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RADCLIFFE COLLEGE

The Mary Ingraham Bunting Institute  
Radcliffe Research and Study Center  
34 Concord Avenue, Cambridge, Massachusetts 02138 (617) 495-8212



THE MARY INGRAHAM BUNTING INSTITUTE  
OF RADCLIFFE COLLEGE

TECHNICAL REPORT  
ONR GRANT #N00014-89-J-3112  
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Prepared by Florence C. Ladd, Director  
Principal Investigator  
and  
Linda Eisenmann, Assistant Director  
Bunting Institute

This technical report for the 1992 Science Scholars Program at the Bunting Institute of Radcliffe College describes the 1992 Science Scholars, who were fellows of the Bunting Institute during the 1991-92 academic year. It provides a description of the program and the fellows; the scholars' evaluations of the fellowship year; highlights and events of the program year; and issues involved in the program. The report then describes the selection process for the 1993 Science Scholars, and lists the incoming fellows. Appendices contain the scholars' publications, evaluations, reports, and other materials.

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for public release and sale; its  
distribution is unlimited.

\* Beginning with the 1991-92 academic year, the Bunting Institute shifted its fellowship year to coincide with the academic rather than the fiscal year. The appointment cycle will now be September 1 - August 31. This change is explained in the text at page 2.

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## 1992 Program

### Program Background

Funding from the Office of Naval Research supported nine 1992 Science Scholars via eight fellowships during the 1991-92 academic year. When one scientist, biologist Elena Budrene, received late notice of partial funding from a grant at her laboratory, her Bunting stipend was split to allow another fellow, biologist Doris Naimark Stern, to remain at Bunting for a second year using the remainder of that stipend. Thus, nine fellows were funded with eight stipends. Three of the scientists -- biologists Elena Budrene and Doris Stern, and geologist Constance Soja -- had also been fellows during the 1990-91 fellowship year.

Beginning with the 1991-92 academic year, the Bunting Institute shifted its appointment cycle to coincide with the academic rather than the fiscal calendar, a decision which benefits both the scholars and the Institute. However, since the change had not been advertised at the start of the selection process, the Institute offered incoming fellows the option to elect either a July 1, 1991 - June 30, 1992 or a September 1, 1991 - August 31, 1992 fellowship year. The three Science Scholars who were continuing for a second year all elected to begin their 1992 year on July 1, 1991; the five new Science Scholars all chose a September 1, 1991 starting date.

The 1992 stipend was \$30,000, and an additional \$3000 was made available to each fellow as a discretionary fund for support of her research. Each scientist had office space at the Bunting Institute. Eight of the 1991-92 scientists were laboratory-based, and made affiliations with Harvard University labs; Tufts University, Brown University, and the Marine Biological Laboratory at Woods Hole were also part-time sites for fellows' work. The ninth fellow was writing her results into a book, and did not need a laboratory affiliation.

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### **1991-92 Science Scholars**

The 1991-92 Science Scholars, with their initial affiliations and project titles, included:

**Elena O. Budrene, Molecular Biology, Harvard University**  
"Complex Patterns Formed by Chemotactic Bacteria"

**Gladys Friedler, Psychopharmacology, Boston University**  
School of Medicine  
"Paternal Effects on Fetal and Postnatal Development"

**Janet Rankin, Materials Science, Oak Ridge National**  
Laboratory  
"The Evolution and Characterization of Textured  
Microstructures in Thin Films"

**Orna Resnekov, Molecular Biology, Karolinska Institute,**  
Sweden  
"The Involvement of Post-Transcriptional Control in the  
Regulation of Cell Differentiation in Bacillus Subtilis"

**Sonja Sandberg, Mathematics, Framingham State College**  
"Understanding Lyme Disease Using Mathematical Models"

**Barbara Moths Sheffels, Geology and Geophysics, Harvard**  
University  
"Constraints on Intracontinental Subduction and Oroclinal  
Bending in the Bolivian Andes from Balanced Cross Sections"

**Constance M. Soja, Geology, Harvard University**  
"Tectonic Controls on Reef Development During the Silurian"

**Doris Naimark Stern, Biological Sciences, Forsyth Dental**  
Center  
"The Effects of Innervation on Early Tooth Development"

**Marja Kien White, Biochemistry, Tufts School of Veterinary**  
Medicine and Marine Biological Laboratory  
"The Role of Sialic Acid in the Carcinogenesis of Leukemia  
in the Soft Shell Clam, Mya Arenaria"

## **Scholars' Evaluations**

The 1991-92 cohort of Science Scholars unanimously cited the success of their Institute fellowship year. They noted several factors particular to the fellowship at the Bunting Institute which contributed to their satisfaction.

1. **Freedom and support to follow research ideas.** Always one of the most positive results that scholars report from their Bunting fellowship year is the freedom and support they receive to follow their research agendas. For some women, the Science Fellowship comes at a time when they otherwise would have no or insufficient funding. The Bunting stipend, office, and research fund allow them to carry their work in the directions they choose, rather than making them dependent on the projects available at their laboratories. Psychopharmacologist Gladys Friedler, biologist Doris Stern, and biochemist Marja White all commented on the importance of the Institute's independent funding for the furtherance of their scientific agendas as they tried to strengthen their home laboratory situations.

For other better-situated scholars like geologists Constance Soja and Barbara Sheffels, and molecular biologists Elena Budrene and Orna Resnekov, the independent funding allowed for strong collaborations on projects important to their career plans. As Soja noted:

The time I spent at the Bunting Institute was critical in revitalizing my career. For the first time in many years, I had the opportunity to focus on my research without having teaching and other academic responsibilities. The Bunting Institute and the grant from ONR provided the physical and financial support necessary to complete significant research and to venture into new and unexplored scholarship areas.

2. **Exposure to Harvard laboratories.** The particular resources and personnel available at Harvard University provide a strong benefit to many of the scholars. For mathematician Sonja Sandberg, the Bunting year gave her the opportunity to collaborate with colleagues at the Harvard School of Public Health on her Lyme Disease project, a partnership that had been less productive from her home institution, and which blossomed during the fellowship year. Geologist Constance Soja noted that her laboratory affiliation with Dr. Raymond Siever prompted not only important insights into her work but also provided her access to a graduate seminar; "some of these discussions," she noted, "helped me formulate questions and consolidate ideas for a paper that I wrote during the second part of my fellowship year."

**3. Value of work with Bunting non-scientists.** The most unusual part of the Bunting fellowship, and one rarely available to scientists, is the opportunity to work in such a large multidisciplinary setting with other accomplished scholars. The 1991-92 cohort commended this aspect of the Bunting year as one of the most significant. Geologist Soja explained the benefits:

The chance to interact with a wonderfully diverse group of professional women was of immeasurable benefit because it showed that Bunting fellows and staff all share at least one common goal, which is to advance the recognition of women's accomplishments in their respective fields."

Geneticist Orna Resnekov noted:

I am not sure that I would have done the program if I was not offered the opportunity to have an association with the Bunting Institute. To me, the support and constructive criticism of a truly talented group of non-scientists was very valuable.

**4. Professional and personal enhancement.** The combination of a supportive environment and resources provided considerable enhancement for several of the fellows. Gladys Friedler said, "My year as a Science Scholar at the Bunting Institute provided me with opportunities and experiences that I could not have obtained elsewhere." She summarized: "It was truly one of the most -- if not the most -- significant and important experiences in my professional life: self-realizing, rewarding, intellectually probing." Materials scientist Janet Rankin agreed, citing the particular benefits provided by the all-female environment: "I found that phenomenon refreshing, fortifying, and comforting." All of the women who commented on this sense of support found that it translated into more productive science.

**5. Support for a second, consecutive year of funding.** Three of the nine Science Scholars were on a second year of funding at the Institute, and each found her career opportunities strengthened by the extended funding. Biologist Elena Budrene was able to consolidate her position in the Harvard laboratory of Professor Howard Berg, and now has partial funding on one of his grants. Biologist Doris Stern used the year to prepare and submit several grant proposals.

The second year was most immediately successful for geologist Constance Soja, whose job hunting the prior year had been thwarted by several job offers for which the funding had been "frozen" by the campuses. At the close of the 1991-92 year, she was offered two tenure-track positions, and chose the Department of Geology at Colgate University, a small research university that is most appropriate to the scope of her work.

## **Program Highlights, 1991-92**

**1. Increase in Stipend Level.** As the result of the successful application by the Bunting Institute to ONR for an increase in the annual stipend provided to Science Scholars, the 1991-92 cohort received a salary of \$30,000 (rather than the \$27,600 that had been planned for that year). This increase brings the program more into line with other science fellowship programs and increases the likelihood of drawing talented, experienced scientists to the Bunting Institute.

**2. Establishment of the Radcliffe Research Partnerships.** A new program inaugurated by Radcliffe College in 1991 proved of strong benefit to the Bunting Science Scholars. The Radcliffe Research Partnerships provide an opportunity for a female Harvard/Radcliffe undergraduate to work as a junior research partner with a Bunting fellow (or another visiting scholar at Radcliffe College).

This program recognizes that the Bunting scholars are a strong complement to the female faculty of Harvard University, and provide an additional opportunity for undergraduates to learn about the rewards and demands of research. The partnerships are a paid work program wherein students apply to work as junior colleagues with senior researchers. The senior scholars interview and select students for a one- or two-semester partnership.

One strong feature of the program is its insistence on a real research basis to the work, rather than seeing these students as an extra set of hands for xeroxing or retrieving books and articles. Depending on the nature and stage of the research project, students receive exposure to formulating research questions, conducting investigations, analyzing data, or writing reports.

In 1991-92, three Science Scholars made excellent use of this new College program: Elena Budrene, Janet Rankin, and Doris Stern.

**3. Clarification of appointment renewals/applications.** The Science Scholars Program has differed over its history on the issue of Scholars being eligible for a second, consecutive year of funding. Initially, scholars could apply for two years of funding at the outset. Over time, the program administrators found that some scholars seemed not to need two years to complete the projects proposed; new applicants often presented stronger cases for funding. For the next few years, Science reapplications were treated in the same manner as other Bunting requests for renewal: scholars presented their case to the

Institute director, and she decided each request on its merits, after consulting with program advisors.

In 1991, the Institute Advisory Committee recommended that, with the exception of Science Scholars, Bunting fellows not be eligible for a second, consecutive year of support. The Science Scholars were excepted because of the disruption in productivity that is often caused by relocating a laboratory or research project to a new site at Harvard.

Beginning with the 1991-92 cohort, Science Scholars requesting a second year are asked to reapply to the Science Committee, and to present progress reports on their research. Their requests are considered along with new applications. This procedure seems more fair to all concerned by allowing the committee to consider the reapplicants on the basis of need and progress, and the new applicants in comparison to those needs. This clarification should help future incoming Science Scholars with their plans and expectations.

**4. Radcliffe College Summer Intern.** Radcliffe College provided funding for a very profitable 10-week internship in the summer of 1991 by Harvard/Radcliffe sophomore Sarah Elson, a double major in Biology and the History of Science. The main goal of the internship was to enhance the "outreach" of the Science Scholars Program, making it more widely known and better able to draw from a wider circle of applicants.

Ms. Elson's work was very successful. A brief report on her activities (without the appendices of lists and names that she submitted to the Bunting Institute) is included herein.

Through letters and telephone calls to more than 50 organizations and dozens of science departments, Ms. Elson enhanced the program's visibility with professional science associations, science publications, special interest groups (e.g., Committee on the Status of Women in Physics, Association for Women in Computing), and influential individual chairs and science faculty.

