

CSWP Gazette

The Newsletter of the Committee on the Status of Women in Physics of the American Physical Society

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Letter from the Editor: Are We Making Progress?

By Patricia Mooney, IBM T.J. Watson Research Center, Member of CSWP



Patricia Mooney

When young women scientists and engineers raise the same questions and mention the same problems that my generation faced when we were starting our careers in the early 1970s, I wonder whether the status of women in physics has changed much at all.

The questions asked pertain to issues such as juggling both a career in physics and a family as well as day-to-day problems like how to deal with an obnoxious male colleague. Watching the film, "The Mona Lisa Smile", starring Julia Roberts in the role of a young woman art professor at Wellesley College in the 1950s, I was forcibly reminded of the vast changes in women's lives in the last 50 years.

Not only have opportunities for women expanded but what we expect of women has changed as well. So why is change so very slow in the physics profession? And how can we measure progress?

By some measures the status of women is improving. In 2003 the percentage of bachelors degrees in physics awarded to women was 22%, up from 7% in 1971, and the percentage of physics PhDs awarded to women was 18%, up from 3% in 1971 (AIP Statistical Research Center). But, as the report "Women in Physics, 2000" (AIP Pub. Number R-430) indicates, "women's participation in physics decreases with each step up the academic ladder" and "compared to other fields, women are under represented in physics at both the bachelors and PhD levels". This study found that salary differences between male and female

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NSF Provides Funding for Professional Skills Development Workshops for Women at APS General Meetings

The Committee on the Status of Women in Physics (CSWP) is pleased to announce an innovative series of five one-day workshops entitled "Professional Skills Development for Women in Physics". Funded by the National Science Foundation, these workshops will coach women in key skills that are needed to enhance their careers. Training in persuasive communication, negotiation, and leadership will be presented by experienced professionals, with an aim towards increasing the influence of female scientists within their own institutions.

The workshops will be held in connection with the APS March and April Meetings, and each workshop can accommodate 30 women. As an outcome of these workshops, 150 women will be prepared to move into leadership roles within their departments and institutions where

they can influence policy and serve as more visible role models for younger women. CSWP sees this an important step toward ultimately rectifying the underrepresentation of women in physics.

Workshops at the 2005 March and April Meetings will be aimed at senior, mid-career, tenured faculty, and will be held on Sunday, March 20, 2005 in Los Angeles and Friday, April 15, 2005 in Tampa. Future workshops will be held for junior, early-career, women (2006) and for senior women physicists in industry and national labs (2007). Workshop participants will receive a stipend help cover the cost of travel and up to two nights lodging.

Workshops will be modeled after the highly successful CoAch (Committee on the Advancement of Women

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Letter from the Editor: Are We Making Progress?, continued

members of the AIP member societies working in academia, government, federally funded R&D labs and industry are not statistically significant for six of the eight groups studied. However, women were paid less than men in the two groups consisting of members who received PhDs after 1990 employed in industry and members who received PhDs in the previous 10 years employed at federally funded R&D laboratories. A more recent study of the academic work force shows that by 2002 the overall percentage of physics faculty that are women had increased to 10% and more than 60% of physics departments had a least one women faculty member ("2002 Academic Work Force Report", AIP Pub. Number R-392.5). In contrast, 9% of physicists in federally funded R&R laboratories but only 5% of physicists working in industry are women (AIP Statistical Research Center).

A lot of effort is spent to recruit and retain women based on the assumption that the problems women face will be resolved simply by increasing the number of women in the field. But the physics profession may not be able to address the many complex reasons why fewer women study physics in the first place and why the attrition rate of women is greater than that of men at all levels. So let's focus instead on the quality of professional life for women physicists. Do women have comparable resources for their research and does their work receive the same recognition as comparable work done by male colleagues?

Is the work of women physicists recognized to the same extent as that done by men or does a woman, as it is often said, "have to be twice as good as a man to get half the recognition"? For example, are women invited to speak at APS meetings, elected to APS Fellow and awarded APS prizes and awards in proportion to their numbers in the profession? According to the 2003 Annual Report of the Committee on the Status of Women in Physics (<http://www.aps.org/exec/bylaws/reports/cswp03.cfm>) about 10% of APS members are women, but only 4.5% of APS Fellows are women. 13.8% of male APS members are fellows but only 5.8% of female members. However,

these numbers are not as bad as they appear to be at first glance, since the percentage of newly elected APS fellows who are women is expected to lag the percentage of physics PhDs awarded to women by roughly 20 years. In 2003, 7 out of 52 APS award/prize recipients were women including 3 out of 7 winners of dissertation awards/prizes. But this was unusual! In both 2002 and 2004 there was only one women award recipient in addition to the winner of the Maria Goeppert Mayer (MGM) Award, which is specifically for women. At the 2003 and 2004 March APS Meetings women were about 8% and 7%, respectively, of all invited speakers, including the invited sessions with all women speakers co-sponsored by CSWP.

