus the sex variable. This modified set shows how race and sex differences and school pay practices vary by employee type. Exhibit IV-2 shows the value of the regression coefficient for each sex, race, and school independent variable in the combined A-1, A-3 model and in the two modified employee type models. Each regression coefficient may be interpreted as the percentage pay difference between the corresponding group and its base used for comparison. It is clear that there are some differences between the A-1 and A-3 groups, e.g., females vs. males. Interpretation of the results for the school variables should be tempered by the fact that some of the schools have small employee groups. The R-squared values for the modified A-1 and A-3 models are 0.36 and 0.49, respectively.

In further analyses we tested educational achievement as an explanatory variable by using only those employees for who such information was available. We found that education had no statistically significant effect on compa-ratios.

In addition to the regression models for the A-1, A-3, and combined groups, separate models were constructed for each major job family. Independent variables included in these models are age, service, time in position, sex, and race. The relatively small sample sizes for some of the families did not permit reliable inclusion of the school variables. (Exclusion of the school variables in the combined A-1, A-3 model described above has no significant effect on the values of the sex and race regression coefficients; see Section IV.3.) The job family models control for employee type since every family consists of employees of only one type. The regression coefficients for the sex and race variables are displayed in Exhibit IV-3 for job families with at least 74 employees. The coefficient for race is not shown where the number of Asian or Black employees in the job family is less than three.

In four of the job families compa-ratio for females is significantly less than that for males by 5% or more. The largest such deficit is in Development/Fund Raising. For this job family age, time in position, and sex give an R-squared value of 0.25. If school variables are added to the model, none is statistically significant at the 5% level. The median compa-ratio for the 70 females in the family is 93.1, and for the 29 males it is 102.7. Seventy-six percent of the females have compa-ratios below the male median ratio. For the other three families with deficit female compa-ratios, General Administration, Specialized University, and Animal Care/Tech, the R-squared values for the fitted models are 0.30, 0.44, and 0.23, respectively.

Altogether nine of the regression coefficients in Exhibit IV-3 are statistically significant at the 5% level. It should be noted that statistical significance or lack thereof stems from consideration of the magnitude of the coefficient and the sizes of the job family and the sex or race subgroup within the family.

2. Promotion Rates and Pay Increases

We now turn to the historical data to examine promotions and pay increases.

More than 1,400 employees held A-1 or A-3 positions at the University throughout 1983-1987 (fiscal years). Of these, 53% experienced at least one promotion, defined as the assignment to a higher salary grade, during the period. Promotions were determined by comparing grade levels for the four pairs of consecutive fiscal years. Exhibit IV-4 shows promotion rates disaggregated according to sex, race, and employee type. The average number of grades advanced for the promoted employees only is shown for the same categories in Exhibit IV-5. The figures in this exhibit are determined from comparison of the grade for fiscal year 1983 and that for fiscal year 1987 and thus can reflect more than one promotion. Altogether 66 employees (or 8.5% of those promoted) experienced cumulative promotions of five or more grades between 1983 and 1987. To minimize the impact of extreme cases on the group averages, we reset all cumulative promotions of more than four grades to the value four in forming Exhibit IV-5. Further, Exhibit IV-6 displays promotion rates for all employees, i.e., using those who were not promoted as well as those who were. All three of the exhibits show that females tended to experience more promotions than males. The number of grades advanced for those White males who were promoted was relatively high. Further, the promotion rates and amounts of grade advancement shown for Black males are relatively low. It should be noted, however, in considering these remarks that some of the categories contain a small number of employees.

Measurable factors that provide legitimate grounds for promotional differentials include age, service, and education. Job performance is another such factor, but as we have noted above, the lack of performance appraisal data prevented the use of such information in our analyses. We expect older and longer service employees to realize fewer promotions for several reasons. They tend to be closer to the top of a career ladder, and thus fewer promotional opportunities are available to them. Also, their experience or learning curves tend to flatten, so that additional increments of job proficiency take longer to achieve. (Compensation studies of many different occupations have shown diminishing returns to experience.) We also expect employees with more education to experience relatively higher levels of promotion.

