FIAP March 1996 Newsletter

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Career Paths In Industry:
A Transition to Applied Research

Robert Kwasnick

What follows is an interview with Don Monroe, a FIAP member and physicist who has been involved in both basic and applied research in industry. Don and I were students in Marc Kastner's group at MIT where Don studied electronic transport in amorphous semiconductors, graduating in 1985. The story of someone's career is of course personal, but also reflects universal aspects of broader interest.

Rob: Tell me about the start of your industrial career.

Don: In the beginning I came to Bell Labs to do basic research, which, as I see it now, meant research that was deemed interesting by the theorists that I knew. I was looking for some unusual behavior in impurity bands at temperatures below 1K. I had begun to see some evidence for the predicted glasslike behavior when high-temperature superconductivity came along and the theorists decided that that was more interesting. This made me begin to realize how the hot topics in basic physics can be driven by what are essentially fads, many of which may have little lasting significance.

Rob: So what did you do?

Don: I moved into the area of Si-Ge heterostructures. I hooked up with skilled material scientists and film growers, who had recently made great improvements in growing relaxed alloy buffers on Si. A major selling point of Si-Ge based devices is that by using modulation-doping to reduce ionized impurity scattering, one can improve the mobility even at room temperature, compared to Si.

Rob: What could you contribute as a physicist?

Don: I could do transport measurements at low temperatures and high magnetic fields, and I was familiar with the two-dimensional electron gas literature, so I could help to identify the remaining limitations on the mobility. We also looked at the integer and fractional quantum Hall effect in this system. Unfortunately, since those effects depend only on Planck's constant and the electron charge, observing them in a new system didn't really bring to light any novel physics. In learning about how this material is grown, I also learned that dislocations have tremendous topological beauty, which physicists can appreciate. Indeed, although some of the great physicists of this century (notably Peierls) explored these topics, it was not part of my condensed-matter physics training because it was thought of as a "solved problem", or as a materials science problem.

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Rob: Or maybe it's just that dislocations weren't a topic you really needed to learn in graduate school.

Don: But there's more to it than that. Dislocations provide a perfect example of how thinking about a problem appropriately can trigger the intellectual curiosity of physicists. I think a big barrier to working on more applied problems is just aesthetic, by which I mean that we are trained to regard some problems as intrinsically less interesting. I think that's one thing that FIAP can do: to help us to communicate ways of framing applied problems that help stimulate our enthusiasm and creativity.

Rob: So how did you move from the quantum Hall effect into transistor technology?

I guess I developed in graduate school a sort of faith that if you discover a new phenomenon some engineers can turn it into a technology.

Don: The advances in growth technique really brought these Si-Ge systems into the realm of electronic quality semiconductors. Nonetheless, the effort required to beat GaAs at the physics game appeared large, and the rewards were uncertain. In contrast, even modest improvements in the room temperature transport could have important technological implications, perhaps easing some of the pressure on reducing device dimensions. We felt that we owed it to the company that had supported our research to honestly explore the potential of these materials in VLSI integrated circuits. One thing we learned was that, because of the very high electric fields when you drop a few volts across a fraction of a micron, improving the low field mobility does not necessarily have the impact that we had expected, because the carrier velocity is really limited by optical phonon emission, not elastic scattering. The physics that governs the characteristics of very short transistors is very subtle, and the advantage provided by Si-Ge heterostructures is pretty modest, although still significant. But until I began to try to think about applying the work, I really misunderstood the nature of the physics challenge. At the same time, we began to recognize some of the practical challenges to incorporating this into VLSI.

Rob: You're talking about the difficulty of bringing a new element into a mature technology. In the case of VLSI, into a long process sequence where changing one step can affect many other steps.

Don: Right. As a physicist you might think that "since Ge and Si are in the same column I can just plug Ge in". Of course you know about the strain that induces, and that was the problem the materials scientists had made great advances in. But the most profound change in introducing Si-Ge alloys is not so much the finished

device structure, but the chemistry of the processing needed to create the structures, for example etching and oxidation. More than half of the many process steps for creating the transistors would have to be redeveloped to deal with the Ge. I guess I developed in graduate school a sort of faith that if you discover a new phenomenon some engineers can turn it into a technology. That faith seems quite naive to me now, and I think that if we are going to improve the technology, we really have to understand rather well how it works. This is especially true for the very mature silicon technology, of course.