How do we define success in terms of the status of women in physics? Is it when the fraction of women in physics is the same as the fraction of women in the working population? Is it when a few exceptional women are in leadership positions and a few women are recognized for their outstanding research? I would hope to see women at all stages of their career having comparable resources as their male colleagues, recognized for excellence at the same rate as men, i.e. in proportion to their numbers in the profession, and as satisfied with their careers in physics as are their male colleagues. Fairness requires this! And our profession needs successful satisfied women physicists at all levels as role models. When we achieve this I believe that attrition rates for women will decrease and it is possible that entry rates will rise as well.

What can all of us do to make sure women physicists are successful? Talk to your women students and colleagues – informal and formal mentoring are both very important. Propose your women students and colleagues for jobs and important career enhancing assignments at all levels. In addition to suggesting women candidates for APS leadership positions, be sure that women colleagues are invited speakers at APS and other professional meetings. And nominate women for APS Fellow and for APS prizes and awards.

Professional Skills Development Workshops for Women at APS General Meetings, continued

Chemists) leadership program for women chemists <http://coach.uoregon.edu/>. They will be conducted by professional facilitators and restricted to a maximum of 30 participants, who will be split into two groups of 15 during most of the day. Each workshop will end with a final wrap up and evaluation session, which will be followed by a CSWP reception.

Details will be posted shortly on the CSWP webpage at <http://www.aps.org/educ/cswp/index.cfm>.

Announcements will be made on both the Women in Physics and the Friends of CSWP listserves, and in the APS News.

The Committee on the Status of Women in Physics is grateful to the National Science Foundation www.nsf.gov for its support of this series of workshops. For further information, please contact Sue Otwell in the APS office at women@aps.org.

Nancy Haegel Wins 2004 APS Prize to a Faculty Member for Research in an Undergraduate Institution

By Patricia Mooney, IBM TJ Watson Research Center



Nancy Haegel

Nancy M. Haegel is a professor of physics at the Naval Postgraduate School (NPS) in Monterey, CA. She received her PhD from the University of California, Berkeley in 1985. After working as a research scientist at the Siemens Research Laboratories in Erlangen, Germany, she joined the faculty in the Department of Materials Science and Engineering at UCLA in 1987 as an assistant professor and was promoted to the rank of associate professor with tenure in 1989. In 1993, she moved to Fairfield University, a Jesuit institution in Fairfield, CT, where she was a member of the Department of Physics for ten years. She moved to NPS in July of 2003.

The APS Prize to a Faculty Member for Research in an Undergraduate Institution, established in 1984 by Research Corporation, honors a physicist “whose research in an undergraduate setting has achieved wide recognition and contributed significantly to physics and who has contributed substantially to the professional development of undergraduate physics students”. Nancy’s research focuses on the development and modeling of infrared photodetectors, transport in high resistivity semiconductors and contact behavior. With her undergraduate students at Fairfield University, Nancy developed a technique for the imaging of charge transport for the study of local drift and diffusion behavior. A scanning electron microscope is used to directly image the motion and injection of charge (see *Appl.Phys. Lett.* **84**, 1329 (2004)). Nancy’s research has played an important role in the calibration of far-IR detectors on the Spitzer Space Telescope, where her group worked on the long-term transient behavior of the detectors. Her award presentation at the APS March Meeting in Montreal was titled “Imaging Charge and Imaging Stars”. She is the author or co-author of 85 scientific publications and the co-editor of one book. At Fairfield University, Nancy also participated in curriculum development efforts sponsored by the Hewlett Foundation (science for non-science majors) and initiated a university-grade 6 collaboration on science literacy and public policy with Roger Ludlowe Middle School.

At NPS Nancy is currently pursuing research on infrared detector development for NASA, detector modeling for the SIRT Science Center, and charge transport imaging with the support of the National Science Foundation. She found that the main difference in doing research in an undergraduate institution is the need to select projects more carefully, choosing topics that are somewhat out of the main stream and can therefore proceed at a slower pace than in a large research university and spending a lot of time in the lab. With a smaller research group, Nancy was able to work closely with her undergraduate students in the lab as well as on her own. Collaboration with scientists at other institutions was also key to her success.

Nancy has received numerous honors including the National Science Foundation Presidential Young Investigator and Graduate Fellowship Awards. She was among the first recipients of the David and Lucile Packard Fellowships in Science and Engineering, a \$500,000 research award for young faculty in the sciences and engineering. In 1989 she was awarded the TRW Excellence in Teaching Award from the School of Engineering and Applied Science at UCLA. She was also selected for the Kellogg National Fellowship Program in 1990, a national leadership development program. She received the Alpha Sigma Nu Teacher of the Year award at Fairfield University in 1997. In 2000, she spent seven months at the Max Planck Institute for Extraterrestrial Physics in Garching, Germany as a 1999-2000 Humboldt Fellow.

