

# APS Forum on Graduate Student Affairs

## FGSA Newsletter

*The APS Forum on Graduate Student Affairs encourages a free exchange of ideas among graduate students and the greater scientific community by providing opportunities for meetings, electronic discussion, and access to a permanent archive of member ideas and programs.*

*We are especially interested in expanding communication with the senior members of the APS, and indeed were created for that very purpose.*

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### Election Summary



As many of you are aware, the first election of the Forum on Graduate Student Affairs took place this fall. As FGSA Secretary I was responsible for coordinating the election process. The first call for nominations was sent out in August and we are very grateful to everyone who nominated themselves to run in the election. Thank you! It really does make a big difference to a fledgling group such as ours to have a group of people who are enthusiastic and motivated.

We sent out an electronic ballot to all our members in early October and returned ballots were accepted until December 1st at which time the results were tallied. Thank you to everyone who voted and had their say in the future of the FGSA!

All the candidates were extremely well qualified for the positions they were running for and I'm sure they would all have made excellent members of the executive committee of the FGSA.

The successful candidates are:

**Chair-Elect:**  
Karsten Heeger

**Treasurer:**  
Tom Tierney

**Members-at-Large:**  
Brian Utter and  
Kelly Korreck

Congratulations to you all and I hope that you enjoy your term in office! Speaking for myself I can say that my involvement with the FGSA has been interesting, challenging, a great learning experience and I have met many wonderful people. The new officers will begin their terms in January 2002. You can find out more about the successful candidates on our webpage at: <http://www.aps.org/units/fgsa/election.html>

Of course, serving on the executive committee is just one way to get involved in the FGSA. Many possibilities for serving on committees and helping with FGSA projects will become available in the future and I would urge you all to consider volunteering.

*Louise Parsons, Secretary*



## Welcome!

The APS Forum on Graduate Student Affairs is a new forum of the American Physical Society, provisionally approved at the April 2001 meeting of the APS Council. The FGSA is currently composed primarily of graduate students, but all APS members are welcome to join us as we discuss the current and future state of graduate education in physics and other topics relevant to the membership. The current officers were selected by the APS Task Force on Graduate Student Participation that was assembled last fall; elections have just concluded for the 2002 executive committee.

This Forum was created to give graduate students and others interested in graduate student issues a place to talk, to share, and to learn from each other about best practices in physics education; current events and new discoveries; pending action in Washington that may increase or decrease funding for our projects or physics in general; special conferences, events, or fellowships; career choices and preparation; and department support groups or mentoring programs particularly relevant to graduate education. Our interests span all of APS, and our goal is to encourage discussion about these topics both among ourselves and with the other

units of the American Physical Society. We want you to feel at home here in our new Forum, and then to explore the myriad opportunities to get involved with other forums, committees, and divisions in APS.

Chad, Louise, Jennifer, Xin, and Hsuan-Yeh will provide other perspectives on this new Forum in the next few articles. Thanks for reading this far; I hope that you will be intrigued, visit our new Website <http://www.aps.org/fgsa/>, and join us as we embark on a new adventure – the APS Forum on Graduate Student Affairs.

Susan Niebur, FGSA Chair

## APS 2002 Conferences

APS conferences provide excellent learning opportunities for graduate students in terms of both outstanding scientific content and informative sessions on education, policy, history, and other areas. As the chair-elect of the Forum on Graduate Student Affairs (FGSA) and the chair of the FGSA program committee, it is my duty and my pleasure to develop additional sessions for APS meetings that will be of special

interest to graduate students and to others interested in graduate student education and career development.

Thanks to the collaborative efforts of several other APS units, the first of these special sessions will take place at the upcoming March 2002 meeting in Indianapolis and the April 2002 meeting in Albuquerque. A number of exciting sessions are currently in development. These sessions strive to meet the goals

that the FGSA has set in a number of areas, including:

### PROVIDING SCIENTIFIC CONTENT

Along with the Division of Astrophysics (DAP) and the High Energy Astrophysics Division (HEAD) of the American Astronomical Society, the FGSA is co-sponsoring a session on

## Join Us!

Join the FGSA! Current APS members may join the Forum on Graduate Student Affairs (FREE) by amending their membership online at <http://www.aps.org/memb/unitapp.html> or by checking the box on their renewal form.