Ms. Elson's other major project was to update and increase our list of reviewers for science applications. Because many science applications are quite specialized, we require a large pool of potential jurors. She mailed information to more than 250 science faculty members around the country.

We trust that, over time, awareness of our program will increase through these outreach efforts.

**5. Gender and Science Study group.** For the past several years, the Science Scholars have met regularly to consider together issues related to gender and science. The 1991-92

cohort met every 2-3 weeks for a combination of shared readings and general discussion, including a review of Science magazine's first special issue on Women in Science. The group, which occasionally invited guests from outside the Bunting community, enjoyed particularly lively discussions of the Zuckerman, Cole, and Bruer book, The Outer Circle: Women in the Scientific Community, and Londa Schiebinger's The Mind Has No Sex.

6. Visit by Vivian Pinn, M.D. In December, the Bunting scientists met with Dr. Vivian Pinn, Director of the Women's Health Initiative at the National Institutes of Health. Dr. Pinn was visiting Radcliffe College to present the Fay Golden Kass Lecture, and asked to visit the Bunting Institute to learn more about our fellowship program and the various projects being undertaken by Bunting scholars in various aspects of science, health science, and medicine. Some of our scholars joined Dr. Pinn for dinner on the evening of her lecture; others met with her informally at the Institute on the day following her presentation.



## Continuing Issues/Concerns

**1. Integration of Science Scholars with Bunting community.** An ongoing issue for many Science Scholars is how to stay connected with the scholarly and social community of the Bunting Institute when their laboratory and other research demands make it difficult to spend time on site at the Institute. As demonstrated herein and in previous years, Science Scholars always cite the interchange of ideas among women of various disciplines as one of the greatest benefits of their Institute year. Yet, a lab-based or field-based project may limit a scientist's ability to be as regular a part of the community as she might like.

The 1991-92 cohort took this issue as a serious challenge and a good opportunity. Perhaps because three of the Scholars were in their second Bunting year, they emphasized to all -- scientists and non-scientists alike -- the value of sharing in the colloquium series, the brown bag discussion groups, and the other formal and informal opportunities for interaction at the Institute.

For example, geologist Constance Soja chose to be the first presenter of the year in the Bunting Institute Colloquium Series. Her talk, "Evolutionary Significance of Marine Fossils from Ancient Oceanic Islands," designed for an educated lay audience, was enormously successful, and in fact resulted in frequent citations by other Bunting fellows during the year. She provided a vocabulary for ideas formulated by poets, writers, and other non-specialists.

Encouraged by Dr. Soja's example, the other Science Scholars presented successfully in the Colloquium Series. (It should be noted that a Bunting presentation does not preclude a talk before a more specialized audience of the scholar's peers; the Bunting talk is usually geared for an educated, lay audience.) This sort of intellectual exchange, as well as participation in the brown bag discussion series, enhances not only the scientific literacy of the overall community but the intellectual benefits to the scientists as well.

**2. Technological support.** With each year, the need grows for better computer and network facilities at the Institute. Because of their frequent dependence on Internet capabilities, E-mail, data processing, and VAX machines, the Science Scholars often present the strongest need for on-site computer support.

Unfortunately, until such facilities can be made available at the Institute, many of the scientists will continue to use offices at their laboratories because of readier computer access. Obviously, some work will always need to be done at laboratory

sites; however, some scholars who are at the stage of writing or analyzing data have explained that they could do this aspect of their work at Bunting, if better facilities existed. This issue will most likely continue for the next few years as Harvard University and Radcliffe College extend their networking and technological capabilities.

### Future Plans of 1991-92 Scholars

**Elma O. Budrene** will continue to collaborate with Professor Howard Berg, Professor of Biology at Harvard University.

**Gladys Friedler** remains as Associate Professor at the Boston University School of Medicine, and will continue work on her book on the Paternal Effects on Fetal and Postnatal Development.

**Janet Rankin** will be a Visiting Research Scientist in the Department of Physics at Brown University.

**Orna Resnekov** will continue to collaborate with Dr. Richard Losick, in the Department of Cellular and Developmental Biology at Harvard University.

**Sonja Sandberg** will return to her tenured position as Associate Professor of Mathematics at Framingham State College, and continue collaborations developed at Harvard University.

**Barbara Moths Sheffels** will continue to collaborate in the Department of Earth and Planetary Sciences at Harvard University, where she will also teach two courses.

**Constance M. Soja** will join the faculty of Colgate University as Assistant Professor in the Department of Geology.

**Doris Naimark Stern** will continue to collaborate at Forsyth Dental Center and Harvard University.

**Marja Kien White** will collaborate with Professor Daniel Shepro at the Biological Science Center of Boston University.

## Selection for the 1992-93 Science Scholars Program

### Applicant Pool

The Institute received a total of 50 eligible applications for the 1992-93 Science Scholars Program, up from 29 eligible applications the previous year. Four of the 1991-92 Science Scholars reapplied for a second year of funding. It is our hope that the increased outreach efforts undertaken by our summer intern, as well as the expanding notoriety of the program, contributed to the increase in applications.

### Selection Procedures

In the first stage of review, applications are read by reviewers whose specialties are close to the applicant's own. In that stage, sixteen of the 50 were eliminated, leaving 34 applicants to be reviewed by the second-stage Science Committee.

The Science Committee consists of senior scientists from institutions around the Boston area. The size of the committee differs each year, depending on the number of areas represented by applicants. In 1992, our committee consisted of eleven scientists, as follows:

Howard Berg  
Professor of Biology  
Harvard University

Melissa Franklin  
Assistant Professor of Physics  
Harvard University

Joyce Friedman  
Professor of Computer Science  
Boston University

Robert Kirshner  
Professor of Astronomy  
Department Chair  
Harvard University

Nancy Kolodny  
Professor of Chemistry  
Wellesley College

James David Litster  
Professor of Physics  
Associate Provost and Vice President for Research  
Director, Francis Bitter National Magnet Laboratory  
Massachusetts Institute of Technology

Susan Lovett  
Assistant Professor of Biology  
Rosenstiel Center  
Brandeis University

William Mackavey  
Professor of Psychology  
Department Chair  
Boston University

Allan Robinson  
Gordon McKay Professor of Geophysical Fluid Dynamics  
Harvard University

Wilfried Schmid  
Dwight Parker Robinson Professor of Mathematics  
Harvard University

Raymond Siever  
Professor of Geology  
Harvard University

## Committee Decisions

The Science Committee chose eight candidates and eight alternates for the Science Scholars award. None of the four Science Scholars who reapplied was awarded a second year of funding. The Committee was particularly pleased to have such a range of disciplines represented among the final candidates: computer science (1), oceanography/aquatic ecology (1), mathematics (1), physics (1), astrophysics (1), cognitive and neural sciences (2), geophysics (1), and biological sciences (1).

After offers were extended to the finalists, aquatic ecologist Nancy M. Butler was offered a new tenure-track post at the University of Montana, which she accepted. Although the University supported Dr. Butler's research visit to Harvard/Radcliffe, they could only free her for the first semester of the new academic year. Dr. Butler felt that even one term of her proposed affiliation with Dr. Joseph Montoya of Harvard University could benefit her research agenda, and she accepted our offer of one-half stipend. The second half of that stipend was offered to the first alternate, neuroscientist Constance Royden, who was able to use the partial funding to accompany her laboratory director, Dr. Ellen Hildreth, in her move from MIT to Wellesley College. Therefore, as in 1991-92, nine scientists shared eight fellowship awards.

The names, disciplines, initial institutional affiliation, and project titles of the 1992-93 cohort of Bunting Science Scholars are provided below:

**Bonnie Berger** - Computer Science, Massachusetts Institute of Technology  
"Efficient Parallel Algorithms"

**Nancy M. Butler** - (fall term only) Aquatic Ecology, Great Lakes Environmental Research Laboratory  
"Zooplankton: Effects of Trophic Status, Food Quality, and Development Stage"

**Rosanne Distefano** - Astrophysics, New York Institute of Technology  
"Studies in Astrophysics"

**Anne Wilson Goldizen - Biological Sciences, University of Tasmania**  
"Causes and Dynamics of Mate-Sharing in Tasmanian Native Hens"

**Marie E. Machacek - Physics, Northeastern University**  
"Astrophysical Implications of Particle Unification"

**Constance Royden - (spring term only) Cognitive and Neural Science, Wellesley College**  
"Human Heading Judgments in the Presence of Moving Objects"

**Cheryl Anne Fillekes Stewart - Geophysics, Cornell University**  
"Thermal Convection in Earth and Venus"

**Janet Talvacchia - Mathematics, Swarthmore College**  
"Non-minimal Critical Points for the Yang-Mills-Higgs Functional on TR3 with Arbitrary Coupling Constant"

**Cheryl White - Neuroscience, Massachusetts Institute of Technology**  
"Role of Activity in Development of the Visual System"

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" Goldizen's project in the biological sciences would no longer be eligible under the current terms of the fellowship. However, she had been deferred from the previous year's selection process because of work issues in Tasmania, an uncommon decision in our process. Her fellowship was "grandfathered" under the old terms of the grant.

### SUMMARY

The 1991-92 cohort of Science Scholars at the Bunting Institute experienced a very successful year. Each commented on the strong progress made through the financial and intellectual resources of the Bunting Institute and Harvard University and Radcliffe College. Their active participation in the multidisciplinary community of women scholars contributed not only to their own intellectual and personal growth, but also to the enhanced scientific literacy of the community in general. One scholar received an ideal academic job offer. All of the scientists made significant progress on their research agendas, consolidating their work and their collaborations to an impressive degree. Their increased participation in the Institute community also offered a model for integrating women in the physical and biological sciences with those in the humanities, social sciences, and the arts.



## **APPENDICES**

**Appendix A.**

Roster of 1991-92 Bunting Fellows

**Appendix B.**

Brief Resumes of 1992 Science Scholars

**Appendix C.**

Roster of 1992-93 Bunting Fellows

**Appendix D.**

Summary of Science Intern Sarah Elson, Summer 1991

**Appendix E.**

Radcliffe News article by Geologist Constance M. Soja,  
Spring 1991

**Appendix F.**

Science Scholars' Reports to ONR on Professional Activities

**Appendix G.**

Science Scholars' Papers and Articles (master copy only of  
Technical Report)

**APPENDIX A**

**ROSTER OF 1991-92 BUNTING FELLOWS**

# The Mary Ingraham Bunting Institute of Radcliffe College

1991-92 Fellows

## HILARY ASTOR

Fellow (Law)  
Sydney University, Australia  
Implications for Women of the Development of  
Alternative Methods of Dispute Resolution

## EVE BLAU

Fellow (Architectural History)  
Canadian Centre for Architecture  
The Architecture of Red Vienna, 1919-1934

## PALMIRA BRUMMETT

Bunting Fellow (History)  
University of Tennessee  
Image and Impenialism in the Ottoman  
Revolutionary Period: Istanbul, 1908-1910

## ELENA O. BUDRENE

Science Scholar (Biological Sciences)  
Harvard University  
Complex Patterns Formed by Chemotactic Bacteria

## SHAN CHOU

Fellow (Chinese Literature)  
Yale University  
A History of the Literature of the T'ang Dynasty  
(618-906)

## NIVEDITA BEO

Fellow (Physics)  
Mount Holyoke College and Brown University  
Study of Phase Structure in Matrix Models of String  
Theory

## CLAIRE DOUGLAS

Fellow (Clinical Psychology)  
Independent Practitioner  
Christiana Morgan's Visions Notebooks: C. G.  
Jung's Visions Seminars, Competing or  
Complementary Paradigms?

