

## SPECIAL FEATURE

## NIH awards to individual members of FASEB societies: an initial examination

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**ABSTRACT** Data from the *FASEB Directory of Members* were merged with information on NIH extramural awards to determine the percentage of FASEB society members who are principal investigators on NIH grants. Analysis of FY 1994 data reveals that FASEB society members earned 30.3% of all NIH awards and 38.8% of the R01 awards. Nineteen percent of the total membership of the nine FASEB societies were NIH principal investigators in FY 1994. This fraction rises to 21.6% when student and emeritus members are excluded. When adjustments are made for the fraction of the membership in government and industrial organizations, more than one-fourth of the academically based members are NIH principal investigators in FY 1994. Although the examination of principal investigators cannot document the full extent of NIH awards to members of FASEB societies (it was not possible to identify all of the scientists, postdoctoral fellows, and students supported through these grants), the study clearly delineates the magnitude of one essential part of the larger system of research support.—Garrison, H. H., Heinig, S. J. NIH awards to individual members of FASEB societies: an initial examination. *FASEB J.* 9, 703–706 (1995)

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INFORMATION ABOUT THE RESEARCH ACTIVITIES of scientists belonging to societies of the Federation of American Societies for Experimental Biology is useful in several contexts. More and better data about the activities of working scientists can improve advocacy efforts on behalf of research funding, discussions of employment and training policy, and planning for future public policy initiatives.

In meetings with congressional staff, FASEB leaders found that the federation's influence was viewed as a function of the number of individual members and their economic impact. More data on the characteristics, activities, and accomplishments of the membership will demonstrate the importance of FASEB's positions on policy issues.

The principal sources of career information on scientists are the National Science Foundation (NSF) databases, which focus on those who have Ph.D.s; they do not include

scientists without this degree. This is a serious limitation for studies of biomedical research.<sup>2</sup> Agencies like NIH that sponsor training are restricted in their ability to follow the career outcomes of their former trainees and fellows. The grouping of data into broad fields (the biomedical sciences are often combined with other fields into a single "life sciences" category) and the delay in processing and publishing NSF data compound the problem, as the issues under study are known to vary across fields and over time. Better data on biomedical scientists would provide a stronger basis for training policy decisions.

More information on members of FASEB societies would also be helpful in developing public policy positions and identifying issues. Better data on members could be used to target FASEB's public affairs program, prioritize initiatives, and set a long-range agenda.

In September 1994, the FASEB Board of Directors discussed the value of developing additional data while voicing concerns about protecting privacy, maintaining confidentiality of databases, and limiting the burden on the membership for reporting information. The Board authorized the Office of Policy Analysis and Research to merge data published in the *FASEB Directory* with data from NIH public-access files to determine the number of FASEB society members who are NIH principal investigators. This information would answer two questions: What percentage of the NIH awards go to individual members of FASEB societies and what percentage of these members have NIH grants?

### DATA AND METHODS

Data on members of FASEB societies were obtained from the files used to create the *FASEB Directory*. Only publish-

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<sup>2</sup>Scientists with degrees other than the Ph.D. comprise a sizable percentage of the biomedical researchers. In a sample of 600 listings taken at random from the *FASEB Directory of Members* (1994–1995), 541 individuals (90.2%) reported their degree type. Of these, 421 (77.8%) have a Ph.D. or M.D./Ph.D. The remaining 120 scientists (22.2%) have M.D., D.V.M., D.D.S., or other degrees only and are not captured in NSF studies of scientists based only on Ph.D. samples.