Nancy is married with two children, Andrew age 19 and Rachael age 8. Her move to Connecticut was motivated by family considerations, as was her return to California last year. As she puts it “life and work have seasons and different times in my life have made it important to live and work in different places.” In addition to work and family life, she likes to walk. Recent accomplishments in that field include walking the Mississippi Marathon in Jan 2003 in six hours flat (“not bad for a first timer!”) and doing the 21 mile Big Sur Power Walk this past spring. She finds that “walking is great for mind, body and soul.”

With a smaller research group, Nancy was able to work closely with her undergraduate students in the lab as well as on her own.

Correction: Women Fellows for 2003

Our apologies to **Shubhra Mukerjee Gangopadhyay** of Texas Tech University whose name was inadvertently omitted from the list of women named to Fellowship in the APS in the last issue of the Gazette. She was nominated by the Forum on Industrial and Applied Physics for *basic studies of amorphous carbon with applications in microelectronics*.

More than 250 women have been recognized by their peers for election to the status of Fellow in The American Physical Society. The Fellowship Program recognizes members who may have made advances in knowledge through original research and publication or made significant and innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the

teaching of physics or service and participation in the activities of the Society. The names of Women Fellows of the APS can be found on the CSWP's website at <http://www.aps.org/educ/cswp/women-fellows.cfm>. A complete listing of all Fellows of the APS can be found at <http://www.aps.org/fellowship/>. There are also complete instructions on how to nominate an individual for fellowship, forms, and deadlines for nomination.

The Committee on the Status of Women in Physics is committed to encouraging the nomination of worthy women physicists for fellowship. If you think there is a deserving woman colleague who is not a fellow, we encourage you to work with colleagues to nominate her.

Book Review: “The Science Glass Ceiling: Academic Women Scientists and the Struggle to Succeed”

by *Miriam Forman, SUNY Stony Brook*

This book is a thorough, timely, documented study of the barriers to women attempting academic science careers. While it will give every woman physicist a list of difficulties similar to her own, it also summarizes recent NSF and privately funded efforts. Most importantly, this book offers policy recommendations for institutions.

Sue Rosser is a Dean at Georgia Tech who has worked for a quarter of a century on theoretical and applied problems of attracting and retaining women in science and engineering. She is a leader in this field, and during a tour at NSF was a key manager of NSF's “POWRE” program of many grants to disadvantaged individual women across all science disciplines from 1997 to 2000. The “POWRE” program was designed to advance women in academic science. It was politically vulnerable because it did not support men. In addition, Rosser's thorough evaluation of the POWRE program, now reported in detail in this book, was giving documented support to the feeling of many of us in the CSWP: institutional approaches to alleviate barriers to women's careers, rather than support of individual women, might be more effective. In FY 2001, NSF replaced POWRE with the ADVANCE program of large grants to academic institutions (including Georgia Tech) to study ways to empower women to participate fully in science and technology.

Rosser's book analyses the issues of how to remove barriers to women's advancement in academic science, at the highest level of public and private interest and support in the USA so far. The book is based on questionnaires and interviews with 400 NSF POWRE awardees and 50 young women scientists awarded the privately funded Clare Booth Luce Professorships in the same era. It has 26 tables, many thoughtful quotes from the interviews, and a good discussion of the goals and workings of POWRE, ADVANCE, and the Clare Booth Luce Professorships.

The Introduction has good stories of women scientists struggling to make it in academic careers. In the last chapter called “A Brighter Future”, Rosser categorizes the major barriers which she found are still discouraging women scientists from academic careers:

1. Balancing career and family—including partner's career, childcare and nurturing, eldercare
2. Low numbers of women and stereotyping
3. Overt discrimination and harassment

Of these, #1 are life issues for both men and women, but perceived in the study as by far the greatest barrier to women. Rosser concludes that institutions must alleviate these difficulties for women.

ADVANCE is essentially NSF's response to this

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Rosser's book analyses the issues of how to remove barriers to women's advancement in academic science

Book Review: “The Science Glass Ceiling:”, continued

study. While ADVANCE will not itself necessarily remove any barriers to women in science in academia, it should supply keener understanding of these barriers, and information about ways academia could remove them, if academia wanted to. Models of change have to be present for change to occur. However, academia has to want to change. NSF cannot make that happen.

I think that at present, most physicists respect successful women physicists and recognize that it is tough for women to succeed, and that women can be as capable as men. This is much better than 50 years ago. However, it seems to me that most (male) physics professors still do not understand that professors can and should alleviate the barriers women face. Professors could do this by insisting on workplace attitudes and procedures in the department and university at all levels, and on university services

for families, that would remove the barriers documented in this book.