To explore the promotion data more fully we developed a multiple regression model with the number of grades promoted from the end of fiscal year 1983 to the end of fiscal year 1987 as the dependent variable. (The dependent variable is the actual number of grades promoted without the truncation employed in Exhibits IV-5 and IV-6.) Independent variables in the model were age, length of University service, race, sex, school, and education. Linear and quadratic terms were used for age and service, and categorical variables for sex, for Asian, Black and Hispanic races and for the school units. Education is measured as the difference

between an employee's years of education and the average years of education for all employees in the same grade at the end of fiscal year 1983. Education data were available for 1044 employees, or 72.1% of those used to determine Exhibits IV-4 and IV-6. Separate models were constructed for A-1 and A-3 employees combined and for the types separately. In each case a stepwise regression procedure was used and those independent variables which were statistically significant at the 5% level were retained in the final version of the model. Details of the analysis are shown in Appendices IV-4, 5 and 6.

In the model for A-1 and A-3 employees combined age, education, and four of the school variables are statistically significant. Promotions decrease with age and increase with education. Employees in Wharton and Engineering and Applied Science experienced more promotions (on average one grade level), and employees in Medicine and Academic Support fewer promotions (on average 1/3 of a grade level) than the aggregation of the units not included in the model. Service, sex, and race are not statistically significant. The R-squared value is 0.20. If we add a categorical variable for Black race to the model, the p-value for the t-test of the regression coefficient is 0.10, and the coefficient is -0.18. If we exclude education from the model, Black race does become statistically significant at the 5% level, and the value of the regression coefficient is -0.23 (the base for comparison is the aggregation of all non-Black employees). Exhibit IV-7 shows why controlling for education in the model eliminates the statistical significance of Black race. It indicates that Black males average one year and Black females one-third of a year less education than the average for their salary grade. In contrast, Asian males average 2.4 years and Asian females 1.5 years more education than the average for their salary grade.

The separate promotion models for A-1 and A-3 employees are displayed in Appendices IV-5 and IV-6, respectively. As with the combined model, age, education, and several school variables are statistically significant in these two models. The impact of education is nearly twice as great among A-3 employees as among A-1 employees. The promotional premium evident for Engineering in the combined model is seen to be restricted to A-1 employees, and the lower level of promotions in the combined model for Academic Support is also confined to A-1s but for the School of Medicine is limited to A-3s. The inverse relationship between promotions and age is more pronounced for A-3 employees. Black race has a p-value equal to 0.06 if it is added to the A-3 model, and the value of the regression coefficient is -0.27.

Finally, we consider pay increases during the period 1983-1987, using salary figures at the end of each fiscal year. Exhibit IV-8 displays average four-year increases disaggregate according to sex, race and employee type. The averages are calculated as geometric mean increases, in order to attenuate the impact of extreme cases and to be consistent with the use of logarithms in the regression analyses shown in Appendices IV-7, 8 and 9. Within each of the racial groups the female percentage increases were greater than those for males. Black males experienced the smallest percentage increases and Asian females the largest.

For the multiple regression analysis of pay increases we used the logarithm of salary. The dependent variable was log (1987 salary) - log (1983 salary), and independent variables were age, length of University services, race, sex, school, education and the number of grades promoted. Models were fit for the combination of A-1 and A-3 employees, and for each of the types separately. Neither race nor education was statistically significant at the 5% level in any of the three cases. (Education was dropped as an independent variable for the analyses shown in order to include all persons employed during 1983 - 1987.) For all three final models of the stepwise procedure the R-squared value exceeded 0.41.

In the combined model the number of grades promoted, service, and age accounted for more than 0.40 of this value, and sex and two schools (Wharton, where employees received increases on average 2.7% greater than the combination of schools not in the model, holding other variables fixed; and Dental Medicine, where the increases were on average 2.8% less) another 0.01. Females received average increases 1.6% greater than males, holding other variables fixed. The separate A-1 and A-3 models indicate that the greater Wharton increase was concentrated on A-3 employees, and that the greater female increase and the lower Dental Medicine decrease were concentrated on A-1s.

3. Alternative Models and Discussion

We have described regression models for A-1 and A-3 employees combined and for the two types separately. We also constructed models with employee type as a categorical variable and found it to be statistically insignificant. Nevertheless, we considered employee type to be a useful label, and for this reason (and because employee type did not capture interactions with the other independent variables) we have presented also separate models for A-1 and A-3 employees.