TABLE 1. NIH research awards to individual members of FASEB societies by type, FY 1994

| Code         | Activity                                  | Number of awards | Number of awards to FASEB society members | Percentage of awards to FASEB society members |
|--------------|---|------------------|---|---|
| R01          | Research projects (traditional)           | 19,111           | 7,408                                     | 38.8%   |
| Other R      | Research projects                         | 6,494            | 1,839                                     | 28.3%   |
| N            | Research and research-related contracts   | 2,611            | 0   | 0.0%  |
| P            | Research program projects and centers     | 1,935            | 764                                       | 39.5%   |
| K            | Research career                           | 1,973            | 225                                       | 11.4%   |
| U            | Cooperative agreements                    | 1,634            | 232                                       | 14.2%   |
| S            | Research-related programs                 | 817              | 236                                       | 28.9%   |
| Y            | Interagency/intraagency agreements        | 763              | 0   | 0.0%  |
| M            | General clinical research centers program | 115              | 35  | 30.4%   |
| G            | Resource programs                         | 34               | 3   | 8.8%  |
| D            | Training projects                         | 25               | 6   | 24.0%   |
| <b>Total</b> |   | <b>35,512</b>    | <b>10,748</b>                             | <b>30.3%</b>                                  |

ed information was used, and no additional information was collected from individual members or corporate societies. The entries in the directory include names, degrees, title, address, and telephone numbers. The address is typically a work address, consisting of institution and department as well as street address, city, state, and zip code.

A listing of all NIH awards for FY 1994 was obtained from the Division of Research Grants. For this study we used the principal investigator's name, institution, address, award number, and monetary amount of award. As public information, these data are available in several NIH online data files.

The NIH file contained records of 35,512 awards representing grants to 24,754 different individuals in FY 1994. The 35,512 awards range from traditional Research Project Grants (R01) to research-related programs such as the Minority High School Student Research Apprentice Programs (S03). A summary of the awards included in the study is presented in **Table 1**. More than half of the grants were R01s. The remainder included other research grants, research contracts, research centers, career grants, cooperative agreements, and a variety of other less common funding mechanisms.

The two files were matched and merged by FASEB's Data Processing Office, which compiles the FASEB Directory from information provided by the member societies. At the time of this analysis in December 1994, the directory file consisted of 38,394 entries from the membership records of the nine FASEB societies.

The records in the FASEB and NIH files were merged by last name and first initial alone and then by last name and first initial plus the first two digits of the zip code. The second and more conservative approach was performed to reduce the likelihood of false-positive matches. The results for both approaches were very similar, differing by no more than 400 cases. For discussion, the more conservative name and zip code merge is used even though some true matches may be excluded.

To test the accuracy of the merge process, a random sample of 600 matching records was drawn and subjected to intensive manual verification. None of the matched re-

cords were determined to be in error. In 587 of 600 cases, the full names were the same and the full institutional affiliations and/or telephone numbers matched. For 13 cases, the full names matched but there were differences in institutional addresses. After closer examination of the full address record for these cases we concluded that the individuals were the same.<sup>3</sup> An error rate of less than 1.0% was found in the sample of 600 cases, and the probability is greater than .99 that the true (population) error rate does not exceed the estimated (sample) error rate by .001.

## RESULTS

FASEB's share of the NIH awards can be measured by the number of grants awarded to its (society) members, the amount of funding received, and number of unduplicated award recipients. Results from each approach are very similar. In FY 1994, members of FASEB societies received 10,748 grants from NIH, or 30.3% of the 35,512 grants awarded (**Table 1**). Expressed in terms of funding levels, FASEB society members (individual) received \$2.743 billion of the \$8.975 billion awarded by NIH in FY 1994 (**Table 2**). This represents 30.6% of the total, indicating that the awards made to society members were, on average, of the same monetary amount as those awarded to other grantees.

Although some scientists receive more than one grant, counting the number of grant recipients does not alter the basic findings. When those with multiple awards were counted only once, the 7,309 award recipients from the FASEB societies comprised 29.6% of the 24,754 NIH award recipients. The 7,307 grantees represent 19.0% of

<sup>3</sup>Five of the variations in address were due to reporting departments or programs rather than larger institutions in one of the data files. In three cases, street or building addresses without institutional names were listed in one file, and institutional designations were given in another. Three researchers were affiliated with a university in one file and a VA or teaching hospital in the other. Different affiliations in the same locality were reported in two cases.