Not so very long ago, white males gave the rest of us the vote in political elections. It was very hard and took many years to convince them to do so. I suspect that the glass ceiling in academic science will crumble only when the faculty who now control the academic vote will either use it to remove the barriers we now face, or give the vote to many more women who will. Then woman-friendly academic science will be normal for everybody.

The Science Glass Ceiling: Academic Women Scientists and the Struggle to Succeed, by Sue V. Rosser, is published by Routledge, New York and London, 2004. ISBN-415-94513-5

For Your Information: Hiring a Diverse Faculty

By Patricia Mooney, IBM T.J. Watson Research Center

Although there is much talk about the need for a diverse faculty, improvements in faculty demographics have been very slow. We recently came across an interesting article written by Myra Gordon, Associate Provost for Diversity and Dual Career Development at Kansas State University, entitled “Diversification of the Faculty: Frank Talk from the Front-line About What Works” published in *What Makes Racial Diversity Work in Higher Education: Academic Leaders Present Successful Policies and Strategies* (ed. Frank W. Hale, et al., Stylus Publishing, 2003, ISBN #1579220673). This is the report of a pilot project to increase the diversity of the faculty at a “large college of an elite research institution in the south”. The pilot project was an experiment “to see if the culture and practices of faculty hiring could be changed and, if these were changed, whether hiring outcomes would also change”. The answer to both questions was “Yes”!

In this article Gordon describes and documents the dynamics that come into play that work against hiring minority and women for faculty positions

and identifies key changes in faculty search procedures that resulted in a large increase in the percentage of women and minorities hired during the three years of the pilot project. What worked in this program includes: savvy leadership at the Dean’s level, accountability at every phase of the hiring process, thoughtful structuring of the search committee, writing position descriptions with attention paid to required and desired qualifications, really searching for diverse applicants, running a first-class campus visit and leveling the field in the evaluation of candidates. The latter was implemented by having the search committee “create profiles of excellence” for all of the acceptable candidates rather than ranking them. Based on these profiles, the dean and department chair then decided the order in which offers were made. Thus the search committee was not the “hiring committee” as is often the case. This article provides a serious discussion of the many complex issues involved in the faculty hiring process as well as a description and analysis of what worked at one institution.

“Frank Talk
from the
Front-line About
What Works”

Katharine became the first woman to work in the GE research laboratories.

My Aunt, Katharine Burr Blodgett

By Katharine Gebbie, National Institute of Standards, Gaithersburg, MD



*Katharine Blodgett in lab
(GE Research Laboratory)*

Katharine Blodgett was the Blodgett of Langmuir-Blodgett films. She was the first woman scientist to join the General Electric Company research staff; she was the first woman to obtain a doctorate from the Cavendish Laboratory in Cambridge, and she was the first industrial scientist to receive the American Chemical Society's Garvin Medal. She was also my Aunt. If you will indulge me, I would like to give a few personal glimpses of the Katharine Blodgett that may not have been available to her colleagues at the General Electric Company or to the scientific community.

Exceptional Talents

Katharine Blodgett entered Bryn Mawr College at 15 and graduated second in her class four years later in 1917. She was most sympathetic with me when, on my own 15th birthday, my grandmother wrote to me congratulating me on being 15 and pointing out that when my aunt was 15, she was entering Bryn Mawr. (I leave to your imagination the subsequent series of letters when I too finally entered and eventually graduated from Bryn Mawr.) A year after graduating from Bryn Mawr, Katharine received a Master's degree in chemistry from the University of Chicago, where she worked with Harvey B. Lemon on the adsorption of gases on charcoal. It is variously asserted that this work helped her invent gas masks that saved many lives during World War II. It is also said that other experiments during World War II led to breakthroughs in the design of the airplane wing, and that she designed a smoke screen that saved lives during military campaigns.

In the Laboratory

Thanks perhaps in part to a wartime labor shortage, and with the assistance of friends of her late father, Katharine became the first woman to work in the GE research laboratories. In a letter dated July 19, 1918,

W.R. Whitney asks, "Can't you come now? We have work you could do and it is part of our Government experimental work. Of course we should be glad to have you join us in the Fall, but gladder if you come soon. I think you would be worth at first about \$125. a month. Is this a bad guess?" This was clearly no affirmative action hire. They really needed her. It was apparently chance that cast her as assistant to Irving Langmuir, who was then beginning his studies of monomolecular films.