## SUSAN C. EATON

Fellow (Peace Studies/Women's Studies)  
Service Employees International Union  
Women, Conflict Resolution and Social Change: A  
Study of Leadership in Labor and Civil Rights

## ALMAZ ESEBETE

Distinguished International Visitor at Radcliffe  
College (Education)  
Addis Ababa University, Ethiopia  
Correlates and Causes of Low Participation and  
Performance of Girls in Primary Education in  
Ethiopia - The Socialization Factor

## GLADYS FRIEDLER

Science Scholar (Developmental  
Psychopharmacology)  
Boston University School of Medicine  
Paternal Effects on Fetal and Postnatal  
Development

## ALICE T. FRIEDMAN

Fellow (Architectural History)  
Wellesley College  
Home Bodies: Houses Built for Women in the 20th  
Century

## BETH GALSTON

Fellow (Sculpture)  
Independent Artist  
Temporary Shelter: Research in Architecture by An  
Environmental Sculptor

## LUCY GREALY

Evelyn Green Davis Fellow (Poetry)  
Independent Writer  
Completion of Manuscript

## MARY HAMER

Fellow (Literature/Women's Studies)  
Independent Scholar  
Political and Historical Readings of Images of  
Cleopatra

## KAREN V. HANSEN

Fellow (Sociology)  
Brandeis University  
Challenges to Feminist Theory: The Social World of  
Working Women and Men, 1820-1860

## BARBARA L.A. HERBERT

Fellow (Medicine and Social Policy)  
Boston City Hospital, Boston University and The  
Zimberg Clinic of The Cambridge Hospital  
AIDS and Domestic Violence: A Critical  
Intersection in Women's Health

## NANCY J. HIRSCHMANN

Fellow (Political Science)  
Cornell University  
"Your Most Humble Servant": The Sexual Politics of  
John Locke

## SUSAN JUNG HOBEN

Fellow (Education)  
Boston University  
Education and Language Policy in Ethiopia: The  
Ethiopian Literary Campaign

## MILOSLOVA HOLUBOVA

Bunting Fellow (Non-fiction)  
Independent Writer  
Off the Road and On the Road

## MARGOT KEMPERS

Fellow (Sociology)  
Fitchburg State College  
Defining the Needs of Women: Unemployment  
Programs for Boston-Area Women, 1980-1990

## JEHANE R. KUHN

Fellow (Art History)  
Independent Scholar  
The Altering Eye: Vision and Representation in the  
Quattrocento

## MADELEINE M. KUNIN

Radcliffe Distinguished Visitor in Public Policy  
Former Governor of Vermont  
Research on Women in Politics

## HARRJET LUTZKY

Fellow (Psychology)  
University of Paris  
The Sacred: A Psychoanalytic Interpretation

## ALISON McINTYRE

Bunting Fellow (Philosophy)  
Wellesley College  
Causation and Corrective Justice

## SALEM MEKURIA

Fellow (Film)  
Independent Filmmaker  
Away From Home

## CAROLYN MOORE NEWBERGER

Herman Dunlap Smith Fellow (Psychology)  
Children's Hospital, Judge Baker Children's Center,  
and Harvard Medical School, Boston  
Mothers and Children Following Sexual Abuse  
Disclosure: Connections, Boundaries, and Recovery

## KATHARINE PARK

Fellow (History of Science)  
Wellesley College  
Wonders of Nature: The Culture of the Marvelous  
in Europe, 1500-1750

## JOY PARR

Fellow (Economic History)  
Queen's University, Canada  
Gender, Nationality and the Material Culture of  
Modern Work

## MARGARET PEARSON

Fellow (Political Science)  
Dartmouth College  
Foreign Sector Managers and the Socialist State in  
China: The Emergence of "Civil Society"?

## OLIVE PIERCE

Fellow (Photography)  
Independent Photographer  
Up River: A Look at Life in a Maine Fishing  
Community

## JANET RANKIN

Science Scholar (Materials Science)  
Oak Ridge National Laboratory  
The Evolution and Characterization of Textured  
Microstructures in Thin Films

## ORNA RESNEKOV

Science Scholar (Biological Sciences)  
Karolinska Institute, Sweden  
The Involvement of Post-transcriptional Control in  
the Regulation of Cell Differentiation in *Bacillus  
Subtilis*

## MARILYN RICHARDSON

Bunting Fellow (Women's Studies)  
Museum of Afro American History, Boston  
An Illustrated Monograph on the Life and Career  
of Edmonia Lewis, 19th Century Black Sculptor

## ELIZABETH L. ROSENBLUM

Evelyn Green Davis Fellow (Painting)  
School of the Museum of Fine Arts, Boston  
The Naming of Paris

## SONJA SANDBERG

Science Scholar (Mathematics)  
Framingham State College  
Understanding Lyme Disease Using Mathematical  
Models

## BARBARA MOTHS SHEFFELS

Science Scholar (Geology and Geophysics)  
Harvard University  
Constraints on Intracontinental Subduction and  
Oroclinal Bending in the Bolivian Andes from  
Balanced Cross Sections

## SUSAN HERRON SIBBET

Fellow (Creative Writing)  
California Poets in the Schools  
"She Waited as if it Might Come to Him": A  
Fictional Biography of Theodora Bosanquet

## HILDA BERNSTEIN SILVERMAN

Peace Fellow (Peace Studies)  
International Jewish Peace Union  
Empathy After Auschwitz: Jews Who Support the  
Palestinian Will to Live

## ANNA DEAVERE SMITH

Bunting Fellow (Performing Arts)  
Stanford University  
On the Road: A Search for American Character.  
Boston 1992

## CONSTANCE M. SOJA

Science Scholar (Geology)  
Harvard University  
Tectonic Controls on Reef Development During the  
Silurian

## KAREN SPALDING

Berkshire Summer Fellow (History)  
Boston College  
Separate Heavens: The Re-creation of Tradition in  
Andean Rural Society under Spanish Colonial Rule

## DORIS NAIMARK STERN

Science Scholar (Biological Sciences)  
Fornth Dental Center  
The Effects of Inservation on Early Tooth  
Development

## PATRICIA TRAXLER

Fellow (Poetry)  
Kansas Wesleyan University  
A Measured Sea: Poems in the Voices of American  
Women, Real and Imagined

## MARJA KIEN WHITE

Science Scholar (Biochemistry)  
Tufts School of Veterinary Medicine and Marine  
Biological Laboratory, Falmouth, Massachusetts  
The Role of Sialic Acid in the Carcinogenesis of  
Leukemia in the Soft Shell Clam, *Mya Arenaria*

## CAROLYNE WRIGHT

Fellow (Literature)  
Dhaka University, Bangladesh  
A Bouquet of Roses on the Burning Ground: An  
Anthology of Poetry and Fiction by Bengali Women  
Poets and Writers

34 Concord Avenue, Cambridge, Massachusetts 02138 (617) 495-8212

**APPENDIX B**

**BRIEF RESUMES OF 1992 SCIENCE SCHOLARS**

# **GLADYS FRIEDLER**

**Science Scholar**

## **FIELD**

**Developmental Psychopharmacology**

## **PROJECT TITLE**

**Paternal Effects on Fetal and Postnatal Development**

## **AFFILIATION**

**Boston University School of Medicine**

## **EDUCATIONAL BACKGROUND**

**Ph.D., Boston University, 1968  
M.A., University of Pennsylvania, 1951  
B.A., University of Maine, 1947 )**

## **PROFESSIONAL BACKGROUND**

**1986-present, Core Faculty, Behavioral Neuroscience Program, Boston University  
1981-present, Associate Professor of Psychiatry, Boston University**

## **PROJECT SUMMARY**

**A text will address the role of the father in the earliest development of his offspring and explore factors which may have limited our knowledge and acceptance of the influence of paternal variables on reproductive outcome. Research in human and infrahuman species which documents the effects of paternal exposure to xenobiotics on fetal and postnatal development will be discussed. Later chapters will review findings from Anthropology, History of Science and Law which suggest that cultural preconceptions and stereotypes may be barriers to the study and acceptance of male-mediated effects. This multidisciplinary approach should provide greater appreciation of the influence of the male parent in a successful reproductive outcome.**

**JANET RANKIN**  
**Science Scholar**

**FIELD**

Materials Sciences

**PROJECT TITLE**

The Evolution and Characterization of Textured Microstructures in Thin Films

**AFFILIATION**

Oak Ridge National Laboratory

**EDUCATIONAL BACKGROUND**

Ph.D., Massachusetts Institute of Technology, 1989

Sc.B., Brown University, 1983

**PROFESSIONAL BACKGROUND**

1989-present, Research staff member at Oak Ridge National Laboratory.

**PROJECT SUMMARY**

The primary objective of the proposed research is to study the microstructure of textured thin films produced by chemical vapor deposition. Analytical and high-resolution transmission electron microscopy will be the primary methods for studying the microstructures in the as-deposited and annealed films. The films will also be characterized with Rutherford backscattering/channeling and x-ray diffraction. In addition to studying the basic microstructural evolution of these thin films, the effects of water vapor in the deposition and annealing atmospheres will also be investigated.

# **BARBARA MOTHS SHEFFELS**

**Science Scholar**

## **FIELD**

**Geology and Geophysics**

## **PROJECT TITLE**

**Constraints on Intracontinental Subduction and Oroclinal Bending in the Bolivian Andes from Balanced Cross Sections**

## **AFFILIATION**

**Harvard University**

## **EDUCATIONAL BACKGROUND**

**Ph.D., Massachusetts Institute of Technology, 1988**

**B.S., Stanford University, 1980**

## **PROFESSIONAL BACKGROUND**

**1990, Lecturer, Department of Earth & Planetary Sciences, Harvard University**

**1990-present, Postdoctoral Research Associate, University of Idaho**

**1989-present, Postdoctoral Research Associate, Harvard University**

**1980-1982, Geophysicist, Office of Earthquake Studies, U.S. Geological Survey, Menlo Park**

## **PROJECT SUMMARY**

**I propose to develop new balanced cross sections in the Bolivian Andes in order to address the following questions: 1) how much intracontinental subduction is required by the amount of crustal shortening that has occurred in the Bolivian fold and thrust belt; and 2) how important is oroclinal bending in the formation of the bend in the mountain belt at approximately 18 S? Balanced cross sections across three transects will allow the definition of the three-dimensional geometry of the fold and thrust belt and provide constraints on the amount of non-plane strain deformation. With this information, I will investigate the interplay between motion along horizontal décollements, motion along strike-slip faults and intracontinental subduction. The results have implications for our understanding of orogenic processes worldwide.**

**CONSTANCE M. SOJA**  
**Science Scholar**

**FIELD**

Geology

**PROJECT TITLE**

Tectonic Controls on Reef Development During the Silurian

**AFFILIATION**

Harvard University

**EDUCATIONAL BACKGROUND**

Ph.D., University of Oregon, 1985

B.A., Denison University, 1977

**PROFESSIONAL BACKGROUND**

1985-present, Assistant Professor, Smith College

1983, Instructor, University of Oregon

1979-1983, Graduate Teaching Fellow, University of Oregon

**PROJECT SUMMARY**

My research on the Silurian Heceta Formation from the Alexander terrane of southeastern Alaska will focus on the dynamics of reef sedimentation in an ancient island arc. I will be studying stromatolites and stromatoporoid reefs that formed in Alaska as part of a volcanic arc in order to compare them in detail with reefs that evolved in Sweden on the craton and in the Welsh Borderland orogenic belt of U.K. during the same period of time. This information will increase our knowledge of Silurian reefs that originated in different parts of the world and will lead to a better assessment of the tectonic factors that influenced Silurian reef evolution, development, and decline.