Nonmembers of the APS may join both FGSA and the APS (and another Forum free!) online at <http://www.aps.org/membstudents.html> or <http://www.aps.org/membhalfprice.html>. The membership fee is WAIVED for first-time student members. New regular members (and all junior members) may join at a special rate of \$50.

## FGSA Executive Committee



Committee Members: Jennifer West, Louise Parsons, Chad Topaz, Joshua Patin, Susan Niebur, Hsuan-Yeh Change, Greg Recine and Xin Chen

major current themes in modern astrophysics, to occur at the April meeting. This session will be accessible to graduate students in all areas of physics and will feature an exciting assortment of leading researchers.

## EXAMINING GRADUATE EDUCATION

A primary goal of the FGSA is to bring together physicists of varying career stages and of different professional and academic affiliations to discuss issues of graduate education. Along with the Forum on Physics and Society (FPS) and the Forum on Education (FEEd), the FGSA is planning sessions for the March and April meetings that will focus on some of these issues. Questions addressed may include:

How can we increase the level of job preparation (for academia and industry) provided by graduate programs?

How can we reduce the time-to-degree for Ph.D. programs?

How might we incorporate into graduate education skills such as grant writing, interfacing with government and industry, and participating in the public policy process?

## PROMOTING CAREER DEVELOPMENT

The FEEd and the FGSA are planning a session at the April meeting on how to find and succeed at a faculty job. This session will incorporate feedback both from members of hiring committees at academic institutions and from new faculty hires. The viewpoints of four-year colleges and large research institutions will be represented.

## ENABLING SOCIAL NETWORKING OPPORTUNITIES

At both the March and April meetings, the FGSA will be co-sponsoring graduate student receptions. These receptions will provide a venue for graduate students from different institutions to meet, interact, and network with each other, as well as to meet some of the APS leadership.

Anyone with interest in the issues mentioned above—students, postdocs, faculty members, and those working in industry or policy—are welcomed and encouraged to attend the FGSA-sponsored sessions. We hope to see you in Indianapolis and Albuquerque!

*Chad Topaz, Chair-Elect*

## Viewpoint

Welcome everyone!! After a long and sometimes difficult, sometimes exhilarating process, we have our new Forum on Graduate Student Affairs. I am a graduate student at the University of California, Santa Barbara and one of the two Members-At-Large in the executive committee of the new forum. As a Member-At-Large I have the freedom to work on what interests me the most. One of my interests is science policy. If you worry about what government policies affect us as scientists—for example, the National Missile Defense system, the recently proposed science budget cuts, science and math K-12 education—and want to know what you can do about your concerns, take a look at the webpage of the APS Office of Public Affairs: [http://www.aps.org/public\\_affairs](http://www.aps.org/public_affairs). They are a committed and passionate group in Washington D.C. who are trying hard to increase communication between us (physicists), the public, and the government. Not an easy task. They offer great fellowships and internships for many different career stages, both grad and postgrad. For

those who worry that taking a year off to work in the nation's capital could affect their academic track trajectory, both the director and the associate director have (or had) professor appointments and would be happy to discuss the pros and cons with you

Another awesome aspect of this job is that you can interview absolutely fabulous people, like Leon Lederman. And if you are lucky, they may even turn out to be your penpal after the interview. It is good for us to have role models, not only stellar scientists, with elegant and deep ways of looking at the universe, but also great human beings who have hearts as stretched as their minds. It is one of the benefits of having our own forum inside the APS that we get to interact with such people—it is so refreshing!

Which reminds me of the APS meeting in April, when about 50 physicists were sitting around this huge square outline of a table, and Susan Niebur (FGSA chair) and I were representing the petitioning graduate students, asking the Executive Commit-

tee to allow us to create a new forum. We had the almost invincible and incredibly supportive Judy Franz (APS Executive Officer) on our side, and Vice President Myriam Sarachik spoke up very strongly in our favor. The refreshing part was listening to almost every one of those distinguished scientists voicing their support for this forum. Strong support. It is nice to know that the older generation is as eager as we are to open up communication between us, and that it is as important to them as to us that we be as happy and heard as possible.

Thanks APS!! And welcome to our members. We hope that you get involved in your forum! Check out our website, contact us, let us know your ideas for making the forum helpful and useful. And run for office!! It is not too time consuming, and it is fun. Now I have to get back to studying.