Katharine's inventiveness and clarity of thought is illustrated in a 1924 letter to the Motor Inventions Company in which she offers a simple remedy for the Ford's dismaying propensity to stall on a steep hill. "I should therefore like to draw your attention to a simple device which I have recently made for my Ford at a cost of fifty cents, and have used with such great satisfaction that I feel convinced it would be popular with other Ford owners... Anyone who has driven a Ford for any length of time has experienced the disagreeable sensation of having his car stop on a steep hill for lack of the five or six gallons of gasoline necessary to supply the gravity feed on a bad pitch...I know from the stories which other Ford owners tell me of their experiences that a compact, inexpensive device like mine which will perform such valuable service and at the same time is so simple in operation that it cannot fail to work, would meet a real need in the Ford world...If you are interested, will you kindly let me know?" Unfortunately, we have no record of a response.

University of Cambridge Diploma

Also in 1924, Langmuir arranged for her to continue her graduate studies with Ernest Rutherford at Cambridge. And two years later, in 1926, she became the first woman to receive a PhD in Physics from Cambridge, University. It's not clear that she worked directly for Rutherford but rather for a Mr. Stead. Here she appears to have implemented a method devised by Langmuir for investigating the properties of gaseous discharges with the aim of explaining the very sharply defined tip observed in a tube with electrodes at only one end.

I'm told it was noteworthy at that time in Cambridge that she was the sole author on the publication resulting from her doctoral thesis. But perhaps that's not the whole story. The paper concludes with an appropriate acknowledgment to Sir Ernest Rutherford "for his interest in this work,

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My Aunt, Katharine Burr Blodgett, continued

and to Mr. Stead, who set her to investigate the properties of long glows and gave her constantly the benefit of his experience. She is also indebted to Dr. Langmuir for important criticisms and suggestions in the course of writing this paper.” However the final page, page 30, of the original manuscript for her thesis, which I found recently, includes an alternative version of the same acknowledgment: “The writer would like to state at this time that Mr. Stead is the most consummate fool she ever met. She would also like to mention that Sir Ernest Rutherford neglects his students with more nonchalance than he ought to be allowed to get away with. She would therefore like to take this occasion to express her thanks to Dr. Irving Langmuir, since the training that she received from him was all that made these experiments possible.” This, mind you, is the woman who 30 years later was a strong advocate of space travel so that she would have some place to go when the meek inherited the Earth.

Return to Schenectady

After receiving her degree in 1926, Katharine returned to Schenectady and remained there for the rest of her career and the rest of her life. There she worked with Langmuir on many different projects, including those involving thin films, and she soon became an expert on thin films in her own right. A number of people, including Jack Hoffman and John Cahn at NIST, have recollections of Katharine Blodgett from their days at General Electric, suggesting that she was a rather formidable colleague. Indeed the professedly macho Hoffman, my former boss, enjoyed telling the story of how Katie Blodgett threw him out of her lab.

“Woman Scientist Invents Wonder Glass”

In 1938, when she received a great deal of publicity for inventing what the press called “invisible glass,” I can still remember her explaining to a very little girl the difference between “invisible” and “non-reflecting.” But there were other projects for which she received much less publicity. It was only long after the war that we learned that her early morning forays with Langmuir down to the banks of the Mohawk River were actually made to test the smoke screens they were developing, which were subsequently used in the Rhine crossing. She also confided to my sister that when she learned what the Manhattan Project was all about, she was relieved that although she had apparently been considered for it, she had not been selected. Soon after her invention of “invisible glass,” she developed

a gauge to determine the thickness of these thin films and obtained six U.S. patents for her work.

Memories of Aunt Katharine

Because she didn’t marry and have children of her own, she spent most of her holidays and vacations with us, and we spent some of ours with her at her cabin on Lake George. I will never know how a woman who hadn’t had a lot of fun herself as a child, and who hadn’t had any children of her own, somehow instinctively knew how to please the young. I have wonderful recollections of stuffed animals and chocolates and board games. She entertained us with marvelous stories about Houdini. She attended séances with a well-known scientist at GE who believed in communicating with the afterlife. I believe she was intellectual enough to have gone to such meetings with an open mind, but she never experienced anything she didn’t feel couldn’t be explained in some ordinary way. As she said, she herself didn’t always know how it was done, but then she didn’t know how a magician pulled a rabbit out of a hat. On the whole, she thought it was harmless, except for once when the dear departed gave advice about the stock market. She thought that was going too far.

She also taught me in a delightful but memorable way the dangers of affecting knowledge that one does not have. In an attempt to make conversation with a woman seated next to her at dinner on some occasion, she remarked on what to her was the interesting fact that today was the vernal equinox. The woman looked puzzled, thought a moment and then replied, “Oh yes, we only had a small one last year, didn’t we.” Aunt Katharine loved telling this story as an example of the trap of intellectual vanity. She always arrived at the house carrying two suitcases—one with her clothes and one with trays and hoses and camphor for making camphor boats. She also showed us how by repeatedly dipping a rectangular glass rod to different depths in a monomolecular layer of oil, you could create a series of different colors. And all the neighborhood children were invited in to share the fun.