## **MARJA KIEN WHITE**

**Science Scholar**

### **FIELD**

**Biochemistry**

### **PROJECT TITLE**

**The Role of Sialic Acid in the Carcinogenesis of Leukemia in the Soft Shell Clam, *Mya Arenaria***

### **AFFILIATION**

**Tufts School of Veterinary Medicine and Marine Biological Laboratory, Falmouth, Massachusetts**

### **EDUCATIONAL BACKGROUND**

**PH.D., Boston University, 1969**

**B.S., Simmons College, 1965**

### **PROFESSIONAL BACKGROUND**

**1991, Research Associate, Tufts School of Veterinary Medicine**

**1987-1990, Research Associate, Associates of Cape Cod, Woods Hole**

**1985, Conference Coordinator, Third International Conference on Toxic Dinoflagellates in St. Andrews**

### **PROJECT SUMMARY**

**It has recently become apparent that the carbohydrate portion of many proteins is important to protein function. In animal cells, the carbohydrate, sialic acid has been implicated in playing a major role in tumor formation by masking tumor cell antigens, enhancing tumor cell invasiveness, transforming normal cells into malignant cells, and by affecting the immune system. Lectins are carbohydrate binding proteins. Few lectins have sialic acid binding affinity. Three such lectins have recently been isolated from the hemolymph of the horseshoe crab, *Limulus polyphemus*. A rapidly developing leukemia has been found in wild populations of the soft-shelled clam, *Mya arenaria*. It is hoped that a study of the role of sialic acid in this leukemic animal model will provide valuable insight into the many stages of carcinogenesis.**

**APPENDIX C**

**ROSTER OF 1992-93 BUNTING FELLOWS**

# The Mary Ingraham Bunting Institute of Radcliffe College

## 1992-93 Fellows

**DELIA D. AGUILAR**  
Fellow (Women's Studies)  
Bowling Green State University  
The Women's Movement in the Philippines

**EDITH J. BARRETT**  
Harmon Dunlap Smith Fellow (Political  
Science/Public Policy)  
Brown University  
Social Welfare and the Political Socialization  
of Inner-City Youths

**DEBORAH BELLE**  
Evelyn Green Davis Fellow (Psychology)  
Boston University  
Children's After-School Experiences:  
A Contextual Analysis

**BONNIE BERGER**  
Science Scholar (Computer Science)  
Massachusetts Institute of Technology  
Efficient Parallel Algorithms

**NANCY M. BUTLER**  
Science Scholar (Aquatic Ecology)  
Great Lakes Environmental Research Laboratory  
Nitrogen Isotope Fractionation in Marine  
Zooplankton: Effects of Trophic Status, Food  
Quality, and Development Stage

**WHITNEY CHADWICK**  
Fellow (Art History)  
San Francisco State University  
The Inn of the Dawn Horse: The Paintings  
and Writings of Leonora Carrington

**KIANA DAVENPORT**  
Bunting Fellow (Creative Writing)  
Independent Writer  
Pacific Woman, Short Story Collection

**MALENA DE MONTIS**  
Peace Fellow (Peace Studies)  
Center for Democratic Participation and  
Development, Managua, Nicaragua  
Building Peace and Democracy in Nicaragua:  
The Role of Women's Groups and  
Non-Governmental Organizations

**ROSANNE DISTEFANO**  
Science Scholar (Astrophysics)  
New York Institute of Technology  
Studies in Astrophysics

**MARGUERITE FEITLOWITZ**  
Bunting Fellow (Creative Writing)  
Independent Writer  
A Legion of Terror: Argentina and the Legacies of  
Ignorance

**ANN FERGUSON**  
Fellow (Philosophy)  
University of Massachusetts, Amherst  
A Study in Feminist Ethics: Why Should I?  
Feminism and Moral Revolution

**ANNE WILSON GOLDIZEN**  
Science Scholar (Biological Sciences)  
University of Tasmania  
Causes and Dynamics of Mate-Sharing in  
Tasmanian Native Hens

**MARCI HERSHMAN**  
Fellow (Creative Writing)  
Tufts University  
Safe in America, a novel

**JEANNE MARIE JORDAN**  
Fellow (Film)  
Independent Filmmaker and Producer  
Last Stand at Troublesome Creek: A Midwestern

**ROSEMARY A. JOYCE**  
Fellow (Anthropology)  
Harvard University  
Gender and Power in Prehispanic Mesoamerica

**MARIE E. MACHACEK**  
Science Scholar (Physics)  
Northeastern University  
Astrophysical Implications of  
Particle Unification

**DENISE MARIKA**  
Evelyn Green Davis Fellow (Visual Arts)  
Independent Artist  
Video Sculptures and Projections

**LINDA McCARRISTON**  
Bunting Fellow (Poetry)  
Independent Poet  
"Route 2, East/West" and "Forward Desire"

**SUSAN LYNN MEYER**  
Fellow (Literature)  
Wellesley College  
Gender and Empire: Figurative Structures in the  
Fiction of Charlotte Bronte, Emily Bronte, and  
George Eliot

**JANE MIDGLEY**  
Fellow (Peace Studies)  
Women's International League for Peace and  
Freedom  
Creating a Peace Economy: De-Militarization and  
the Transformation of Federal Resource  
Distribution in the U.S.

**JUDITH NIES**  
Fellow (Creative Writing)  
Independent Writer  
Roberta Blackgoat and the Moccasin Telegraph:  
Indigenous Peoples and Global Corporations

**LETTITIA EVA OBENG**  
Distinguished International Visitor at Radcliffe  
College (Parasitology)  
Environmental Management Services in Ghana  
Parasites, People and their Wastes

**LEILA PHILIP**  
Fellow (Creative Writing)  
Independent Writer  
Throwing Off the Mask: Narratives on Japanese  
Women

**MARILENE PHIPPS**  
Fellow (Visual Arts)  
Independent Artist  
Visions of Light: The Haitian Landscape

**CHRISTINA ROBB**  
Fellow (Journalism)  
The Boston Globe  
Changing the Voice of Psychology

**ELLEN ROTHENBERG**  
Bunting Fellow (Visual Arts)  
Independent Artist  
A Probability Bordering on Certainty

**CONSTANCE ROYDEN**  
Science Scholar (Cognitive and Neural Science)  
Wellesley College  
Human Reading Judgments in the Presence of  
Moving Objects

**OFELIA SCHUTTE**  
Fellow (Philosophy)  
University of Florida  
Gender, Community, Utopia: Essays in Feminist  
Ethics

**ROSALIND H. SHAW**  
Fellow (Anthropology)  
Tufts University  
Women, Men and Divination: Temne Negotiations  
of Gender and Self

**SHANTI MARIE SINGHAM**  
Fellow (European History)  
Williams College  
Public Opinion, Police Records, and the Origins of  
the French Revolution: The Importance of the  
Maupeou Years, 1770-1775

**DEBRA SPARK**  
Fellow (Creative Writing)  
Tufts University and Emerson College  
Dog Star/Coqui

**SARAH SPENCE**  
Fellow (Comparative Literature)  
University of Georgia  
Female Voices in Vergil's Aeneid

**CHERYL ANNE FILLEKES STEWART**  
Science Scholar (Geophysics)  
Cornell University  
Thermal Convection in Earth and Venus

**LINDA K. STOUT**  
Fellow (Public Policy)  
Piedmont Peace Project  
Building a Multi-Class, Multi-Racial  
Movement for Social Change

**JANET TALVACCHIA**  
Science Scholar (Mathematics)  
Swarthmore College  
Non-minimal Critical Points for the Yang-Mills-  
Higgs Functional on TR3 with Arbitrary Coupling  
Constant

**FREDRIKA J. TEUTE**  
Berkshire Summer Fellow (American History)  
Institute of Early American History and Culture  
"The Duties of Our Sphere": Home as Constraint  
and Liberation in the Early Republic; The  
Writings of Margaret Bayard Smith

**ANN F. THOMAS**  
Fellow (Law)  
Fried, Frank, Harris, Shriver & Jacobson Law Firm  
The Impact of the Internal Revenue Code on Women

**MARY E. VOGEL**  
Fellow (Sociology)  
State University of New York, Stony Brook  
The Social Origins of Plea Bargaining:  
Law and the Courts in the Process of State  
Formation, 1830-1890

**KATHLEEN WEILER**  
Fellow (Education)  
Tufts University  
Women Teachers in Country Schools:  
California, 1850-1950

**CHERYL A. WHITE**  
Science Scholar (Neuroscience)  
Massachusetts Institute of Technology  
Role of Activity in Development of the Visual  
System

**NORMA J. WIKLER**  
Evelyn Green Davis Fellow (Sociology)  
University of California, Santa Cruz  
Water On Stone: An Interpretive Account of the  
Movement to Eliminate Gender Bias in the Courts

**ZIPPORAH BATSHAW WISEMAN**  
Fellow (Law)  
University of Texas School of Law  
Biography of Soia Mentschikoff

**APPENDIX D**

**SUMMARY OF SCIENCE INTERN SARAH ELSON, SUMMER 1991**

**SUMMARY REPORT  
SUMMER INTERNSHIP 1991  
SCIENCE SCHOLARS PROGRAM AT THE MARY INGRAHAM BUNTING INSTITUTE**

The ten-week Radcliffe internship at the Bunting Institute involved the various projects for the Science Scholars Fellowship program.

**Outreach**

Outreach for the Science Scholars Fellowship program was conducted primarily through advertising in science and women-in-science publications and through letters to university departments.

**Science / Women in Science Organizations**

The sources for women's science organizations included the Encyclopedia of Associations (women's science organizations are listed in the keyword index) and the following lists: NCROW women's caucuses, the list of women's science organizations compiled by the Women in Science Program of the Center for the Education of Women at the University of Michigan, and catalog "Associations and Committees of or for Women in Science, Engineering, Mathematics, or Medicine," compiled by the Office of Opportunities in Science of the American Association for the Advancement of Science (Cabot Science Library Reference).

Inquiry calls were made to Harvard and MIT department chairs and administrators in all fields in which the Science Scholars program accepts candidates. Their recommendations for places to publicize the fellowships were requested. Some department chairs were especially helpful not only in suggesting sources of outreach, but also in providing names of important contacts.

Letters and questionnaires were sent to former fellows in the sciences, asking for recommendations for science outreach. Although the response rate was low (of approximately seventy-five letters sent, fifteen questionnaires were returned), some responses were very helpful. Calls were also made to former science fellows in Boston area, but these were not particularly fruitful.

Most associations for women in science were willing to help publicize the program, as were some national science organizations. Many of the larger organizations, however, routinely charge for any advertising, and were unable to include a notice or the fellowships gratis. Several of the smaller, less formal organizations did not have any publications coming out prior to our deadline.

Two areas in which there was little success were outreach to women scientists of color and outreach through major science conferences. Organizations for people of color in science were located through searches in the Encyclopedia of Associations and the Directory of Minority Organizations. Most of these, however, do not cater to postdoctoral scientists, but rather to pre-college students, undergraduates, and professionals. In regard to science meetings, few department chairs and administrator, former fellows, and women's science organizations suggested conferences in which we might publicize. Many annual meetings are held in the fall, after the deadline for applications. Moreover, many of the large national science organizations which hold conferences are unwilling

to publicize outside organizations at their meetings.  
Appendix 1 is the master list for science outreach.