Rob: So, what is the nature of your work now?

Don: The group effort to examine Si-Ge FETs really changed my perspective on where the problems are in VLSI. Now I'm working on other more traditional VLSI problems such as trying to improve circuit speed at lower power by using thinner oxides. The potential for improvement depends on a detailed circuit understanding, while the tradeoffs include potentially reduced reliability. The physics underlying oxide reliability, in oxides less than 10 nm thick, is quite complex, and a subject of tremendously active research. There are numerous problems that interest me in VLSI. Of course, there are many that I find less interesting, but so far I have been able to choose. One of the most important transitions for me was to abandon the smooth, adiabatic connection with my physics training. Of course, adiabatic also means reversible, and I can think of few things sillier in life than to try to retain the ability to do what you used to do, rather than to explore new areas of human experience.

Robert Kwasnick is a physicist in the Industrial Electronics Laboratory at the GE Corporate Research and Development Center. Don Monroe is a physicist at Lucent Technologies, Bell Labs.

NEWS FROM SILICON VALLEY

Scientific Careers in the Magnetic Recording Industry

Caroline Ross

With increasing use of multimedia and ever more powerful computer applications, demand for low cost, rapid access data storage continues to expand, making the magnetic recording industry a dynamic and fast growing sector. Data can be stored on floppy disks, hard disks, magneto-optical disks and magnetic tapes, depending on the application. This article will concentrate on the hard disk industry, though technological progress and the potential for scientific careers also exists in other types of storage media and in niche products such as flash memory.

Hard disk storage density (measured in bits per unit area of disk surface) has historically increased at a compound annual growth rate of 30%. This trend shows no sign of diminishing, and recently has even accelerated with the advent of magnetoresistive readback heads. The overall geometry of the hard disk drive has remained the same, with a rigid disk spinning under a read/write head which floats over the disk and which moves radially to access different tracks. However, all components of the drives have become smaller and bit densities and data rates higher, providing continuing challenges in physics, materials science and mechanical engineering.

Hard disks are generally made from aluminum platters coated with hard electroless nickel-phosphorus. Circumferential grooving (texture) is made in the surface, using an abrasive to reduce stiction between the head and disk and to modify the properties of the magnetic film. A chromium underlayer, cobalt alloy magnetic layer and hydrogenated carbon layer are deposited sequentially onto the substrate by sputter deposition, and the disk is then lubricated.

Reading and writing is usually done by an inductive head made from nickel-iron pole pieces, though in the last year or two, advanced heads based on more sensitive magnetoresistive (MR) read elements have been incorporated in high performance drives. These MR heads are complex to manufacture, but have enabled significant increases in storage density. Heads are created on ceramic substrates using lithography and film deposition processes similar to those used in semiconductor device fabrication. After the read and write

elements are produced, the substrate has to be diced and shaped to create an airbearing surface which will fly at a controlled height above the disk while the disk spins. The head is mounted on a suspension which is actuated by a small motor under command from the disk drive controller in the computer.

By the year 2000 it is estimated that the recording density will be 10 Gb/in2, and 250 M drives will be sold per annum