If Katharine Blodgett felt any discrimination, she never let on to us, nor, I think, to my mother. And since all I knew was that she was constantly receiving awards and giving lectures, why would it ever have occurred to me to ask? I did once ask her whether she had felt lonely being so young and so bright at Bryn Mawr, and she said it was about an even trade off—the fun of being different and special versus the isolation of being different and special. Her loyalty to Langmuir, to GE and to her circle of colleagues and friends in

She also taught me in a delightful but memorable way the dangers of affecting knowledge that one does not have.

My Aunt, Katharine Burr Blodgett, continued

Schenectady was very important to her. Her only regret, as far as I know, was that she had never made any money for the General Electric Company. I only learned much later that despite her long and outstanding career at General Electric, her name was not mentioned in a 1953 *Science* article on 75 years of research at G.E. laboratories. But neither was Langmuir's work on amphiphilic monolayers or his Nobel Prize.

This article is adapted from an invited talk presented at the APS 2004 March Meeting in a session on "Monolayers and Multilayers: Agnes Pockels and Katharine Blodgett," sponsored by the Forum on the History of Physics and the Committee on the Status of Women in Physics. The slides and full text of the talk may be viewed at <http://www.aps.org/educ/cswp/events.cfm>

Agnes Pockels: Life, Letters and Papers

By Christiane A. Helm, Ernst-Moritz-Arndt Universität Greifswald, Germany

She was passionately interested in natural science, especially physics.



Agnes Pockels
(Family Photo)

Outside of the scientific community, Agnes Pockels (1862-1935) is considered a nice, quiet housewife from the late 19th century, who made some discoveries in the kitchen working with dishwasher. Actually, the impact of her work on the physics and chemistry of interfaces is continu-

ing to this day, due to the current interest in self-organization within monolayers, superstructures, and nanotechnology.

Agnes Pockels was born in 1862 in Venice, Italy, to parents of German origin. Her father was an officer in the Austrian army. She had one younger brother, Friedrich, born 1865 in Vincenca. At that time, malaria was widespread in Northern Italy. Her parents had severe health problems, and her father had to retire when he was 42. The family settled in Braunschweig, Northern Germany, which had a healthier climate. There, Agnes Pockels visited the municipal high school for girls. She was passionately interested in natural science, especially physics. However at that time, girls were not allowed to attend University. Instead, she became a housewife and cared for her sickly parents. When her younger brother started to study physics, she had access to text books and continued her education. In her diary, she described her efforts at home and her experiments which she performed in the kitchen.

At age 18 or 19, she developed an apparatus (consisting of a wire, a light balance, and an empty soup can) to measure the surface energy of

water. She found that, in general, the surface of water is contaminated, and that soap decreases the surface energy. She concluded that soap forms a surface layer. In 1882, she designed a rectangular trough, which turned out to be a breakthrough because, with a barrier, a surface layer can be expanded or compressed. Today this device is called the Langmuir trough, since Irving Langmuir used and described the set-up extensively. Using this trough, she was able to measure the first quantitative isotherm of a fatty acid monolayer. The next important step was the development of a method to bring a defined amount of molecules onto the water surface. Surface active materials like fatty acids or phospholipids are dissolved into organic fluids, which are brought onto the water surface. The organic fluids evaporate and a monolayer remains. This method is still used today.

Agnes Pockels was unable to publish her results in German scientific journals, however she subscribed to "Natuwissenschaftliche Rundschau" (akin to "Physics Today" in the US), and learned about recent research. There, she read about the work of an English physicist, Lord Rayleigh (who won the Nobel Prize in 1904 for his work on noble gases) in a new area, the physics and chemistry of surfaces. In January 1891 she wrote him a long letter, describing her work of the last 10 years and explaining that nothing was published. Lord Rayleigh was impressed by her methods and her results. He exchanged some letters with her to clarify details. Then, he translated her original letter into English, wrote a cover letter and submitted the letter under her name to *Nature*, where it was published. In the next years, she published three more papers in *Nature*. She

continued on page 9

Agnes Pockels: Life, Letters and Papers, continued

also became interested in the thickness of wetting layers, and wave damping by putting oil on water, an approach known since ancient times. She wrote, “Encouraged by the support of Lord Rayleigh and the publications in *Nature*, ... I dared to submit papers to German journals, and conducted about 10 years of successful investigations. The care of my sick parents was very challenging, therefore after 1902 I did few experiments, but I did a translation and wrote comments for “*Beiblätter zu den Annalen*”, which my brother edited. In 1909 I published my observations of the contact angle.” (A. Pockels, autobiographic notes)

In her private life, major changes occurred at the beginning of the 20th century. In 1900, her brother became a full professor of theoretical physics in Göttingen.