We concluded, after some discussion and consideration of alternative models, that age is a reasonable proxy for work experience and should be used as an independent variable. (Exclusion of age from the compa-ratio model for all employees altered the regression coefficients for race, but sex remained statistically insignificant.)

The individual case listings mentioned in Section II were examined to try to identify explanatory variables in addition to those we have described. We were unable to specify any for which even partial data were reasonably accessible.

We formed several alternative regression models to assess the robustness of our conclusions. In this we paid particular attention to the finding of modest pay differences associated with Asian and Black employees.

A regression model was also fit with the logarithm of compa-ratio as the dependent variable. There were some changes in the results. For example, the beta coefficient for Asian race increased by 10% and that for Black race decreased by 17% However, sex remained statistically insignificant. We concluded that the basic findings were unchanged and decided to retain the nonlogarithmic model for simplicity. We further examined a model with the logarithm of compa-ratio as the dependent variable and logarithms of age, service, and time in position as independent variables (instead of linear and quadratic terms for these three). The results were very similar to those obtained when the independent variables were used in polynomial form. For example, the Black race coefficient decreased by 14% and the Asian coefficient increased by 1%, and sex remained statistically insignificant. However, the R-squared value of this "log age" model was 0.03 less than that for the "polynomial age" model. Moreover, the polynomial age models for both forms of the dependent variable were consistent: one showed negative returns to age at age 54 and the other at age 55. We concluded that there was no reason to use a model with log transformation of age, service and time in position.

Exclusion of the school variables from the models did not materially alter the conclusions indicated by tests of the regression coefficients. We concluded that the school variables did not mask unexplained differences attributable to race or sex and that they were legitimate explanatory variables that enhanced the predictive power and interpretation of the models.

In the promotion analysis we also tested for an interaction between sex and race for Black employees, but found no statistical significance.

V. Summary and Conclusions

This report has studied salary, promotion, and pay increase figures for University of Pennsylvania employees who are classified as nonacademic and are not members of a bargaining unit. Multiple regression analysis was the methodology used to explore differentials between groups and to look for possible sex and race bias.

Some statistically significant sex and race variables were found. For the compa-ratio analysis, however, only two of the statistically significant differences did not involve small pay differentials, and both of these occurred in the job family analysis. Interpretation of a statistically significant difference requires some caution, because the conclusions are influenced by group sizes. In this study some of the groups are small, e.g., Asian and Hispanic races, and the findings should be viewed with this in mind. Throughout the regression analyses some of the school variables were statistically significant. Such results are to be expected, as administrative and staff structures and practices are unlikely to be uniform when there is some degree of decentralization.

Education was found to be an important variable in accounting for promotional differences. However, the lack of education data for more than 40 percent of the employees in this study precluded use of this variable in most of the regression analyses.

We recommend that the University undertake the following steps in light of this study:

—Pay and promotional group differences which were found to be statistically significant should be explored in detail, e.g., by examination of a sample of files.

—Reasons for the school differences should be investigated.

—A concerted effort should be made to expand the educational achievement information in the data base.

—This type of study should be performed in the future periodically.

Notes and Exhibits: see pages VII and VIII.

Notes and Exhibits, TPF&C Study of Salary Equity [Full-time A-1/A-3 Staff]

Exhibits, Section 1

Exhibit I-1: Biographical Sketches of Project Team Members
[In full document available at the Van Pelt Reference Desk, Rosengarten Reserve Desk, or by calling 898-6884.]

Exhibit I-2
University Personnel Interviewed for Salary Equity Study

Michael Aiken, Provost
Barbara Butterfield, VP Human Resources
Kemel Dawkins, Director Project Management
Linda Frank, Employment Manager
Sheldon Hackney, President
Susanne Iannece, Director Training and Organization Development
Frank Jackson, Compensation Specialist
Joann Mitchell, Director Affirmative Action
Anu Rao, Director Faculty/Staff Assistance Program
Adrienne Riley, Director Human Resources
Jackie Wade, Director Afro-American Studies

Sections II and III (No Exhibits.)