Products are currently available with densities of around 500 Gb/in2, corresponding to track widths of order 5um and bit lengths of 0.2um. The head flies about 50nm above the surface, which is protected by a 20nm carbon overcoat. Such media have coercivities of order 2000 Oe and magnetic film thicknesses of 20 - 40nm. Typical data rates are around 6MB/s. The drive might contain 4 platters with 8 heads for a total capacity of 1 - 1.5 GB, spinning at 4500 rpm and packaged in a 70mm x 100mm x 12mm unit weighing less than 200g. Cost of storage is around 20c/MB, and about 85M drives were sold in 1995. As large as this appears, by the year 2000 it is estimated that the recording density will be 10 Gb/in2 and 250 M drives will be sold per annum. Even such a brief description indicates the range of research in the hard disk industry. From the media side, alternative substrate materials are being studied to improve shock resistance and new texture processes are being investigated to enable the head to fly lower without crashing. The sputtering process is constantly evolving to produce magnetic films with higher coercivities and lower thicknesses, and control of the film microstructure is key to achieving this. Tribologists are working on overcoat materials which will protect the magnetic film at thicknesses of less than 10nm, and ways to reduce wear between the head and media. Recently developed removable hard disk cartridges impose particularly severe requirements for mechanical reliability. From the heads side, a tremendous effort is going into development of more sensitive and manufacturable MR elements, since the demand for MR heads is far greater than the available supply. These elements are complex multilayer structures whose compositions and layer thicknesses have to be controlled to almost atomic resolution, but which have to resist corrosion and interdiffusion during use.

Mathematical modeling of air flows past the slider is another active research area, allowing smaller sliders to be built with flying heights which are independent of disk radius. The head suspension and drive have to be designed to avoid vibration and minimize power consumption, while allowing the head to be positioned with submicron accuracy on a track. Finally, there is considerable mathematical and electronic research into new schemes for encoding and reading back signals and for boosting data rates, and into methods of integrating large numbers of drives into arrays. Developing a better understanding of the physics of the recording process is crucial to high density recording. The conventional coding scheme, in which bits are detected as isolated pulses, is giving way to a coding scheme known as PRML. In this scheme, the readback signals from closely spaced bits are assumed to overlap, and linear superposition principles are used to back the original sequence of bits out of the readback signal.

There are some physical limits to the hard disk systems made at present. For example, as the magnetic bits become smaller they approach the size of the magnetic grains in the media, causing a rapid decrease in the signal to noise ratio. Grain size cannot be decreased arbitrarily because the magnetization in very small magnetic particles becomes thermally unstable. However, the physical limits to existing hard drive technology are a few years away, and the industry is expected to meet the technological challenges and continue to expand. Eventually new recording schemes will become necessary: for instance, data may be stored in discrete magnetic particles formed lithographically in an array and written or read using a fine probe.

Most of the drive companies today are hiring graduates in physics, materials or engineering for research positions

In such a competitive and technology-driven industry, significant spending on research and development is very important. Apart from their internal research departments, companies often collaborate with local universities, providing financial support or equipment for projects of mutual interest. The University of Minnesota, the University of Alabama, Carnegie Mellon University, the University of California at San Diego and Stanford University, among others, have established research groups or centers dedicated to information storage technology. The National Storage Industry Consortium (NSIC) has promoted links between universities,

companies and government laboratories and provided funding for research over the last few years, with the aim of improving the competitiveness of U.S. companies in information storage technology.

Most of the drive companies today are vigorously expanding and hiring graduates in physics, materials or engineering for research positions. Graduates have a wide choice of industrial environments in which to pursue research, ranging from companies which specialize in one component (such as Komag, which makes over 25% of the world's hard disks) to vertically integrated companies such as Seagate who make many of the components and assemble drives. Although many U.S. companies are moving their manufacturing offshore to take advantage of lower costs, their research centers and some of their manufacturing are still firmly rooted in the U.S. companies, often in Silicon Valley, and the foreign factories follow a 'copy exactly' philosophy in manufacturing. There is, of course, strong competition in the drive industry from Japanese companies, but U.S. companies hold the majority of the market. What is certain is that the storage industry plays a crucial role in the information age, and as it evolves it will continue to provide stimulating careers for physicists. More information may be found at Magnetic Recording Web Sites (http://www.wsrcc.com/alison/magrec.html).

Caroline Ross is a Principal Engineer at Komag, Inc.

NEWS OF UPCOMING MEETINGS

FIAP's 1996 Program Activities

by Fred Dylla and Craig Davis

Industrial and applied physics play a more visible role in APS meetings this year. The combined efforts of CAP and FIAP have generated a series of technical sessions - covering topics from optics to economics - at APS's general meetings in St. Louis and Indianapolis.

At the **APS March Meeting in St. Louis** on March 18-22, FIAP will present five sessions:

Towards an All-Optical Communications Network will cover several technological issues including next-generation networking, optical switching, and fiber nonlinearities.