TABLE 2. NIH research funds awarded to members of FASEB societies by award type, FY 1994

| Code         | Activity                        | Funding (dollars)      | Funding awarded to FASEB society members | Percentage of funding awarded to FASEB society members |
|--------------|---------------------------------|------------------------|--|--|
| R01          | Research projects (traditional) | \$3,954,343,159        | \$1,477,865,324                          | 37.4%  |
| Other        | All Other Activities            | \$5,020,912,756        | \$1,265,609,324                          | 25.2%  |
| <b>Total</b> |                                 | <b>\$8,975,255,915</b> | <b>\$2,743,474,648</b>                   | <b>30.6%</b>   |

the total membership of the nine FASEB societies (Table 3). Several FASEB societies have emeritus and student members. Excluding 2,885 emeritus members and 2,063 student members from the analysis, 21.6% of the members (7,234 out of 33,446) are FY 1994 NIH principal investigators.

Although FASEB society members do not differ from the average NIH awardee in terms of the size of their awards or the likelihood of multiple awards, they are more likely to receive certain types of awards (research project grants) and less likely to receive others (career development awards and cooperative agreements). Almost 39% of traditional research project grants (R01s) are awarded to members of FASEB societies, who also receive 37.4% of the total funds for R01 grants. The percentage of NIH program project and center grants (P series) awarded to FASEB society members is 39.5%. FASEB members receive much smaller fractions of the K series research career awards (11.4%) and cooperative agreements (14.2%).

Two factors explain the relatively low representation of FASEB members in the K series awards. The most important is the shift over time in the allocation of awards across various components of the series (Table 4). In 1978, the Modified Research Career Development Awards (K04) were the largest components of the series, accounting for 983 of 1,425 individuals supported (69.0%) and a nearly identical fraction (68.9%) of the total dollars awarded. By 1994, however, the emphasis in the K series awards had changed, with far more support going to the clinician and physician scientist programs. The K04 awards comprised only 212 of 1,920 awards in FY 1994 (11.0%) and \$14.1 million of the total of \$161.8 million (8.7%) awarded to individuals. During this same period, NIH also established institutionally based programs for the development of physician and dental scientists. When the \$15.6 million for these programs is included, the K04 awards comprised only

8.0% of the total \$177.4 million awarded for K series grants in FY 1994.

Another factor contributing to the relatively low representation of FASEB society members in K series awards is the inclusion in the total of several awards from institutes of the former Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). These institutes (NIMH, NIDA, and NIAAA) support a relatively large number of K series awards, whereas relatively few FASEB society members are funded by these institutes. In 1994, the former ADAMHA institutes made 20.4% of the all K series awards to individuals. In FY 1994, only 2.4% of the NIH awards to FASEB society members were from former ADAMHA institutes.

As a further validation of the patterns reported, a similar analysis was conducted for FY 1993 grants. The findings were very stable and virtually identical to those for FY 1994.

## QUALIFICATIONS

The percentage of FASEB society members who are NIH principal investigators in FY 1994—21.6%—clearly underestimates the importance of NIH funding for FASEB society members. Only principal investigators are included in this calculation. Because many of the grants provide research support for coinvestigators, subproject investigators, senior scientists, postdocs, graduate students, and other collaborators, many of whom belong to FASEB societies, the full number of FASEB members receiving NIH research support is much larger than the number reported in this analysis.

Some FASEB society members work for government or industrial organizations and (except for a few interagency or small business grants) are unlikely to apply for NIH grant funding. A conservative estimate based on an analysis of members' mailing addresses indicates that at least 15% of

TABLE 3. FASEB society members with NIH grants

|  |          | FASEB society members | FASEB society members with NIH grants (FY 194) | Other FASEB society members |
|--|----------|-----------------------|--|-----------------------------|
| All members                            | <i>n</i> | 38,394                | 7,307  | 31,087                      |
|  | %        | 100.0%                | 19.0%  | 81.0%                       |
| Excluding emeritus and student members | <i>n</i> | 33,446                | 7,234  | 26,212                      |
|  | %        | 100.0%                | 21.6%  | 78.4%                       |

