Science and Engineering Careers
in the United States
RICHARD B. FREEMAN holds the Herbert Ascherman Chair in Economics at Harvard University and is currently serving as faculty director of the Labor and Worklife Program at Harvard Law School. He is director of the Labor Studies Program at the National Bureau of Economic Research. DANIEL L. GOROFF is professor of mathematics and economics at Harvey Mudd College, where he previously served as vice president for academic affairs and dean of the faculty. He codirects the Sloan Scientific and Engineering Workforce Project at the National Bureau of Economic Research.
National Bureau of Economic Research

Officers
John S. Clarkeson, *chairman*  Kelly Horak, *controller and assistant corporate secretary*
Kathleen B. Cooper, *vice-chairman*  Alterra Milone, *corporate secretary*
James M. Poterba, *president and chief executive officer*  Gerardine Johnson, *assistant corporate secretary*
Robert Mednick, *treasurer*

Directors at Large
Peter C. Aldrich  Jessica P. Einhorn  Alicia H. Munnell
Elizabeth E. Bailey  Mohamed El-Erian  Rudolph A. Oswald
Richard B. Berner  Jacob A. Frenkel  Robert T. Parry
John H. Biggs  Judith M. Gueron  James M. Poterba
John S. Clarkeson  Robert S. Hamada  John S. Reed
Don R. Conlan  Karen N. Horn  Marina v. N. Whitman
Kathleen B. Cooper  John Lipsky  Martin B. Zimmerman
Charles H. Dallara  Laurence H. Meyer
George C. Eads  Michael H. Moskow

Directors by University Appointment
George Akerlof, *California, Berkeley*  Joel Mokyr, *Northwestern*
Jagdish Bhagwati, *Columbia*  Andrew Postlewaite, *Pennsylvania*
Glen G. Cain, *Wisconsin*  Uwe E. Reinhardt, *Princeton*
Ray C. Fair, *Yale*  Nathan Rosenberg, *Stanford*
Franklin Fisher, *Massachusetts Institute of Technology*  Craig Swan, *Minnesota*
Mark Grinblatt, *California, Los Angeles*  David B. Yoffie, *Harvard*
Saul H. Hyman, *Michigan*  Arnold Zellner (Director Emeritus), *Chicago*
Marjorie B. McElroy, *Duke*

Directors by Appointment of Other Organizations
Martin Gruber, *American Finance Association*  Angelo Melino, *Canadian Economics Association*
Timothy W. Guinnane, *Economic History Association*  Harvey Rosenblum, *National Association for Business Economics*
Thea Lee, *American Federation of Labor and Congress of Industrial Organizations*

Directors Emeriti
Andrew Brimmer  Franklin A. Lindsay  Eli Shapiro
Carl F. Christ  Paul W. McCracken  Arnold Zellner
George Hatsopoulos  Peter G. Peterson
Lawrence R. Klein  Richard N. Rosett
Relation of the Directors to the
Work and Publications of the
National Bureau of Economic Research

1. The object of the NBER is to ascertain and present to the economics profession, and to
the public more generally, important economic facts and their interpretation in a scientific
manner without policy recommendations. The Board of Directors is charged with the respon-
sibility of ensuring that the work of the NBER is carried on in strict conformity with this ob-
ject.

2. The President shall establish an internal review process to ensure that book manuscripts
proposed for publication DO NOT contain policy recommendations. This shall apply both to
the proceedings of conferences and to manuscripts by a single author or by one or more co-
authors but shall not apply to authors of comments at NBER conferences who are not NBER
affiliates.

3. No book manuscript reporting research shall be published by the NBER until the Presi-
dent has sent to each member of the Board a notice that a manuscript is recommended for pub-
lication and that in the President’s opinion it is suitable for publication in accordance with the
above principles of the NBER. Such notification will include a table of contents and an ab-
stract or summary of the manuscript’s content, a list of contributors if applicable, and a re-
sponse form for use by Directors who desire a copy of the manuscript for review. Each manu-
script shall contain a summary drawing attention to the nature and treatment of the problem
studied and the main conclusions reached.

4. No volume shall be published until forty-five days have elapsed from the above notifica-
tion of intention to publish it. During this period a copy shall be sent to any Director request-
ing it, and if any Director objects to publication on the grounds that the manuscript contains
policy recommendations, the objection will be presented to the author(s) or editor(s). In case
of dispute, all members of the Board shall be notified, and the President shall appoint an ad
hoc committee of the Board to decide the matter; thirty days additional shall be granted for
this purpose.

5. The President shall present annually to the Board a report describing the internal manu-
script review process, any objections made by Directors before publication or by anyone after
publication, any disputes about such matters, and how they were handled.

6. Publications of the NBER issued for informational purposes concerning the work of the
Bureau, or issued to inform the public of the activities at the Bureau, including but not limited
to the NBER Digest and Reporter, shall be consistent with the object stated in paragraph 1.
They shall contain a specific disclaimer noting that they have not passed through the review
procedures required in this resolution. The Executive Committee of the Board is charged with
the review of all such publications from time to time.

7. NBER working papers and manuscripts distributed on the Bureau’s web site are not
deemed to be publications for the purpose of this resolution, but they shall be consistent with
the object stated in paragraph 1. Working papers shall contain a specific disclaimer noting that
they have not passed through the review procedures required in this resolution. The NBER’s
web site shall contain a similar disclaimer. The President shall establish an internal review pro-
cess to ensure that the working papers and the web site do not contain policy recommenda-
tions, and shall report annually to the Board on this process and any concerns raised in con-
nection with it.

8. Unless otherwise determined by the Board or exempted by the terms of paragraphs 6 and
7, a copy of this resolution shall be printed in each NBER publication as described in para-
graph 2 above.
Contents

Acknowledgments ix

Introduction 1
Richard B. Freeman and Daniel L. Goroff

I. Supply of Students and Postdoctoral Fellows to Science and Engineering

1. Supporting “The Best and Brightest” in Science and Engineering: NSF Graduate Research Fellowships 19
Richard B. Freeman, Tanwin Chang, and Hanley Chiang

2. Internationalization of U.S. Doctorate Education 59
John Bound, Sarah Turner, and Patrick Walsh

3. Improving the Postdoctoral Experience: An Empirical Approach 99
Geoff Davis

II. Careers in Changing Markets

4. Immigration in High-Skill Labor Markets: The Impact of Foreign Students on the Earnings of Doctorates 131
George J. Borjas
   Donna K. Ginther and Shulamit Kahn

6. Patterns of Male and Female Scientific Dissemination in Public and Private Science
   Kjersten Bunker Whittington

7. Educational Mismatch among Ph.D.s: Determinants and Consequences
   Keith A. Bender and John S. Heywood

8. Capturing Knowledge: The Location Decision of New Ph.D.s Working in Industry
   Albert J. Sumell, Paula E. Stephan, and James D. Adams

III. Creation and Use of Knowledge

   Cyrus C. M. Mody

10. International Knowledge Flows: Evidence from an Inventor-Firm Matched Data Set
    Jinyoung Kim, Sangjoon John Lee, and Gerald Marschke

11. The Growing Allocative Inefficiency of the U.S. Higher Education Sector
    James D. Adams and J. Roger Clemmons

Contributors
Author Index
Subject Index
This study was supported by the Alfred P. Sloan Foundation as part of the Science and Engineering Workforce Project (http://www.nber.org/~sewp/). We benefitted greatly from many meetings and discussions with a wide variety of scientists, policymakers, and business and labor groups concerned with U.S. scientific and engineering work and the economic status of scientists and engineers. Michael Teitlebaum of the Sloan Foundation was particularly helpful in our work.