*Member at Large,  
Associate Newsletter Editor,  
Jennifer West*

## FGSA Website

FGSA was created to enhance the ability of the APS to meet the needs of graduate students, to offer support services, and to provide increased opportunity for inclusion and participation in the activities and decision-making of the physics community. The website is very important in achieving these goals and serving our members.

When we were an APS task force on graduate student participation, a personal friend of mine volunteered to provide us a host website and gave us a lot of technical assistance. The task members also worked hard on it. The website played an important role in the establishment of this forum and collected most of the signatures for the founding of the new forum.

After the new forum was approved by the APS Council, we realized the importance of the website. In July, a

FGSA executive committee meeting was held and the website improvement was intensively discussed. Every executive committee member volunteered for some task in the website improvement. We have also discussed the website hosting issue, and decided to transfer the FGSA webpage to an APS website. This will give the website a more professional look, and we wish to provide professional service to our members. With the effort of all FGSA officers and with the help from APS staff members, our webpage has a new look now. Please visit the new website at <http://www.aps.org/units/fgsa>. You may have noticed the changes in the webpage. Much more improvement is still going on.

We hope that you will be proud of being a member of this graduate student forum. Your participation and

contributions are very much appreciated. If you have any comments and suggestions for the website, please mail me at [xinchen@mailaps.org](mailto:xinchen@mailaps.org). Thank you very much for your support.

*Xin Chen, Web Master and  
Member-at-Large*



## Editor's Note

Welcome to the APS Forum on Graduate Student Affairs! First of all, I would like to apologize for such a severe delay for editing this first issue of newsletter. Due to the recent attack on the WTC, everybody's life in NYC has somehow been affected. However, we are trying our best to go back to normal. So, here is our newsletter!

As already mentioned by other executive committee members, the essential purpose for establishing such a forum is to enhance the communication between graduate students and the APS, and with each other. A newsletter serves for such a purpose. In addition, we are trying our best to think of anything that graduate students might be interested in. In this first issue, we included a special report on interviews with celebrity physicists. I hope that you may find it interesting.

This forum was established for everyone interested in graduate student education. So, your input is very important to us. If you have any

comments or suggestions, you may simply send me an e-mail telling me your ideas about our newsletter. Also, if you have written something that you think most of the graduate students might be interested in, you can also submit your work to me. We will discuss with you the possibility of getting it published here. In addition to the newsletter, we have also established a website. In this website, we have added a bulletin board (<http://chaogic.com/aps/forum>) system where you can discuss any issue with other graduate students. However, it has been pretty quiet recently. So, again, your contribution is very important. Please take advantage of this modern technology and benefit from it. Finally, thank you for reading our newsletter! I hope you find it interesting and helpful.

*Hsuan-Yeh, Newsletter Editor and  
Member-at-Large*

## New Data Available!

No, not that kind of data! Now that I've got your attention, I am pleased to announce that the final results of the 2000 National Doctoral Program Survey have been released. This survey, conducted by the National Association of Graduate-Professional Students <http://www.nagps.org>, compiles data on the graduate student experience at the department level at hundreds of universities across the U.S. and Canada. Over 32,000 doctoral students participated, including many of your fellow scientists. The site is interactive; you can search for results for a particular department or an entire field. You can, for example, compare Physics departments to Astronomy departments using criteria such as information provided to prospective students, career preparation and guidance, TA preparation, time to degree mentoring practices, and program climate. You can even rank individual programs based on your own relative weights of these criteria! The Survey provides raw data on graduate students' perceptions of their graduate student experience...useful for comparison with your own department/experience or when looking at future positions. The Survey can be found at <http://www.survey.nagps.org>.

*Susan Niebur, FGSA Chair*

*(Disclosure: I was also  
Co-Administrator of the National  
Doctoral Program Survey)*

# Special Report - Interviews with Famous Physicists on Graduate Student Issues

Leon Lederman

The FGSA interviews Leon Lederman, Nobel Laureate in Physics, 1988. The prize was awarded for figuring out a way to make a beam of high energy neutrinos, for detecting these elusive (euphemism!) particles, and for later discovering the muon neutrino. His work, along with that of his two co-Laureates, was crucial for understanding the weak force, one of the four known fundamental forces of nature. Dr. Lederman is Director Emeritus of Fermilab.