TABLE 4. Distribution of NIH career development awards (K series) by types, 1978–1994

| Award type   | 1978         |               | 1994         |               |
|--|--------------|---------------|--------------|---------------|
|  | N            | %             | N            | %             |
| K01—Research scientist development award, research, and training     | 30           | 2.1%          | 51           | 2.7%          |
| K02—Research scientists development award, research (ADAMHA)         | 81           | 5.7%          | 147          | 7.7%          |
| K04—Modified research career development                             | 983          | 69.0%         | 212          | 11.0%         |
| K05—Research scientist award (ADAMHA)                                | 52           | 3.6%          | 131          | 6.8%          |
| K06—Research career award  | 105          | 7.4%          | 10           | 0.5%          |
| K07—Academic/teacher   | 99           | 6.9%          | 151          | 7.9%          |
| K08—Clinical investigator  | 68           | 4.8%          | 736          | 38.3%         |
| K10—Special scientific projects                                      | 7            | 0.5%          | 0            | 0.0%          |
| K11—Physician scientist <sup>a</sup>                                 | —            | —             | 314          | 16.4%         |
| K14—Minority school faculty development award <sup>a</sup>           | —            | —             | 29           | 1.5%          |
| K15—Dentist scientist <sup>a</sup>                                   | —            | —             | 20           | 1.0%          |
| K17—Research career reentry program <sup>a</sup>                     | —            | —             | 7            | 0.4%          |
| K20—Scientist development award for clinicians (ADAMHA) <sup>a</sup> | —            | —             | 65           | 3.4%          |
| K21—Scientist development award (ADAMHA) <sup>a</sup>                | —            | —             | 47           | 2.4%          |
| <b>Total</b>   | <b>1,425</b> | <b>100.0%</b> | <b>1,920</b> | <b>100.0%</b> |

<sup>a</sup>These programs did not exist in 1978.

FASEB members work in industry or government. (Scientists at VA medical centers are eligible for NIH funding and were not counted as government employees in this tally.) Adjusting for the estimated percentage of members in government or industry raises the fraction of NIH principal investigators to more than one-fourth of the total “academic” membership. This is still a conservative count, because a certain (again, unknown) percentage of the academically employed scientists are also in administrative positions and therefore less likely to apply for research funding.

Some legitimate matches may have been excluded due to the imposition of the matching two-digit zip code criterion. The zip code criterion is particularly vulnerable to false-negative classifications in metropolitan areas covering more than one state, where nearby localities have numerically distant zip codes. In addition to the variation in reporting addresses and the existence of multiple affiliations, recent relocations could also cause true matches to fail the zip code criterion.

## DISCUSSION AND CONCLUSIONS

Data from FASEB societies provide a valuable perspective on the federation, its nine constituent societies, and their individual members. This information can also be developed into a unique source of data on policy issues of concern to the scientific research community.

Members of FASEB societies account for a substantial fraction (29.6%) of the recipients of NIH awards. In FY 1994, 21.6% of the FASEB society members (excluding students and emeritus members) have NIH awards. When this percentage was adjusted to account for the members of FASEB societies working in government or industry, more than one-fourth of the eligible total were NIH principal investigators in FY 1994. These relationships identify only one facet of a more extensive network of support in which NIH research grants support coinvestigators, subproject investi-

gators, senior scientists, postdoctoral fellows, and graduate students. The results of this study cannot document the full effect of NIH support for FASEB society members, but they do underscore the common interests of FASEB and NIH.

Data from FASEB societies may provide further insight into questions of broader professional interest. More information is needed on the career activities of biomedical scientists. Kennedy (1) concluded that current data on careers in the biosciences constitute a good beginning but still leave an information gap. The National Research Council (NRC) Committee on Funding of Young Investigators in the Biological and Biomedical Sciences found a paucity of data on the career paths and funding of young scientists (2). The NRC Committee on National Needs for Biomedical and Behavioral Research Personnel reported that one of its most significant findings was the lack of general information about predoctoral and postdoctoral training programs for biomedical and behavioral scientists (3). The FASEB database has the potential to provide much needed information on biomedical scientists because no other source captures information on so many scientists who hold degrees other than the Ph.D. [FJ]

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