### University Outreach

Several people contacted for outreach recommendations suggested publicizing through university departments as one of the most effective means of reaching prospective candidates. At their suggestion, letters were written to heads of approximately 220 university departments in fields in which Science Scholars were underrepresented. The fields targeted were chemistry, geology, mathematics, physics, oceanography, and all engineering sciences. The letters asked department heads to post our flyer in their departments and make information about the program available to their colleagues; they included two flyers and a roster of several outstanding former science scholars.

The strong university departments were located through recommendations from Harvard and MIT department chairs and administrators, recommendations from former fellows, and, primarily, searches conducted in the Peterson's Guides to Graduate Programs. The criteria for selecting the strongest universities departments from Peterson's Guides included size of department, number of doctoral degrees awarded yearly, competitiveness of the program, and, in some cases, number of women in the department. For the field of chemistry, the American Chemical Society's Guide to University Departments was used instead of Peterson's Guide. Letters were also sent to several engineering departments which had special programs for women engineers.

Appendix 2 contains the letter to department heads and the list of university departments contacted.

### Jurors

A list of approximately 250 potential jurors to assist in the selection of science fellows was generated.

The letter and questionnaire sent to former fellows asked for recommendations for potential jurors, as did the letter to university departments. These two sources combined yielded approximately thirty names of potential jurors. Most prospective reviewers were found through searches in university catalogues and Peterson's guides. Prospective jurors were selected from strong university departments located for university outreach and from a few other local universities. For some university departments (presumably those that pay for advertising), Peterson's lists the faculty, as well as their title and field of specialization. Widener and Gutmann libraries maintain comprehensive microfiche lists of university catalogues.

There were several criteria for selecting potential jurors. In all fields, the first prospective reviewers chosen were women who were full or associate professors. When there were not enough women found, men, usually full professors at the top university departments, were chosen whose fields of specialization created a broad range of sub-fields among the potential reviewers.

Once response cards were returned, the list of potential jurors could be updated and expanded with further recommendations.

Appendix 3 is the master list of potential jurors.

### **Readings**

With the intent of compiling material for a Science Scholars Fellowships program brochure, applications of current and former science fellows were reviewed, with particular attention to their personal statements.

A five-page summary report of Project Access: A Study of the Access of Women Scientists and Engineers to Research Careers was written.

Appendix four is the summary report of Project Access. Appendix five contains information about the Science Scholars program taken from statements by fellows.

**APPENDIX B**

**RADCLIFFE NEWS ARTICLE BY  
GEOLOGIST CONSTANCE M. SOJA,  
SPRING 1991**



Naturally  
?



they would care for puppies and kittens compared to how they would care for babies. The older boys had more ideas about how to care for young animals than did the older girls, and all the boys had more ideas about how to care for younger siblings.

Melson suggests that future research might investigate how gender role expectations become associated with who we are and how these expectations influence how we nurture and whom our children deem appropriate to nurture.

All children do show an interest in nurturance, Melson concluded. But because it is not a highly valued skill, this interest wanes and is quite often blatantly discouraged in boys. "The hidden agenda to this work," Melson concluded, "is the need to promote nurturance as a valued masculine characteristic."

Leslie Nitabach

Research Assistant, Murray Research Center



Reception for women scholars. The Bunting Institute, Murray Research Center, and Schlesinger Library hosted a reception at the library for women visiting fellows, scholars, and faculty at Radcliffe and Harvard. Left to right: Dafna Izraeli, visiting scholar, women's studies, Harvard; Sylvia McDowell, Schlesinger Library staff; Mitsue Imai, visiting scholar, Harvard Graduate School of Education; Kamai Lin, Fulbright Scholar from China at the Schlesinger Library.

## Unraveling Southeastern Alaska's Geologic History

by Constance M. Soja

I am a science scholar in geology at the Bunting Institute for 1990-91, and one of eight scientists who have affiliations there for the coming year.

My research at the Bunting Institute focuses specifically on fossil organisms that built coral-like reefs in southeastern Alaska approximately 400 million years ago during the Silurian. In affiliation with Prof. Andrew Knoll's laboratory in the Botanical Museum at Harvard University, I look at the dynamics of reef sedimentation associated with a series of ancient volcanic islands. I also plan to undertake collaborative research with a geologist in Wales in order to compare the composition, anatomy, and tectonic setting of reefs that evolved in Sweden, Wales, and Alaska during the same period of time. This information will determine the tectonic factors that influenced reef evolution, development, and decline during the Silurian.

As a geologist my research takes me to the remote and largely uninhabited coastline of southeastern Alaska. Since 1986, I have been conducting geological research on ancient limestones that are exposed on and near Prince of Wales Island with the aid of Smith College geology majors. The National Science Foundation has supported this research since 1988 and will continue to fund it through 1992.

Because of the impenetrable forests, our geologic research is restricted almost entirely to coastal areas. We have solved some of the logistical problems of doing field work on islands by using a skiff and outboard engine to collect rocks from the modern intertidal zone, where the limestones are best

*I view my fellowship at the Bunting Institute as a very important point in my career thus far.*

exposed below the thick forest cover. Stratigraphic sections of rock are mapped, described, and photographed along the shoreline. Limestone samples are broken from the outcrop with sledge hammers. Each specimen is labeled with locality information and marked with orientation symbols in the field before being packed into canvas bags.

Under perennially rainy skies, handling and labeling wet rocks may be one of the most difficult tasks we perform on a daily basis. Two canvas bags, each weighing 15 pounds, are fitted into sturdy cardboard boxes, which are then shipped by the US Postal Service back to the laboratory for further study of the rocks. Over the past several years we have sent home from Alaska approximately 3,000 pounds of rock. Most of these specimens have been cut into slabs with rock saws and ground to a thickness of .03 millimeters. When mounted on glass slides, the rocks are then referred to as thin-sections and are studied with a microscope. Surprisingly, thin-sections can also be examined with a microfiche reader, which magnifies and projects an image of these thinner-than-paper rocks on the screen.

### New Southeastern Alaska was Formed

As a paleontologist, my interest in studying limestones from Alaska is to look in detail at the fossils that are preserved within them. Because of their excellent preservation in an area whose origins are uncertain, the organic remains of a wide variety of invertebrate animals have an enormous potential for yielding information critical to understanding the evolution and diversification of life in southeastern Alaska during the geologic past. I integrate this research with data collected by other geologists in order to unravel this region's geologic history, which is hotly debated.

The controversy surrounding the origin of southeastern Alaska stems at least in part from recent theories that have been developed to explain the complex geologic relationships that characterize much of Alaska. Most geologists now believe that the west coast of North America is

made up of individual continental fragments or crustal slivers that formed somewhere in the ancient Pacific Ocean at sites as yet unknown. Through a series of complex tectonic processes involving millions of years of geologic time, these crustal blocks, or terranes as they are called by geologists, were later welded or accreted onto the western edge of the North American continent. The Alexander terrane, where I work, was named indirectly for Tsar Alexander of Russia, whose name reflects the presence of Russians in the Alexander Archipelago of southeastern Alaska during the late 1700s-mid 1800s.

I view my fellowship at the Bunting Institute as a very important point in my career thus far. For the first time in many years I have the opportunity to focus on my research without having teaching and other academic responsibilities. The Bunting Institute and a



grant to Radcliffe from the Office of Naval Research generously provide the physical and financial support necessary to complete significant research and to venture into new and unexplored scholarship areas. I also have the chance at the Bunting Institute to interact with a wonderfully diverse group of professional women, all of whom share at least one common goal, which is to advance the recognition of women's accomplishments in their respective fields. For a person who spends much of her time looking over her shoulder into the geologic past, I look forward to this year and to looking backwards in a geologic sense in order to understand more about the evolution of life on our planet.

Constance Soja, BI '90-'91, was born in Frankfurt, Germany and grew up in Massachusetts and West Virginia. She was an undergraduate at Denison University in Ohio and received her PhD in geology from the University of Oregon, Eugene. For the past five years she was an assistant professor of geology at Smith College.

Radcliffe News

SPRING 1991

**APPENDIX F**

**SCIENCE SCHOLARS' REPORTS TO ONR ON PROFESSIONAL ACTIVITIES**

**GLADYS FRIEDLER  
SCIENCE SCHOLAR, 1991-92**

My year as a Science Scholar at the Bunting Institute provided me with opportunities and experiences that I could not have obtained elsewhere. It was truly one of the most - if not THE most- significant and important experiences in my professional life: self-realizing, rewarding, intellectually probing. The opportunity to interact with and actively learn from individuals in other disciplines and in an environment where one is free to explore and to discover was invaluable. It is still difficult to put this experience into words, in part because the "fallout" continues and I anticipate will do so for the remainder of my career and lifetime.

My project at the Bunting was to write a book for the educated lay public which summarized my field of research and the implications of the findings. The numerous discussions with Bunting Fellows from diverse scholarly and creative fields as well as from other branches of science opened my mind to ideas which continue to affect and to nourish this writing.

As a Science Scholar who was neither working in a laboratory nor developing experimental proofs, I was in a somewhat unusual position. It was a unique challenge that resulted in much personal and professional growth. How it will affect my career will become clearer as my book nears completion. Whether I will become actively involved in health policy or return to the laboratory is unclear at this juncture, although the latter is somewhat problematic given my age, university position and in particular, status of funding.

Mainly, for me, it was the calm of the Bunting Institute and its remarkable Director Florence Ladd and her fine staff, which allowed those of us there to fly-- often in quantum leaps. It enabled one to be the best you can be -- and even more.

A suggestion - and with the hope of not being presumptuous. I think that other Science Scholars would profit immeasurably from a year where the majority of their time was spent at the Bunting rather than in laboratories away from the Institute. It would afford an expanded vision which rarely if ever occurs in a laboratory-- even with the most knowledgeable and stimulating colleagues. This is an invaluable part of the Institute and of one's professional growth.

I am grateful to the Office of Naval Research for giving me this opportunity to "do my thing" and without the restrictions often imposed by formal grant awards. I believe it is essential for a scientist ( and for progress in science) to go where your ideas-- and your findings-- take you. That is often difficult if not impossible to do in the current climate of science.

Friedler, G. Paternally-mediated Developmental Effects, (Chapter 5) IN: Occupational and Environmental Hazards: A Guide for Clinicians. (Ed. M.Paul). Williams & Wilkins, 1992.

Davis DL, Friedler G, Mattison D, Morris R. Male-mediated teratogenesis and other reproductive effects: biologic and epidemiologic findings and a plea for clinical research. Reproductive Toxicol. 6: 289-292, 1992.

**GLADYS FRIEDLER  
SCIENCE SCHOLAR 1991-92**

Below is a list of professional invitations and activities relevant to my Fellowship application which have occurred since submission of the initial application.

1. Invited chapter "Paternally-mediated Developmental Effects", IN Occupational and Environmental Hazards: A guide for Clinicians. (ED. M. Paul). Williams & Wilkins, 1992.
2. Invited participant in a national "Working Conference on Occupational and Environmental Reproductive Hazards", November 20-22, 1991, Woods Hole, MA. The conference includes participants from six areas -- research, clinical, educational, environmental, labor, and legal/policy-- and is sponsored by Health/Rights (collaborative project of the University of Massachusetts Medical Center, the American Civil Liberties Union, and the University of Maryland Medical School), the March of Dimes Birth Defects Foundation, the Ruth Mott Fund and others.
3. Videotaped interview by Visual Media Department of Dartmouth-Hitchcock Medical Center for The Doctor is In program on pregnancy. To be distributed nationally to public television stations.
4. Taped interview by Canadian Broadcasting Company of myself and two other participants on the AAAS symposium for a program to be aired on the CBC science series Quirks and Quarks.
5. Taped interviews by CBS and WCRB.
6. Considerable and continuing media attention to AAAS symposium and the role of the male on developmental outcome (e.g., enclosed article from Economist, London).
7. Science writer Leslie Roberts plans to do an extensive article on paternally-mediated effects for an upcoming issue of Science magazine.
8. At the AAAS meeting, I was approached by two publishers ( Rutgers University Press; Basic Books) who expressed interest in a book on male-mediated effects.