On to the interview. The FGSA asks Dr. Lederman 10 questions:

## How do you feel about the formation of the new forum?

LL: I am enthusiastic about giving young physicists a voice and a platform. The key is to design it so that continuity is assured. Too many such ideas died as the proponents, the movers and shakers, grew "old" or lost interest.

## When did you get involved with APS and why?

LL: I joined APS in 1950 or so as a graduate student. It was probably during an "up" period in the roller coaster emotional experiences of the grad student.

## Was your path through school to becoming a professor pretty linear or was it full of twists?

LL: My college to grad student transition had a glitch known as World War II. I took three years off to help winning the war. The enforced break had interesting non-linearity in later life. But getting off a troop ship from Germany and starting graduate school was more of a challenge than anyone really needs. I

was at Columbia, not having any fun, ready to quit many times. My closest and dearest friends were at MIT, having been through The Bomb or Radar experience, really ahead. Knowing how to take apart a 50 caliber machine gun at night didn't help too much in E&M. I called them and cried. They said: "Come to MIT, we'll take care of you!". So I applied and was turned down.

## How did you choose your advisor?

LL: Advisors were chosen for us. Most of the useful advice came from senior grad students and brand new post docs. In the 1945-50 period, we were all pretty experienced.

## Since you have been on both sides of it, what do you think makes an ideal student/advisor relationship?

LL: The advisor should be a paid senior grad student or young AP who would be available to steer the new student through the pitfalls of the first two years. My advice was always irrelevant to the career. Like: In a singles bar, never, ever admit you are a physics student. [Note from interviewer: Rest of his comment has been edited out. It was very funny but a tiny bit racy for our first news-letter.]

## Why did you choose physics? And what do you love most about research?

LL: I think I selected physics because the friends I loved most were physics students...both in HS and college. I wanted more than anything to associate with them and not be too conspicuous. I was a chemistry major in college but enjoyed the physics courses more and switched near the end. And physics is just unbeatable! Research

must have its day-to-day kicks: a circuit works, the shop did a great job, the seminar was exciting, our proposal was not rejected. The ultimate closing in on a result, be it a measurement or an observation, is like a courtship with its joys and tensions. The intense high of a real discovery, once in a lifetime for most, is too infrequent to depend upon.

## What personal characteristics makes one, or makes you, such a successful physicist?

LL: I don't know. Stubbornness, total obsession during the experiment, willing to try to think differently, an associativeness, trying to connect different happenings, oh, most important of all: LUCK. That is crucial.

## Any advice for graduate students today?

LL: Physics is in a very exciting phase, essentially all fields. Also, George Bush can't stay forever. The sociology is changing in the wrong direction but you can work with it. "Plastics!" Or, go to law school after the Ph.D. and run for Congress.

## What do you think are the most important questions in physics today?

LL: Is there a Higgs? What is the family? Supersymmetry? Neutrino mixing, long baseline, the incipient marriage of quantum Mechanics and Relativity, the new applications of quantum mechanics to computing, cryptography, (for practice), for a less spooky, less bizarre quantum theory, and the stuff coming out of astrophysics!!! accelerating expansion, changing alpha, dark

*continued on next page*

energy. Also a very interesting field of applied physics is called biology... molecular biology.

### Any thoughts on the state of physics education today (at any level)?

LL: I am up to the wazoo in high school science reform. Physics first, then chemistry, then biology. Progress is glacial but I know we will overcome.

*[Interviewer was FGSA founding member Jennifer West, who first met Dr. Lederman at a talk in Berkeley soon after the demise of the Superconducting Super Collider in 1993. He was deeply upset by the failure of the project and gave a passionate talk on the science involved and the reasons behind the funding cut off. He made a huge impression on at least one future graduate student in the audience by showing her that physicists were people who went after fundamental and exciting science, and who were strongly affected when things went wrong.*

*Almost ten years later, at the April meeting of the APS Council (where future FGSA members gave their own passionate arguments for the formation of a new forum), she met him again. This time he was reporting on his progress in overhauling the science curriculum for public high schools nationwide. As he mentions briefly at the end of the interview, the idea is to have a 3 year science requirement with the order of subjects: physics, chemistry, biology - not alphabetically as it is usually taught.*