- Transparent Optical Networks for the Next Generation Communications Infrastructure, Dr. Eric A. Swanson, MIT Lincoln Laboratories
- All-Optical Switching, Prof. Mohammed Islam, University of Michigan
- Fiber Nonlinearities: Ultrafast All Optical Serial Processing in Fiber Networks, Dr. Andrew Chraplyvy, AT&T Bell Laboratories
- Novel Devices for All-Optical Networks, Prof. Turan Erdogan, Institute of Optics, University of Rochester

Physics of Product Design, Development, and Manufacturing Processes will consider the role of physics in product design from machine tools to aircraft.

- Chaos in Machining Processes, Henry Abarbanel, UCSD
- Physics-Based Modeling in the Design of Electromechanical Products, Gerald A. Domoto, Xerox Corp. Wilson Center
- The Physics of Optical Position Sensors for Robotics and Numerical Control (N/C), Jeffrey A. Koch, FANUC Berkeley
- Measurement of Metal Cutting Forces at High Speed, David W. Princehouse, Boeing

The Industrial Use of Synchrotron Radiation will reveal applications of this technology for thin films, microelectronics, and pharmaceuticals.

- Overview of Industrial Synchrotron Radiation Use, Stephen Laderman, Hewlett-Packard Labs

- State-of-the-Art Evaluation of Ultraclean ULSI Processes, Alice M. Fischer-Colbrie, Hewlett-Packard Labs
- Magnetic Thin Film Research with X-Ray Synchrotron Radiation, Dieter Weller, IBM
- Applications of Infrared Synchrotron Radiation to Industrial Analytical and Basic Research, Gwyn Philip Williams, Brookhaven
- Synchrotron Radiation in Pharmaceutical Research, Noel D. Jones, Molecular Structure Corp.

Physics of Waste Management will investigate the future for nuclear waste disposal, the physics of decontamination of dirt, and industrial ecology.

- Nuclear Waste-Physics and Policy, John F. Ahearne, Sigma Xi & Duke University
- Physics at Work: Decontaminating Soil by the Application of Heat, William A. Edelstein, GE
- Rigorous Modeling of Contaminant Removal from the Subsurface by Soil Heating, Tadeus W. Patzek, Berkeley
- Industrial Ecology of Materials, Robert A. Frosch, Harvard

will explore how physics and physicists can be useful on Wall Street, and more.

- A Physicist in Finance, Joe Pimbley, Financial Guaranty Insurance Corporation
- Financial Products, Albert Zisook, Swiss Bank Corp.
- Methods for Quantifying Trading Risks, Evan Picoult, Citicorp
- Risk Management, George Pastrana, Morgan Stanley

A second set of FIAP sessions will be held at the **Joint APS/AAPT Meeting in Indianapolis** from May 2 to 5:

Futures of Renewable Energy: Efficiency, Fissions and Fusion, will discuss renewable-energy successes from the past and potential savings in the future.

- From the Lab to the Marketplace - Smarter Products, Developed Since 1973, Have Already Avoided 300 GW, A. H. Rosenfeld, DOE-EE
- Windows - How Application of the Plasma Frequency Equation Has Avoided Using Up 1 Prudhoe Bay or 5-10 ANWRs, Stephen Selkowitz, LBNL
- Status of Renewable Technologies, Allan Hoffman, DOE-EE
- The Role of Fusion in the Future World Energy Market, John Sheffield, DOE-ONRL
- A High Power Energy Amplifier, Carlo Rubbia, CERN

Measuring Fundamental Properties of Complex Materials will examine sensors and techniques for a variety of measurements, including the electrical properties of polymers and rheology of fluids.

- Electrical Properties of Polymers-Sensor Measurements, Jerome B.Lando, Case Western Reserve University
- Mapping of Microscopic Thermal Conductivity Variations in High Performance Materials, Ralph B. Dinwiddie, DOE- ONRL
- Static and Dynamic Rheology of Controllable Fluids, John M. Ginder, Ford Motor Co.
- Optical Rheometry of Complex Fluids, Gerald G. Fuller, Stanford University

Particle Beam Processing of Materials will provide an overview of advanced-materials processing techniques including applications to crystallography, composite curing, lithography, surface treatment, and transmutation of nuclear waste.