Exhibits, Section IV

Exhibit IV-1
Distribution of Employees by Race and Sex
Figures for 15 March 1988

Race/Sex	Percentage of A-1Employees	Percentage of A-3 Employees	Percentage of All Employees
Black females	6.7	26.6	16.6
Black males	2.5	5.5	4.0
Hispanic females	0.6	0.9	0.7
Hispanic males	0.5	0.4	0.4
Asian females	2.3	1.6	2.0
Asian males	1.6	1.1	1.4
White females	49.6	47.8	48.7
White males	36.1	15.8	26.1
Other females	--	0.2	0.1
Other males	--	--	--

Note: 4,131 employees are included in the compa-ratio regression study, and 2,020 and 2,111 in the A-1 and A-3 groups, respectively.

Exhibit IV-2
Sex, Race, and School Regression Coefficients for Combined A-1, A-3 Model and Modified A-1 and A-3 Models

Independent Variable	Modified A-1 Model	Modified A-3 Model	Combined Model
Female	-2.5*	2.8*	+
Black	-0.9	-1.8*	-1.5*
Asian	-4.8*	-1.5*	-3.6*
Arts and Sciences	-2.5*	-0.5	-1.2*
Nursing	6.1	4.9*	5.2*
Wharton	4.3*	3.2*	3.8*
Engrg and Applied Science	2.1	2.2*	2.4*
Graduate Education	1.4	7.2*	4.5*
Dental Medicine	0.0	-2.9*	-1.9*
Medicine	1.8*	1.0*	1.3*
Veterinary Medicine	0.9	-2.9*	-2.0*
R-squared	0.36	0.49	0.41
Standard Error	11.0	8.2	9.9

* Coefficient statistically significant at the 5% level.
+ The sex variable is not retained in the combined model.

Exhibit IV-3
Regression Coefficients for Sex and Race Variables in Job Family Regression Models

Job Family	Group Size	Regression Coefficient: Female	Black	Asian
General Administration (A-1)	369	-5.0* (286)	0.8 (43)	-13.9* (3)
General Clerical (A-3)	560	-0.5 (495)	-1.1 (164)	-1.5 (9)
Financial (A-1)	264	-2.1 (185)	4.8* (31)	-4.6 (10)
Data Processing (A-1)	206	1.2 (64)	-1.8 (13)	-5.9* (16)
Development/Fund Raising (A-1)	99	-10.1* (70)	+ (2)	-7.2 (3)
Student Services (A-1)	79	-2.6 (56)	-0.6 (15)	-5.2 (3)
Tech/Professional Research (A-1)	403	-3.2* (237)	-2.5 (27)	-3.0 (38)
Tech/Professional Medical and Health (A-1)	74	2.0 (66)	3.3 (4)	+ (1)
Engineering/Construction/ Facilities (A-1)	89	0.4 (13)	-8.9 (5)	+ (1)
Museum/Archival/Library (A-1)	91	-1.1 (63)	-3.8 (4)	+ (2)
Specialized University (A-1)	106	-5.4* (54)	1.4 (10)	+ (1)
Clerical Financial (A-3)	251	2.8 (218)	-1.4 (94)	-2.3 (6)
Information/Message Distribution (A-3)	96	-1.1 (81)	-2.3 (46)	+ (0)
Secretarial (A-3)	445	-1.9 (435)	-1.5* (162)	3.1 (7)
Animal Care/Tech (A-3)	111	-5.1* (71)	0.0 (28)	+ (0)
Technical Science (A-3)	294	-0.2 (187)	-1.4 (68)	-1.6 (25)

* Coefficient statistically significant at the 5% level.
+ Coefficient not displayed if number of employees is less than three.
Note: Numbers in parentheses are group sizes.

Exhibit IV-4
Promotion Rates by Race, Sex and Employee Type, 1983-1987

Race/Sex	Percentage of Employees Promoted: A-1 Employees	A-3 Employees	All Employees
Black females	53 (47)	55 (194)	55 (241)
Black males	32 (19)	29 (21)	30 (40)
Hispanic females	100 (2)	67 (3)	80 (5)
Hispanic males	50 (2)	75 (4)	67 (6)
Asian females	40 (15)	69 (13)	54 (28)
Asian males	45 (11)	17 (6)	35 (17)
White females	51 (336)	66 (396)	59 (732)
White males	45 (261)	43 (117)	44 (378)

Note: Numbers in parentheses are group sizes.