*There is an inspiration and a lesson in this for graduate students. A scientist who sits down and asks himself why did this happen? Why was so much time, energy, sweat and money wasted here? One of the answers he sees is the lack of science literacy of the general public. So he sets about to change that, spending the next eight years working hard on this issue. The lesson for us is that it is vital to ask "why?" not only in physics as we are taught, but also in life. The inspiration is Leon himself.]*

### Walter Kohn

Notes on graduate student days at Harvard University from Walter Kohn, Nobel Laureate in, 1998. Dr. Kohn, a Physics professor at the University of California, Santa Barbara, received his prize (in Chemistry!) for showing that in a complicated molecular system it is not necessary to consider the motion of each electron, but it is enough to know the average number of electrons located at any one point in space. From the UCSB website, "Walter Kohn is a condensed matter theorist who has made seminal contributions to the understanding of the electronic structure of materials. He played the leading role in the development of the density functional theory, which has revolutionized scientists' approach to the electronic structure of atoms, molecules and solid materials in physics, chemistry and materials science." In addition to being a scientist of the highest caliber, Professor Kohn is a kind and thoughtful human being. We are honored to be sharing a profession as well as a planet with him.

### GRADUATE SCHOOL DAYS

A letter from Harvard in 1946, informing me that I had been awarded a Lehman Fellowship for graduate study in physics, hit me like a bombshell. I was in Toronto, just finishing my master's degree work. Arrival in Cambridge was not too auspicious: with hundreds of others who also could not find a regular bed, I found myself sleeping on the floor of the Harvard gymnasium. But from there on, matters improved. The great, young star in the Physics Department - not yet 30 - was Julian Schwinger. Luckily for me, we shared a common interest in variational methods of theoretical physics, and so he quickly agreed to accept me as a graduate student - one of ten or eleven!

Those were heady days: Schwinger himself, Feynman, and Tomonaga were independently able to solve a long standing, deep problem, a consistent theory of the interaction of electrons with radiation. My role in this great work was

to mimeograph Schwinger's manuscripts. We all knew he was a night owl, doing his research at home, far into the morning hours. His lectures never began before 11 a.m., to accommodate him, and appointments with him were easy to make, but almost impossible to consummate. We, his disciples, went through scientifically unbelievably rewarding, and personally character-building experiences.

My thesis topic dated to one of his earlier interests, nuclear physics. I knew he was not very happy with my thesis because I had followed a simpler, and less interesting, route than he had suggested (his own ideas only came to fruition about ten years later). I was all the more surprised and delighted that, after my Ph.D. in 1948, he invited me to stay on as a half-time post doc and half-time instructor.

During this period, while working on Schwinger's new theory, I also developed a very friendly relationship with John Housbrook Van Vleck (or V-squared, as everybody called him). This got me interested in the then-new field of solid state physics, to which I have devoted most of my subsequent scientific work.

Those were also the years when I formed many lifelong friendships: Quin Luttinger, Phil Anderson, Charlie Slichter, Nicholas Bloembergen, Rolf Landauer, and others, just as my Toronto advisor, the Polish physicist and former Einstein assistant, Leopold Infeld, had predicted.

When I became oversaturated with physics, I would dart across to the music building, or up to the Fogg Museum for a few minutes, or listen to lectures by Professor Bush on Milton. What an embarrassment of riches!

I left Harvard in 1950. Last June, a half-century later, Harvard was kind enough to give me one of their Centennial Medals, even though I'm not quite there yet.

*Kindly submitted by Professor Kohn to Jennifer West, Member-at-Large, and Associate Editor, first published in Harvard graduate student newsletter, 2001.*