## ANNUAL REPORT

### INVITED SPEAKER/PARTICIPANT:

National Working Conference on Occupational and Environmental Reproductive Hazards, November 20-22, 1991, Woods Hole, MA. Proceedings in Environmental Health Perspectives (in press).

Biological evidence for male-mediated effects on the fetus. Informal panel Fetal Rights: Politics, Law, and Science. Sponsored by Women's Studies Program, Harvard University & Radcliffe College. The Bunting Institute, November 25, 1991.

Effect of paternal exposure in the workplace on reproductive outcomes. Harriet Hardy Institute of Occupational Health. Harvard Faculty Club. March 16, 1992.

Male-mediated effects on reproductive outcome: evidence and controversies. Association for Women in Science, New England Chapter. Harvard-Smithsonian Center for Astrophysics. April 28, 1992.

Paternal preconception exposure to chemical and physical agents: effects on fetal growth and development. Colloquium of senior scientists. Marine Biological Laboratory, Woods Hole, MA August 8, 1992.

### PRESENTATIONS (OTHER):

Paternal effects on fetal and postnatal development. Colloquium at The Bunting Institute, Radcliffe College, February 26, 1992.

Friedler, G. Experimental evidence for a male-mediated imprint on behavioral development. Workshop: Male-mediated Effects on Progeny (organizer, co-chair) joint annual meeting: Teratology & Neurobehavioral Teratology Societies, Boca Raton, FLA, June 30, 1992.

PRINT/BROADCAST MEDIA: Attention to a symposium The Father and the Fetus (G. Friedler: organizer, chairperson) and its subject matter continues. Symposium was presented at the American Association for the Advancement of Science 1991 annual meeting. Interviews during the academic year included articles: American Health, Omni, Washington Post, Jour. Natl Cancer Inst, Science News, Child Magazine, Frankfurter Allgemeine, Harvard Gazette. broadcast media: CBS radio, German Public Radio, network TV: NBC, CBS (Good Morning), CNN.

### PUBLICATIONS:

Friedler, G. Paternally-mediated Developmental Effects, (Chapter 5) IN: Occupational and Environmental Hazards: A Guide for Clinicians. (Ed. M.Paul). Williams & Wilkins, (in press).

Davis DL, Friedler G, Mattison D, Morris R., Schrader S. Male-mediated teratogenesis and other reproductive effects: biologic and epidemiologic findings and a plea for clinical research. (Viewpoint: Reproductive Toxicol. (in press).

GLADYS FRIEDLER  
THE BUNTING INSTITUTE 1991-1992.

## **The Evolution and Characterization of Textured Microstructures in Diamond Thin Films**

**Janet Rankin  
The Bunting Institute  
ONR Science Scholar 1991-1992**

### **Project Summary**

**My year at the Bunting Institute as an ONR Science Scholar was professionally productive and personally enriching.**

**The results of my research were reported at the Spring Meeting of the Materials Research Society in April of 1992 and at the Fall Meeting of the Materials Research Society in December of 1992. Papers describing this work were submitted for publication in the Conference Proceedings:**

**J. Rankin, Y. Shigesato, R.E. Boekenhauer, R. Csencsits, D.C. Paine, and B.W. Sheldon, "Early Stages in the Microwave-assisted Chemical Vapor Deposition of Diamond Films on Glass Substrates", Novel Forms of Carbon - MRS Symposium Proceedings, Vol. 270, edited by C.L. Renschler, J. Pouch, and D. Cox (Materials Research Society, Pittsburgh, PA., 1992), pp. 317-322.**

**R. Csencsits, J. Rankin, R.E. Boekenhauer, M.K. Kundmann, and B.W. Sheldon, "Early Stage Microstructure Evolution during the Chemical Vapor Deposition of Diamond Films", to appear in Evolution of Surface and Thin Film Microstructure - MRS Symposium Proceedings, edited by H.A. Atwater, E. Chason, M. Grabow, and M. Lagally, (Materials Research Society, Pittsburgh, PA., 1993).**

**Copies of these papers are attached. Two more detailed journal articles are currently being prepared, and will be submitted to the *Journal of Materials Research* by this spring.**

**I also worked with a Radcliffe undergraduate, Qing-Rong Fan, on another research project. This work involves the analysis of experimental results that I obtained prior to my arrival at the Bunting. This work was presented at the Fall Materials Research Society meeting in December of 1991 and at the Annual American Ceramic Society meeting in the spring of 1992. I have already submitted prepared an article to report these results in a refereed journal.**

**In order to grow diamond films, under specific and carefully formulated deposition conditions, the first phase of my research involved the design, construction and implementation of a microwave-assisted chemical vapor deposition system. This phase consumed the first four months of my Bunting appointment. This was a very positive learning experience which greatly increased my confidence in my ability to design, construct and implement sophisticated experimental equipment. Most of my work in the past has focused on materials characterization. This experience has made me more at ease with the integration of characterization studies and materials synthesis and processing.**

My investigations focused on the earliest stages of the nucleation and growth of diamond thin-films grown by microwave-assisted chemical vapor deposition. The primary method of characterization was analytical and high resolution transmission electron microscopy (TEM) combined with electron energy-loss spectroscopy to determine how changes in various deposition parameters affect nucleation and growth.

The first series of experiments examined the early stages of diamond deposition on fused silica and silicon substrates. The major findings of this study are enumerated below.

1. Early-stage growth rates on both silicon and fused silica decrease as deposition proceeds.
2. The morphology of the diamond grains on silica changes between deposition times of 5 and 15 minutes under the conditions of this study. At 5 minutes, the growing particles are cuboids, while at 15 minutes, they are cubo-octahedral.
3. The growth rate of diamond on silicon is slower than that on fused silica.
4. Extensive surface roughening of the fused silica substrates occurs during deposition. This roughening was exacerbated by, but not solely dependent on the presence of methane in the plasma.

After reviewing the work of other researchers, I decided to investigate deposition after a biased (-200V) pre-treatment of the samples. The implementation of biasing was desirable for many reasons, including: better reproducibility, and control of pretreatments, and the ability to avoid the surface scratches necessary to enhance nucleation on unbiased samples. For this series of experiments, single crystal silicon was used as the substrate. The results of this study are summarized below.

1. No diamond (or graphite) nucleation was observed in scanning electron microscopy after 90 minutes of biased deposition. However, high-resolution electron microscopy and energy loss spectroscopy on cross-sectional samples revealed the presence of a 4 nm amorphous carbon layer
2. After 180 minutes of biased deposition, the amorphous is still present, with isolated regions of SiC. The silicon carbide was identified by analyzing electron energy loss spectra collected for both high and low energy loss. In addition, the measured lattice spacings of the isolated regions (0.256 nm), agree well with {111}-spacings in beta silicon carbide. After 180 there is also some evidence of diamond growth on the top surface of the sample.

As a Visiting Research Associate at Brown, I am continuing my research on the effects biased pretreatments on the nucleation of diamond on a variety of substrates. In particular, the observance of isolated islands of SiC within the bias-deposited amorphous carbon layer is of great interest. Additionally, I have begun studies on the effect of oxygen on the nucleation and growth of diamond during biased deposition.

**Summary of activities and work during the appointment of Orna Resnekov to the Bunting Institute (September 1991-August 1992)**

This is a summary of most of the work that was done during the year in Professor Losick's laboratory at Harvard University.

Post-transcriptional control of the gene for  $\sigma^H$  by the sporulation gene *spoVG* ORNA RESNEKOV, Harvard University, Cambridge, Ma.

The transition from growth to sporulation in *Bacillus subtilis* is controlled, in part, by a cascade of sigma factors. Recent circumstantial evidence has suggested that one of the earliest-acting sigma factors in the cascade,  $\sigma^H$  (the product of the *spo0H* gene) is regulated post-transcriptionally (Leahy et al., (1991) Mol. Microbiol. 5:477-87; Weir et al., (1991) J. Bact. 173:521-529). Conditions that induce sporulation lead to an increase in the cellular concentration of  $\sigma^H$  but not to a corresponding increase in the rate of *spo0H* transcription.

To study the post-transcriptional regulation of *spo0H* I used *lacZ* fused in-frame near the 5' and 3' ends of the *spo0H* gene and monitored *spo0H-lacZ* expression during growth and sporulation in wild-type or mutant strains. I have found that in wild-type cells containing either of the two translational fusions,  $\beta$ -galactosidase activity was induced to a low constitutive level when the cells were grown in DS medium. Surprisingly however, in cells containing a mutation in *spoVG* (which is itself controlled by  $\sigma^H$ ) and a translational fusion to the 3' end of the *spo0H* gene, but not in cells containing a translational fusion to the 5' end of the gene,  $\beta$ -galactosidase activity was induced about 4-fold as the cells entered sporulation. This was a specific effect of the *spoVG* mutation in that the effect on  $\beta$ -galactosidase accumulation was absent in cells bearing a mutation in another  $\sigma^H$  controlled gene *spo11B*. As further evidence that *spoVG+* inhibits *spo0H* expression, the *spoVG* mutation was found to substantially stimulate expression of *spo11B* which we interpret to indicate that the mutant cells contain elevated levels of  $\sigma^H$ . These results suggest that *spoVG* is a negative regulator of the translation or stability of the *spo0H* mRNA.

This work was presented in two meetings:

A joint Harvard University, Tufts University and M.I.T. Meeting-March 1992-Cambridge, Ma.

The Eleventh International Spores Conference-May 1992, Woods Hole, Ma.



I have gone on to expand this work to the role of cell wall and membrane metabolism in development. The work will be presented at a Keystone Conference on Microbial Differentiation, February 1993, Durango, Co.

The Science Scholar Fellowship enabled me to continue to collaborate with my previous laboratory in Stockholm, Sweden. A manuscript of this work has just been submitted to the journal *Genes and Development* and is entitled *An Elongated Poly(A) Tail of the  $\beta$ -IFN mRNA is Associated with a Block of Translation* (Resnekov et al.).

The Fellowship also allowed me to continue previous collaborations, a manuscript from one of these was published during my time at the Bunting Institute: Resnekov, O. et al, Organization and regulation of the *Bacillus subtilis odhA* operon, which encodes two of the subenzymes of the 2-oxoglutarate dehydrogenase complex, *Mol. Gen. Genet.* (1992) **234**:285-296.

The Science Scholar Fellowship also enabled me to be co-organizer of a NATO/FEBS Meeting entitled *Posttranscriptional Control of Gene Expression*. The other three organizers were A. von Gabain (Stockholm), A. Evangelopoulos (Athens) and J. McCarthy (Braunschweig). The meeting was held in Spetsai, Greece from the 3rd-14th of August, 1992. About 110 students and 25 lecturers attended. I presented a lecture at the meeting. A book is to be published from the meeting that I am editing, it will be published by Springer-Verlag. I am presently organizing the manuscripts and I expect to send them to the publisher within the next two months.