Today he is best known for the linear electro-optical effect, the so-called “Pockels effect”. In 1903 her father died. In 1913 her brother died, and in 1914, her mother. Her own health deteriorated, especially her eyesight. Her sister-in-law wrote that “during her later years she led a quiet life as ‘Auntie Agnes’, like many other middle-aged women in Braunschweig. She had many acquaintances, and two puzzle-solving societies met

in her home. The war and the inflation hit this society hard. She herself suffered less because her American relatives constantly cared for her and because later on the capital invested in California produced extremely high dividends. As a result, she was able to help others in all kinds of ways, and shared her income for years.”

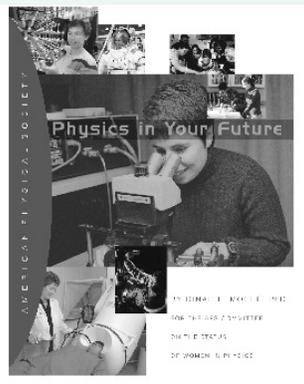
Agnes Pockels was very surprised when, in 1931 at almost 70, she received the annual award of the German Colloid Society. The award ceremony was the first time she had attended any sort of scientific conference. In 1932, the same year that Irving Langmuir obtained the Nobel Prize for his discoveries and investigations in surface chemistry, she received an honorary degree from the Technical University of Braunschweig (the first woman to be honored that way, and, until now, the only one).

This article is adapted from an invited talk presented at the APS 2004 March Meeting in a session on “Monolayers and Multilayers: Agnes Pockels and Katharine Blodgett”, sponsored by the Forum on the History of Physics and the Committee on the Status of Women in Physics. The slides and full text of the talk may be viewed at <http://www.aps.org/educ/cswp/events.cfm>

“I dared to submit papers to German journals, and conducted about 10 years of successful investigations.”

Copies Remain of Beatrice Tinsley Book

Beatrice Tinsley was an astrophysicist, wife, mother, and teacher. She died in 1981 at the age of 40, leaving a powerful influence on friends, family, and colleagues. Her father, Edward Hill, collected his memories of her, and they were published by the APS in a short book “*My Daughter Beatrice*” in 1986. This is a delightful book and includes anecdotes from her life as well as family photos and the perspectives of professional colleagues. The book is now out of print, however we have a few copies remaining on hand. If you would like a copy, please contact Sue Otwell in the APS office otwell@aps.org.



“Physics in Your Future”

Available at no charge to students and their parents, educators, guidance counselors, and groups who work with young women. To order or to view an electronic version, please go to <http://www.aps.org/educ/cswp/future.cfm>. Shipping is free, however we reserve the right to limit quantities.

Have you moved? Changed jobs? Changed fields?
 Take a moment to update your name/address/qualifications on the Roster of Women in Physics. This database also serves as the Gazette mailing list. See pages 13-14.

Need to reach more women and minority candidates for job openings in your department of institution? Consider a search of the APS Roster of Women and Minorities in Physics (see www.aps.org/educ/roster.cfm).



Only a few copies remaining of the “Celebrate Women in Physics” poster!

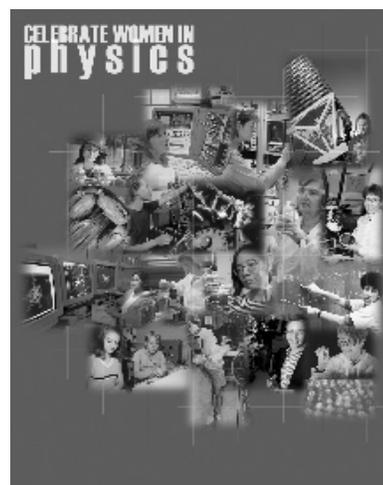
Simply return this form to APS and receive a free copy of this full-color poster. Single copies are free of charge, please call 301-209-3231 for information on bulk orders.

Name: _____

Address: _____

Telephone: _____

Email: _____



Mail to: Sue Otwell • APS • One Physics Ellipse • College Park, MD 20740

The American Physical Society 2004-2005 Travel Grants for Women Speakers Program



Purpose The program is intended to expand the opportunity for physics departments to invite women colloquium/seminar speakers who can serve as role models for women undergraduates, graduate students and faculty. The program also recognizes the scientific accomplishments and contributions of these women physicists.

Grant The program will reimburse U.S. colleges and universities for up to \$500 for travel expenses for one of two women colloquium/seminar speakers invited during the 2004-2005 academic year.

Qualifications All physics and/or science departments in the United States are encouraged to apply. Canadian and Mexican colleges and universities are also eligible, provided that the speakers they invite are currently employed by U.S. institutions. Invited women speakers should be physicists or in a closely related field, such as astronomy. Speakers should be currently in the U.S. The APS maintains the Women Speakers List which is available online at (www.aps.org/educ/women-speaker.cfm). However, selection of the speaker need not be limited to this list. Neither of the two speakers may be a faculty member of the host institution.