## Latest Research Results Online at a Student Level: Physical Review Focus on BEC Nobel Prize

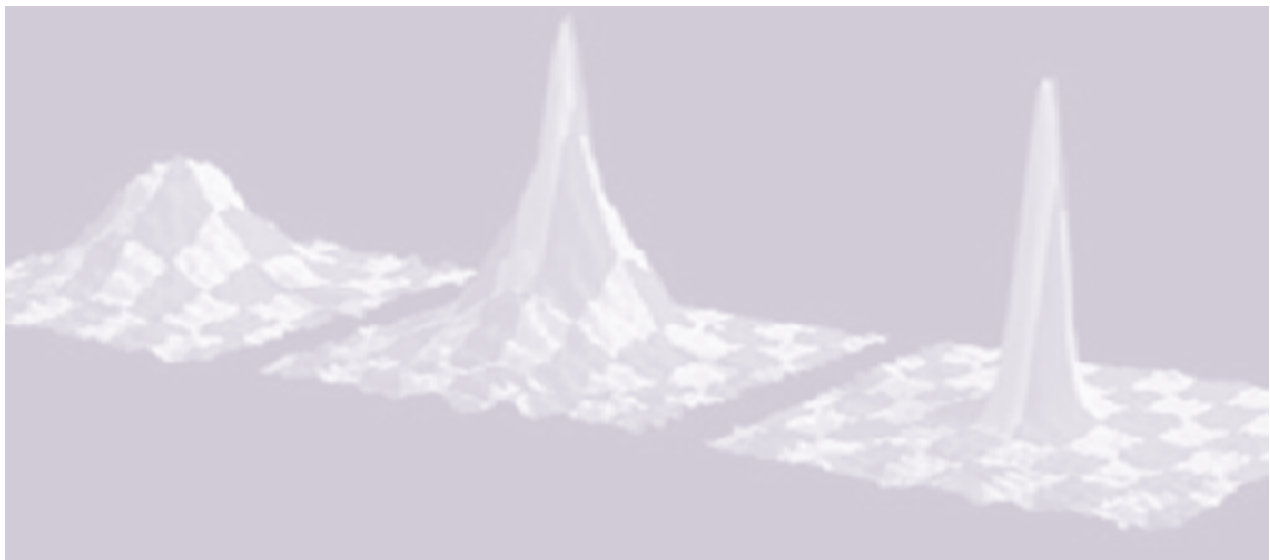
[Reprinted from Physical Review Focus, 12 October 2001. Copyright 2001, The American Physical Society. Focus is an online publication that covers the latest research appearing in the Physical Review journals. Visit the site at <http://focus.aps.org> to sign up for weekly e-mail alerts.]

This year's physics Nobel Prize went to three researchers who were the first to observe and study the Bose-Einstein condensate (BEC), a new phase of matter. Wolfgang Ketterle of MIT, one of the Laureates, published his first BEC observation in the 27 November 1995 issue of PRL, just four months after the other two Nobelists published their work in Science. Ketterle's experiment used a laser "plug" to trap the condensate and achieve much higher densities than the other team. Since then, dozens of BEC papers have appeared each one further probing the nature of this strange form of matter. In 1924, Satyendranath Bose and Albert Einstein published a series of papers on the physics of particles with integer spins (bosons). The duo predicted that if a collection of bosonic atoms could be cooled to the point that

each one reaches its lowest possible quantum mechanical energy, a BEC would result. In this state, atoms would lose their individual properties and would act collectively as a single entity. A few years after Bose and Einstein's prediction, physicists observed the first hints of BEC behavior. They observed a strange new phase of liquid helium which had no measurable viscosity. Called superfluid helium, the liquid was a few percent BEC, but creating a pure BEC was still decades away. It required technology for creating extremely low temperatures and a material that would not liquify before reaching the BEC phase. In 1995, a group led by Eric Cornell and Carl Weiman at the National Institute of Standards and Technologies in Boulder produced the world's first true BEC. The group cooled a gas of rubidium atoms to a few hundred nanokelvin using magnetic and laser traps. The magnetic trap was particularly troublesome because its fields had a hole through which the atoms could escape, so Cornell and his colleagues had to use a second set of rotating magnetic fields to keep the atoms in place. Later that

same year, Ketterle and his group produced a BEC with much higher densities. The team achieved these densities by "plugging" the magnetic field hole with a laser. The laser's photons exerted a force on escaping atoms, pushing them back into the center of the trap. Using this technique, Ketterle and his team were able to create a BEC with ten times as many atoms at 100 times higher density. Both Cornell and Ketterle's groups observed a state of matter unlike any other. The condensates had densities of about a hundred billion atoms per cubic millimeter, and although the BEC could be millimeters across, it behaved something like a giant atom. In the years since, others have observed the numerous strange properties of BECs. When two condensates come together, for example, atoms suddenly vanish at the troughs of an interference pattern. And when researchers stir the condensate, they can never get a single vortex—dozens of smaller ones form instead. These improved experiments have helped BECs win a place in modern physics and in Nobel Prize history.

*Geoff Brumfiel*



## FGSA Executive Officers (2001)



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