#### Should the Science Scholar Program be in the Bunting Institute?

I feel strongly that the Science Scholar Program should continue to be in the Bunting Institute. I am not sure that I would have done the program if I was not offered the opportunity to have an association with the Bunting Institute. To me the support and constructive criticism of a truly talented group of non-scientists was very valuable. It was also stimulating to be exposed to scientists in different fields. Unfortunately for a person at my stage, who is basically a bench scientist, and does not have the luxury of taking a year off to write and read, maximum contact with the Institute was not achieved. Necessarily my laboratory was across campus, and biological experiments require a lot of "hands on" time, which limited my time at the Bunting Institute. The only suggestion that I have is that people who are working in laboratories should be funded from the beginning for a two year period, it is really impossible to accomplish something in Biology in less time, and by funding for a one-year period ONR is selecting for more superficial projects.

## Final Report on Bunting Fellowship 1991-92

Sonja Sandberg

I had a wonderful and very productive year at the Bunting Institute. My activities fall into three categories: (1) writing manuscripts for publication, (2) making progress on research and (3) giving lectures and attending meetings. All three activities have enhanced my career and will continue to do so into the future.

**MANUSCRIPTS:** Four manuscripts were written or revised and submitted for publication. Two of these have already been accepted. The manuscripts are listed below and a copy of each is appended to this report.

Sandberg S, Awerbuch T, Spielman A. A Comprehensive Matrix Model Representing the Life Cycle of the Tick that Transmits the Agent of Lyme Disease, to appear in the *Journal of Theoretical Biology*.

Donnelly C, Leisenring W, Sandberg S, Kanki P, Awerbuch T. Comparison of Transmission Rates of HIV-1 and HIV-2 in a Cohort of Prostitutes in Senegal, to appear in the *Bulletin of Mathematical Biology*.

Sandberg S, Awerbuch T, Gonin R. Model Selection and Parameter Estimation for AIDS Data, submitted to *Statistics in Medicine*.

Awerbuch T, Sandberg S, Telford S, Spielman A. Critical Abundance of Mice Required to Perpetuate the Vector of Lyme Disease, submitted to *Ecology*.

**WORK IN PROGRESS:** I made significant progress on research in several areas. I participated in the Radcliffe Partnership Program by working on an analysis of decision making for elective hysterectomy with my partner Francine Weist, a Harvard undergraduate. Working together Francine and I made good progress on this problem and I was pleased to be able to share some of my Bunting year experiences with Francine.

The main focus of my research this year was understanding Lyme disease. In addition to the two papers mentioned above, research was conducted on the basic reproductive rate,  $R_0$  for Lyme disease and also modeling the effect of the reduction of the deer herd on Crane's Beach. Both of these projects will further the understanding of the dynamics of Lyme disease. In addition I and colleagues Tamara Awerbuch and Andrew Spielman provided guidance for Tony Kiszewski to develop a model for the mating behavior of adult ticks in order to understand how tick density might limit the size of a tick population.

I had the opportunity to get to know and begin working with Richard Levins, a mathematical ecologist at the Harvard School of Public Health. This project involves analyzing a large set of data on scale insects, fungi and parasitic wasps living on citrus trees in Cuba. The first goal is to characterize the observations. Ultimately, these results will guide the construction of a model to describe the population dynamics of the scale and their parasites in an effort to help citrus farmers protect their crops.

Progress has been made on a continuation of the work on modeling the progression of the AIDS epidemic. This new research is an effort to determine the beginning of the epidemic in several locations.

**MEETINGS AND PRESENTATIONS:** I , along with my colleague Tamara Awerbuch (Biostatistics Dept., HSPH), organized a symposium, Models of Vector-Borne Diseases, that was held on December 3, 1991 in Boston as part of the 40th annual meeting of the American Society of Tropical Medicine and Hygiene. In addition to co-chairing the session, I was a speaker in a presentation entitled "The Ecological Interactions Involved in the Transmission of Lyme Disease". The other symposium speakers included people from Canada, Nicaragua, Yale University and the WHO in Geneva.

I was the invited speaker for the Student Chapter Session at the fall MAA meeting held at Providence College, Providence, RI on November 22-23, 1991. My talk was entitled *Mathematical Models for AIDS and Lyme Disease*.

I was invited to speak at the 7th annual Sonia Kovalevsky High School Mathematics Day on March 26, 1992 at Simmons College. My talk was entitled *Mathematics and Lyme Disease*.

I had the opportunity to attend several meetings and workshops this year. In January I attended the annual joint meeting of the American Mathematical Society and the Mathematical Association of America. In June, I went to Venice to attend the Summer School on Environmental Dynamics, an international workshop on ecological modeling. Later that month I went to the University of Wyoming to attend a workshop on using MATLAB, a mathematical software package. In July, I attended a workshop at Colby College in Maine on using Computer Algebra software such as *Derive* and *Maple*.

I gave lectures at the Harvard School of Public Health as a guest speaker in Biostatistics 260 cd, Mathematical Models in Biology and in BEEP-ID 201cd, Malaria: Biology, Epidemiology, Economics and Policy .

Although I did not attend the International AIDS meeting in Amsterdam, the paper on comparing infectivity of HIV-1 and HIV-2 was accepted for oral presentation and one of the co-authors, Phyllis Kanki, gave the presentation.

## **Sonja Sandberg**

### **Publications and Work in Progress**

Flynn JZ, Sandberg S. Analysis of the Mathematical Achievement of students in a Fashion Merchandising Course, to appear in the *Clothing and Textiles Research Journal*.

Sandberg S, Awerbuch T, Spielman A. A Comprehensive Matrix Model Representing the Life Cycle of the Tick that Transmits the Agent of Lyme Disease, to appear in the *Journal of Theoretical Biology*.

Donnelly C, Lisenring W, Sandberg S, Kanki P, Awerbuch T. Comparison of Transmission Rates of HIV-1 and HIV-2 in a Cohort of Prostitutes in Senegal, to appear in the *Bulletin of Mathematical Biology*.

Sandberg S, Awerbuch T, Gonin R. Model Selection and Parameter Estimation for AIDS Data, submitted to *Statistics in Medicine*.

Awerbuch T, Sandberg S, Telford S, Spielman A. Critical Abundance of Mice Required to Perpetuate the Vector of Lyme Disease, submitted to *Ecology*.

### **Lectures**

Using Statistics to Understand the AIDS Epidemic, guest speaker in: Biometrics (23.404) Framingham State College, November 4, 1991

Mathematical Models for AIDS and Lyme Disease, Student Chapter Session, Fall MAA meeting, Providence College, Providence RI, November 23, 1991

The Ecological Interactions Involved in the Transmission of Lyme Disease, American Society of Tropical Medicine and Hygiene meeting, Boston, Massachusetts, December 3, 1991

Mathematics and Lyme Disease, The Mary Ingraham Bunting Institute, Radcliffe College, Cambridge, Massachusetts, January 22, 1992

Compartmental Models and AIDS, guest speaker in Biostatistics course: Mathematical Models in Biology (Biostatistics 260cd), Harvard School of Public Health, February 21, 1992

Conceptual Models of Malaria, guest speaker along with Tamara Awerbuch in : Biology, Epidemiology, Economics and Policy (BEEP) (ID 201cd), Harvard School of Public Health, February 27, 1992

Leslie Matrices and Lyme Disease, guest speaker in Biostatistics course: Mathematical Models in Biology (Biostatistics 260cd), Harvard School of Public Health, March 20, 1992

Mathematics and Lyme Disease, 7th annual Sonia Kovalesky High School Mathematics Day, Simmons College, March 26, 1992

### **Attendance at Workshops and Professional Meetings**

**Mathematical Association of America, Northeastern Section, Fall 1991 Meeting, Providence College, Providence, Massachusetts, November 22-23, 1991**

**American Society of Tropical Medicine and Hygiene meeting, Boston, Massachusetts, December 1-5, 1991**

**Joint meeting of the American Mathematical Society and Mathematics Association of America; Baltimore, Maryland, January 6-11, 1992.**

**Mathematics and Technology Workshop, Boston College, Chestnut Hill, Massachusetts, April 4, 1992.**

**Summer School on Environmental Dynamics, Istituto Veneto di Scienze, Lettere ed Arti, Venice, Italy, June 1-12, 1992.**

**ATLAST Workshop on using computers to teach Linear Algebra, University of Wyoming, Laramie, Wyoming, June 25-27, 1992.**

**Computer Algebra Systems Workshop, Colby College, Waterville, Maine, July 12-17, 1992.**

***Final Report—Barbara Moths Sheffels, Science Scholar, Bunting Institute***

**Project title: Constraints on intracontinental subduction and oroclinal bending in the Bolivian Andes from balanced cross sections**

**I am pleased and satisfied with what I have accomplished during my year at the Bunting Institute as a Science Scholar.**

**My research proceeded well, both in the directions I planned and in other unexpected and exciting ways that developed as the research did. I had proposed to examine the processes of intracontinental subduction and oroclinal bending in the Bolivian Andes, for the purpose of elucidating the development of the central Andes, and also in order to understand better mountain building processes in general. While studying what is known and postulated about intracontinental subduction in general, I evaluated the plausible extent of this process in the Bolivian Andes and the process by which it may have occurred, as constrained by the amount of crustal shortening that has occurred in the Bolivian Andes. This work led me to a comparison of the Bolivian Andes with other mountain belts, a consideration of the implications of intracontinental subduction for the thermal history of the central Andes, and to question the traditional views of the development of the bend in the mountain belt and of the effect of slab dip on upper plate structural style. Further investigation into the possibility of oroclinal bending led to a more detailed look at paleogeography, an emphasis on the effects of differential shortening along strike, and a consideration of strain partitioning around the bend in the mountain belt and its testable effects on structural style, that is, the type and magnitude of strike-slip faulting associated with thrusting.**

**In addition to pursuing my proposed research, I was able to continue a) development of a computer program for the construction of balanced cross sections and b) manuscript preparation for publication of prior research results. The computer program was made much more versatile through the addition of two new deformation mechanisms and several editing and other "user-friendly" tools. Three manuscripts have been developed in tandem, with one submitted for publication (Geological Society of America Map and Chart Series, copy enclosed), and the other two within weeks of being submitted (to *Tectonics and Journal of Structural Geology*).**

**My research results were also disseminated through four talks. During the year, I presented the following talks: 1. "Crustal Shortening in the Bolivian Andes: Implications for mountain building", Bunting Institute, December, 1991; 2. "Structural Constraints on Crustal Shortening in the Bolivian Andes", University of Idaho, January, 1992; 3. "Orogenesis in the Bolivian Andes", Harvard University, May, 1992; 4. "Intracontinental Subduction in the Bolivian Andes", Primera Conferencia Internacional Cuencas Fanerozoicas de Gondwana Sudoccidental, Santa Cruz, Bolivia, August 12-14, 1992. The trips to Idaho and Bolivia, which were made possible by the discretionary funds supplied by ONR, also included time for collaboration with colleagues.**

**The remaining discretionary funds were used for map reproduction, drafting supplies, and computer software.**

**I am excited about pursuing the new avenues of research that have become apparent during the past year: the possibility of mapping mantle structure seismically to test ideas about intracontinental subduction; examining thermal processes and consequences for the same purpose; evaluating old and, if possible, developing new hypotheses about mountain**

building on the basis of comparisons between different mountain belts; and evaluating models of strain partitioning and oroclinal development.

I plan to work on proposals for funding this work during the next year, but my primary efforts will be in teaching. I will be teaching "Stratigraphy and Structural Geology", a required, second or third year course for geology majors, at Harvard University as a lecturer during the fall term. I expect to continue in the spring term with some combination of teaching and research, balanced with time for my child.