[Exhibits continued on p. VIII]

Notes and Exhibits, TPF&C Study of Salary Equity [Full-time A-1/A-3 Staff]

Exhibit IV-5
Average Number of Grades Promoted by Race, Sex and Employee Type, Promoted Employees Only
1983-1987

Race/Sex	Average Number of Grades Promoted A-1 Employees	A-3 Employees	All Employees
Black females	1.88	2.18	2.12
	(25)	(107)	(132)
Black males	1.33	1.83	1.58
	(6)	(6)	(12)
Hispanic females	1.50	2.00	1.75
	(2)	(2)	(4)
Hispanic males	1.00	2.67	2.25
	(1)	(3)	(4)
Asian females	1.83	2.67	2.33
	(6)	(9)	(15)
Asian males	1.80	3.00	2.00
	(5)	(1)	(6)
White females	1.85	2.26	2.10
	(171)	(262)	(433)
White males	2.37	2.36	2.37
	(117)	(50)	(167)

Notes: Numbers in parentheses are group sizes. Grade increments were truncated at 4 for the figures shown to minimize the impact of extreme cases. Altogether 66 employees (8.5% of all those promoted) experienced advances of 5 to 8 grades.

Exhibit IV-6
Average Number of Grades Promoted by Race, Sex and Employee Type, All Employees
1983-1987

Race/Sex	Average Number of Grades Promoted A-1 Employees	A-3 Employees	All Employees
Black females	1.00	1.20	1.16
	(47)	(194)	(241)
Black males	.42	.52	.47
	(19)	(21)	(40)
Hispanic females	1.50	1.33	1.40
	(2)	(3)	(5)
Hispanic males	.50	2.00	1.50
	(2)	(4)	(6)
Asian females	.73	1.85	1.25
	(15)	(13)	(28)
Asian males	.82	.50	.71
	(11)	(6)	(17)
White females	.94	1.49	1.24
	(336)	(396)	(732)
White males	1.06	1.01	1.04
	(261)	(117)	(378)

Notes: Numbers in parentheses are group sizes. Grade increments were truncated at 4 for the figures shown to minimize the impact of extreme cases. Altogether 66 employees (8.5% of all those promoted) experienced advances of 5 to 8 grades.

Exhibit IV-7
Difference From Grade Average of Years of Education by Race, Sex, and Employee Type

Race/Sex	Average Difference in Years A-1 Employees	A-3 Employees	All Employees
Black females	-.56	-.25	-.33
	(37)	(114)	(151)
Black males	-1.42	-.63	-1.04
	(16)	(15)	(31)
Hispanic females	1.44	.76	1.03
	(2)	(3)	(50)
Hispanic males	1.58	.88	1.16
	(2)	(4)	(6)
Asian females	1.33	1.79	1.52
	(15)	(10)	(25)
Asian males	2.55	1.57	2.39
	(10)	(2)	(12)
White females	-.02	.00	-.01
	(271)	(238)	(509)
White males	-.01	.18	.04
	(236)	(70)	(306)

Note: Numbers in parentheses are group sizes.

Exhibit IV-8
Average Salary Increase by Race, Sex, and Employee Type
1983-1987

Race/Sex	Average Percentage Increase* A-1 Employees	A-3 Employees	All Employees
Black females	36.0	35.9	35.9
	(46)	(187)	(233)
Black males	28.7	30.0	29.3
	(19)	(20)	(39)
Hispanic females	41.3	32.2	35.8
	(2)	(3)	(5)
Hispanic males	32.4	32.5	32.5
	(2)	(4)	(6)
Asian females	32.8	47.1	39.3
	(15)	(13)	(28)
Asian males	32.1	34.2	32.8
	(11)	(6)	(17)
White females	36.9	37.8	37.4
	(329)	(378)	(707)
White males	32.1	33.5	32.6
	(257)	(113)	(370)

* Average salary increase is calculated as the geometric mean increase, to minimize the impact of extreme cases and to be consistent with the regression analysis displayed in Appendices IV-7, 8, 9.

Note: Numbers in parentheses are group sizes.

Appendices I through IX: Regression analyses of A-1, A-3, and All Employees.

[In full document available at Van Pelt Reference Desk, Rosengarten Reserve Desk or call 898-6884.]