Guidelines Reimbursement is for travel and lodging expenses only. Honoraria or extraneous expenses at the colloquium itself, such as refreshments, will not be reimbursed.

Application The Travel Grants for Women Speakers Application Form (www.aps.org/educ/cswp/travelgrant.cfm) should be submitted to APS identifying the institution, the names of the two speakers to be invited and the possible dates of their talks. Please note that funds for the program are limited. The Travel Grants for Women Speakers Application Form should be submitted as early as possible, even if speakers and dates are tentative, or if the speakers are scheduled for the spring semester. The application form will be reviewed by APS, and the institutions will be notified of approval or rejection of their application within two

See following page for application

Women Speakers List

Need a speaker? Consider consulting the American Physical Society Women Speakers List (WSL), an online list of over 300 women physicists who are willing to give colloquium or seminar talks to various audiences. This list serves as a wonderful resource for colleges, universities, and general audiences. It has been especially useful for Colloquium chairs and for those taking advantage of the Travel Grant Program for Women Speakers. To make the WSL easy to use, we have made the online version searchable by state, field of physics, or speakers' last names.



If you'd like to search the list to find a woman speaker, go to <http://www.aps.org/educ/women-speaker.cfm>

Women physicists who would like to be listed on the Women Speakers List or those who'd like to modify their existing entries can do so at <http://www.aps.org/educ/women-speaker-enroll.cfm> or see page 15.

APS also has a companion program for minority speakers. Information on the Travel Grant Program for Minority Speakers can be found at <http://www.aps.org/educ/com/travelgrant.cfm>. The Minority Speakers List can be found at www.aps.org/educ/minority-speaker.cfm.

2004-2005 TRAVEL GRANTS FOR WOMEN SPEAKERS

◆ APPLICATION FORM ◆

This form is also available on the Internet at www.aps.org/educ/cswp/women-app.html

This form must be filled out and approval received from the APS in order to be eligible for up to \$500 travel reimbursement. Please note that submitting this application form does not guarantee reimbursement. You will be notified within two weeks of receipt of this application whether or not it has been approved.

DATE:	_____				
INSTITUTION:	_____				
DEPARTMENT:	_____				
CITY:	_____	STATE:	_____	ZIP:	_____
APPLICATION PREPARED BY (Required):	_____				
NAME:	_____	TITLE:	_____		
PHONE:	_____	FAX:	_____		
EMAIL:	_____				

Please list information on the speakers below. Please indicate if speakers' dates or talk titles are tentative.

DATE OF COLLOQUIUM:	_____				
SPEAKER'S NAME:	_____				
HOME INSTITUTION:	_____				
HOME DEPARTMENT:	_____				
ADDRESS:	_____				
CITY:	_____	STATE:	_____	ZIP:	_____
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Please return this form to: Arlene Modeste Knowles, Travel Grants for Women Speakers Program
The American Physical Society
One Physics Ellipse
College Park, MD 20740-3844
Tel: (301)209-3232 • Fax: (301)209-0865 • Email: travelgrant@aps.org

Women Speakers List (WSL)

Enrollment/Modification Form 2004-2005

Additions/Modifications may also be made on the Internet at www.aps.org/educ/women-speaker-enroll.cfm
An online copy of the WSL is also available.

The Women Speakers List is compiled by The American Physical Society Committee on the Status of Women in Physics (CSWP). The list is updated continuously online. Comments, questions and entries should be addressed to:

Women Speakers List • APS • One Physics Ellipse • College Park, MD 20740-3844 • (301) 209-3232

To enroll or update your current entry, please fill out this form completely and return it to the address above.
Please print clearly or type.

Title/ Name Dr. Prof. Mrs. Ms. _____ **Date** _____

Institution _____ **Telephone** _____

Address _____ **Fax** _____

_____ **Email** _____

City _____ **State** _____ **Zip Code** _____

If you have moved out of state, list previous state: _____

New Entry **Modification**

For which audiences are you willing to speak? (Please check all that apply)

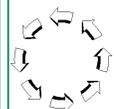
Middle school High school General Audiences Colloquium

To register a new title, give the title as you want it to appear in the left column below. Then check the section(s) where it is to be inserted. To delete a title, indicate the title and check the appropriate box below. A limit of four total entries will be imposed. You may use additional pages if you are submitting more than four modifications. PLEASE TYPE OR PRINT LEGIBLY PAYING PARTICULAR ATTENTION TO FORMULAS. WE REGRET THAT WE ARE UNABLE TO INCLUDE ILLEGIBLE ENTRIES.

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Committee on the Status of Women in Physics
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