- An Overview of Particle Beam Processing Techniques, H. Frederick Dylla, Continuous Electron Beam Accelerator Facility
- Commercialization of Radiation, Dr. Joseph McKeown, AECL Accelerators
- Electron Beam Curing of Composites, Mr. Gregory Stein, Northrop Grumman
- UV FEL Processing-A Unique Opportunity, Dr. Michael Kelley, DuPont Central Science Engineering Laboratories
- The Physical Sciences in Biotechnology: Crystallography for Fun and Profit, Dr. Cele Abad-Zapatero, Abbott Laboratories
- Sources for Future Lithography Generations, Dr. Juan Maldonado, IBM
- Ion Beam Surface Treatment, Dr. R. W. Stinnett, Quantum Manufacturing, Inc.
- Magnetically Nozzled Plasma Accelerator for Material Surface Treatment, Dr. Kurt F. Schoenberg, LANL
- The APT Accelerator, Dr. George P. Lawrence, LANL
- Accelerator-Driven Transmutation of Nuclear Waste: Status, New Concepts and Future Developments, Dr. Tarlochan Bhatia, LANL

Nuclear Imaging Techniques will explore the current status of positron-emission tomography, gamma-emission mammography, and digital x-ray imaging.

- Positron Emission Tomography (PET) Instrumentation: Past, Present & Future, Simon Cherry, UCLA
- Advances in Magnetic Resonance Imaging, Ronald R. Price, Vanderbilt
- Gamma Emission Mammography, Irving Weinberg, NIH
- Digital X-ray Imaging, Larry Antonuk, University of Michigan

The 1997 FIAP Program Committee, chaired by Craig Davis from Ford Research is already planning for the 1997 APS general meetings. The committee invites suggestions for session topics and speakers, which should be sent to LDavis@smail.sr1.ford.com. To keep up with future activities, watch FIAP's World Wide Web site (/FIAP/).

Fred Dylla from CEBAF and Craig Davis from Ford Research co-chaired the 1996 FIAP Program Committee.

Managing R&D in the '90s

September 11-12, 1996

CEBAF, Newport News, VA

Creativity and originality are no longer enough. Ever-tightening budget constraints are changing the way universities, government laboratories and industry view research and development, and even pure research is required to demonstrate cost-effectiveness.

On September 11-12, 1996, the Continuous Electron Beam Accelerator Facility (CEBAF) will host a conference and workshop "Managing R&D in the 90s" addressing the following topics:

- Getting More R&D for the Dollar
- Measuring R&D
- Getting Funding: Perspectives from Different Sources
- Leveraging Resources Through Partnerships

The speakers will present practical examples of management strategies that have worked, and provide information that can be used by anyone leading an R&D effort. Topics which affect universities, government laboratories and industry differently will be addressed in panel sessions and include speakers with different viewpoints. One session will focus on improving R&D effectiveness through partnering and joint ventures. The first day will consist of a half-day workshop on creativity lead by Chic Thompson.

The conference is co-sponsored by the FIAP and the Virginia Peninsula Total Quality Institute (VPTQI), a consortium of local industries, universities and government laboratories dedicated to improving quality.

For further information use the CEBAF World Wide Web address at http://www.cebaf.gov/general/cal/RnD_wkshp.cfm or call CEBAF at (804) 249-5033.

APS to Survey Membership

FIAP will use forthcoming APS surveys to find out specifically what its members want from this Forum. An extensive survey of the demographics of APS members some five years ago revealed that about 50% of APS members were in the industrial and applied physics fields. This discovery led to the formation of FIAP. The new surveys will target questions to produce action items for the APS. Some possible survey questions are:

- Should APS organize itself as a professional as well as a scientific society?
- What attracts industrial physicists to APS meetings: symposia on what topics? short courses? networking events?
- Should APS take an active role in finding jobs for its members and in developing their careers?
- Should the APS help develop new working relations between industry, universities and government?
- In what fields do physicists in government and universities seek consultation with industry? In what areas do industrial physicists collaborate with their colleagues in academia?
- Which physics courses offered at the upper-division and graduate levels prove useful in professional life, and should others be substituted in some cases?