My year as a Science Scholar has resulted in tremendous personal growth, particularly with respect to the issue of combining motherhood and career. I have made gains in personal confidence, been encouraged by inspirational role models, become cognizant of gender and science issues, have experienced a surge of creativity and enthusiasm, and most importantly, clarified how I can combine career and motherhood.

One explanation for the low numbers of women in academia as professors is that the typical tenure track career path is too inflexible and does not mesh with parenthood; the Science Scholar program at the Bunting Institute provides a real alternative. In a time when the issue of tenure track alternatives is increasingly discussed, the concrete example provided by the Institute and the Science Scholars is a very important contribution to the debate. This fellowship has allowed me to combine motherhood and career in a professional way, in a way unavailable elsewhere, and in a way that has benefitted both parts of my life.



## ***Summary for the Solstice report***

**Barbara Moths Sheffels, Science Scholar**

**Project title: Constraints on intracontinental subduction and oroclinal bending in the Bolivian Andes from balanced cross sections**

### **Talks:**

1. Bunting Institute, December, 1991, "Crustal Shortening in the Bolivian Andes: Implications for mountain building".
2. University of Idaho, January, 1992, "Structural Constraints on Crustal Shortening in the Bolivian Andes"
3. Harvard University, May, 1992. "Orogenesis in the Bolivian Andes".
4. Primera Conferencia Internacional Cuencas Fanerozoicas de Gondwana Sudoccidental, Santa Cruz, Bolivia, August 12-14, 1992, "Intracontinental Subduction in the Bolivian Andes".

### **Publications:**

1. A Tertiary fold and thrust belt in the central Andes: maps and cross sections from the Bolivian Andes, submitted August, 1992, Geological Society of America Map and Chart Series.
2. A quantitative assessment of the role of crustal shortening in orogeny in the Bolivian Andes, in preparation for Tectonics, to be submitted September, 1992.

### **Research:**

1. Investigations regarding the amount and nature of 1) intracontinental subduction and 2) strike-slip faulting in the Bolivian Andes
2. Continued collaboration with Peter Isaacson and students at the University of Idaho on investigations regarding Devonian through Permian paleogeography of the Bolivian Andes.
3. Continued collaboration with Brian Wernicke on the development of a computer program for the construction of balanced cross sections.

## REVIEW AND EVALUATION

NAME: Constance M. Soja

DATE: 8/31/92

FELLOWSHIP PROGRAM: Science Scholar

YEAR: 1991-92

### I COMMENTS AND REFLECTIONS:

Thanks to the Bunting Institute and ONR, I was able to spend a second fellowship year at the Bunting Institute. I spent much of my fellowship year applying for academic positions, analyzing data on Silurian reefal deposits from southeastern Alaska, writing articles for publication in refereed journals, and attending professional meetings. The papers I wrote synthesize detailed analyses of the similarities and differences in reefs that evolved on the craton (Sweden), in an orogenic belt (Norway), and in a volcanic arc (U.S.A.) during the same time interval.

During this fellowship year, three papers written or revised during my first fellowship year were published, four abstracts of papers presented at scholarly meetings were published, two papers and a meetings abstract were accepted for publication, and two additional papers are being reviewed for publication. ONR's discretionary award enabled me to travel to Sweden for a field trip on the geology of Gotland and its ancient reefal deposits. From there, I traveled to Münster, Germany, to present a paper at the International Symposium on Fossil Cnidaria. The opportunity to consult with international colleagues on ancient reefs in Sweden and Germany was enormously beneficial to my research and has provided the foundation for additional work with European colleagues that will yield important new data for interpreting reef development during the Silurian within a tectonic context.

I also benefited from having a laboratory affiliation with Dr. Raymond Siever (Harvard University), who offered important insights into carbonate deposits. My participation in his graduate seminar exposed me to a variety of important research problems in sedimentology and historical geology. Some of these discussions helped me formulate questions and consolidate ideas for a paper that I wrote during the second part of my fellowship year. My participation in the Science and Gender discussion group at the Bunting Institute also helped to clarify issues that face many women in the sciences, especially those factors that affect the employment and professional development of women scientists.

Because my five-year replacement position at Smith College ended in June, 1990, I spent the first part of the fellowship year submitting applications for academic positions. I was fortunate in receiving two offers for tenure-track appointments (at Colgate University and Vassar College) and began my appointment as Assistant Professor in the Department of Geology at Colgate University on 1 July 1992! Because of the scarcity of academic positions in the field of paleontology, I feel extraordinary gratitude for having had two years at the Bunting Institute, which allowed me more time to devote to my research and make important professional contacts. Being able to enhance my professional record during these two fellowships resulted in a significant increase in my level of confidence as a professional geologist.

As I wrote in my *Radcliffe News* article more than a year ago, the time I spent at the Bunting Institute was critical in revitalizing my career. For the first time in many years, I had the opportunity to focus on my research without having teaching and other academic responsibilities. The Bunting Institute and the grant from ONR provided the physical and financial support necessary to complete significant research and to venture into new and unexplored scholarship areas. The chance to interact with a wonderfully diverse group of professional women was of immeasurable benefit because it showed that Bunting fellows and staff all share at least one common goal, which is to advance the recognition of women's accomplishments in their respective fields. I extend my heartfelt thanks to the Bunting Institute and to the Office of Naval Research for making this second year possible.

## **Contribution to The Solstice**

**Constance M. Soja  
Science Scholar  
Activities for 1991-92**

### **Abstracts and Publications**

- Soja, C.M. 1991a. Origin of Silurian reefs in the Alexander terrane of southeastern Alaska. *Palaios*, 6:111-126.
- Soja, C.M. 1991b. Silurian trace fossils in carbonate turbidites from the Alexander arc of southeastern Alaska. *Ichnos*, 1:173-181.
- Soja, C.M. 1991c. Development of Silurian reefs in an island arc setting. Proceedings of the VI International Symposium on Fossil Cnidaria (Münster, Germany):80.
- Soja, C.M. and Riding, R. 1991. Contributions of Silurian microbial communities to carbonate platform development, southeastern Alaska. *Geological Society of America Abstracts with Programs*, 23:279.
- Soja, C.M. 1992a. Potential contributions of ancient oceanic islands to evolutionary theory. *Journal of Geology*, 100:125-134.
- Soja, C.M. 1992b. Island-arc carbonates: characterization and recognition in the ancient geologic record. *Geological Society of America Abstracts with Programs*, 24:82.
- Soja, C.M. 1992c. Using fossils to identify allochthonous oceanic islands in the ancient geologic record. In Lidgard, S. and Crane, P.R. Fifth North American Paleontological Convention, Abstracts and Programs. *The Paleontological Society, Special Publication* 6:275.
- Soja, C.M. 1992d. Comparative effects of tectonism on Silurian carbonate platform evolution. *Geological Society of America Abstracts with Programs*, 24:*in press*.

#### **Manuscripts In Press:**

- Soja, C.M. and Riding, R. 1993. Silurian microbial associations from the Alexander terrane, Alaska. *Journal of Paleontology*.
- Riding, R. and Soja, C.M. 1993. Silurian calcareous algae, cyanobacteria, and microproblematica from the Alexander terrane, Alaska. *Journal of Paleontology*.

#### **Manuscripts In Review:**

- Soja, C.M. Criteria for recognizing carbonates of island-arc origin in the geologic record. *Geology*.
- Soja, C.M. Tectonic controls on carbonate platform development during the Silurian. *Journal of Geology*.

### **Invited and Professional Lectures**

**Bunting Institute colloquium:** Evolutionary significance of marine fossils from ancient oceanic islands (September 1991); **Colgate University lecture:** Evolution of Silurian marine communities in the Alexander terrane, Alaska (November 1991); **Yassar College lecture:** Tectonic analysis of Silurian island-arc carbonates (December 1991); **McGill University lecture:** Accreted oceanic islands and Silurian reefs: a case study from southeastern Alaska (February 1992); **Colgate University talk:** Paleobiology of ancient oceanic islands (April 1992); **Wellesley College lecture:** Terrane analysis of accreted oceanic islands (April 1992)

### **Other Professional Activities**

**Co-convener** of session on paleoecology at the annual meeting of the Geological Society of America, San Diego, CA; **Co-convener** of session on sediment genesis and provenance at the Geological Society of America meeting, Eugene, OR; **Moderator** of a panel on environmental careers at Radcliffe College; **Reviewer** for an article submitted to *Palaios*; **Reviewer** for a grant application submitted to the National Science Foundation's Japan Program; **Participant** at the Symposium on the Geology of the Bahamas, San Salvador Island, Bahamas

## **SUMMARY OF WORK UNDERTAKEN AS A BUNTING SCIENCE SCHOLAR, 1991-92**

**Doris M. Stern**

I was extremely fortunate to be at the Bunting Institute for a second year. Since I had no other financial support that year, I was provided with the means to continue research, write papers, and apply for funding. If I had not received support from the Office of Naval Research, I probably would have left the field of biological research. This year, I am appointed as an Associate Scientist at Children's Hospital in the Department of Orthopaedic Research, and as an Instructor at Harvard Medical School. In essence, the second year at the Bunting Institute prevented me from reaching the point of despair.

The emotional support that my sister-fellows provided was even more critical than the financial support. The problems involved in the struggle for funding were ameliorated by the friendly, nurturing atmosphere that the Bunting provides.

In December of 1991, I submitted a grant application to the National Science Foundation on comparative and evolutionary aspects of enamel ultrastructure and development. The project was not funded, but the application will be revised and resubmitted.

I also began working on gingival epithelium in order to follow cell adhesion in healthy and inflamed tissue. Much of this work was done using the high voltage electron microscope in Albany, NY. A videotape was made so that the intercellular connections could be viewed in three-dimensions; structural detail was revealed using this technique that had not been observed by other methods. For example, a common motif of attachment was the interdigitation of three-pronged clothespin-like structures. This work will be reported on at the International Association of Dental Research meeting in Chicago in March.

### **Articles:**

A paper entitled "Elemental Detection and Immunolocalization in Enamel Matrix of the Opossum", by D.N. Stern, M.J. Song, and W.J. Landis appeared in the journal, *Anatomical Record* (Vol. 234, pp. 34-38, 1992). Also, I was invited to participate in the Ninth International Conference on Dental Morphology which was held in the summer of 1992 in Florence, Italy. A paper entitled "Enamel Organization, from Reptiles to Mammals", by D.N. Stern and A.W. Crompton will appear in the proceedings of those meetings.

### **Presentations at Meetings:**

1) "Immunocytochemical identification of oral bacteria on root surfaces", by J.M. Dobeck, D.N. Stern, J.D. Heeley, E. Skobe, and J. van Houte. *J. Dent. Res.* 71:291, 1992. American Association of Dental Research, Boston, MA. March, 1992.

2) "Immunocytochemical studies of opossum enamel matrix", by D.N. Stern. Society of Vertebrate Paleontology, Toronto, CA. October, 1992.

3) "Functional influences in the evolution and devolution of odontocete enamel", by A.J. Werth and D.N. Stern. Society of Vertebrate Paleontology, Toronto, CA. October, 1992.

### **Teaching and Lectures:**

1) Spring, 1992. Two hour lecture on "Enamel" in the course "Oral Biology of Connective and Mineralized Tissues", Harvard School of Dental Medicine.

2) Spring, 1992. Bunting brown bag seminar on "Osteoporosis".

3) Spring, 1992. Teaching Assistant, Harvard University. "Biology, Biochemistry, and Physiology of the Skeletal System of Vertebrates".