Meanwhile, we encourage you to express your views on these issues through letters to the editor.

Conference on Lasers and Electro-Optics (CLEO '96)

If you're interested in the frontiers of applications and industrial opportunities in applied optics and lasers, you should attend CLEO '96 in the Anaheim Convention Center, June 2-7, 1996.

CLEO, the greatest annual technical and trade show in the field of lasers and optics in the U. S., is sponsored by the Optical Society of America and the IEEE Lasers and Electro-Optics Society, and is held concurrently with the Quantum Electronics Laser Science Conference (QELS'96).

Areas of special interest to industrial and applied physicists include: laser materials processing in industry; optoelectronics for printing, storage and display applications; lasers and optics in medicine and biological applications; fiber lasers, amplifiers devices, and sensors; lightwave communications and networks.

CLEO features many invited papers by renowned scientists and technologists and several short courses in related fields. An Employment Center will provide job postings and interview scheduling.

For further information, contact OSA at 202-223-0920.

Career Workshops for Physicists

The APS offers Career Workshops at schools and professional meetings for physicists seeking employment through the Career Planning and Placement Division of the AIP. The job market in physics has shifted from academia towards industry and from basic research to broad skills applications in development, process, and production areas. Today, physicists need placement skills and career information to compete strongly in a more diversified jobs arena.

The Workshops offer practical training on preparing to enter the job market. Topics covered include resume and letter writing as well as how to prepare for an interview. Advice is given on resources for jobs in physics, statistics of employment and education, and networking strategies. Workshop training also deals with a diverse range of career paths for physicists. A Career Materials Book, specially designed for physicists, accompanies the Workshop presentation and exercises.

The next workshop will be held in conjunction with the APS March meeting on Sunday, March 17, 1996 at the America's Center/Cervantes Convention Center, Room 260, at 1:00 p.m. - 4:00 p.m. and again at 6:00 p.m. - 9:00 p.m.

For further information, call Career Planning and Placement at 301-209-3190 or e-mail cpp@aip.org.

The George E. Pake Prize - Invitation to Nominate 1997 Candidates

Nominations are invited for the 1997 George E. Pake Prize of the American Physical Society. This prize is awarded annually to one individual for outstanding accomplishments in physics research combined with major success as a manager of research or development in industry. This prize was established in 1983 by the Xerox Corporation in recognition of the outstanding achievements of George E. Pake, a research physicist and director of industrial research. Its purpose is to recognize and encourage outstanding work by physicists combining original research accomplishments with leadership in the management of research or development in industry. It consists of a $5,000 allowance to travel to the meeting at which the prize is awarded, and a certificate recognizing the contributions of the recipient.

Since this is a prize that recognizes directly the pursuit of physics in industrial settings, FIAP members should be aggressive in nominating their favorite candidates. This year's prize selection committee especially invites nominees from small physics based industries, e.g., of entrepreneurs who have started their own firms.

Nominators should include in their nominations package a statement of the accomplishments for which the prize would be awarded, a proposed citation, a curriculum vita of the candidate, and letters of support from at least three individuals familiar with the candidate's accomplishments. As a helpful hint, letters from individuals who are well recognized in the physics community (e.g., current or past society officers, APS fellows, APS prize winners, members of the national academies, etc.) play an important role in the selection committee's deliberations.

Nominations for the 1997 prize should be sent before June 14 to: Dr. Charles B. Duke Xerox Wilson Center for Research and Tech 800 Phillips Road, 0114-38D Webster, NY 14580

The Industrial Physicist - On Its Own

With the March issue, **The Industrial Physicist** is on its own. While two trial issues were mailed with **Physics Today** in 1995, the new magazine is now mailing to its own subscribers, "destined to rise or fall on its own merits" as the editorial says. The March issue has a cover story about Structured Inventive Thinking, a technique for getting scientists and engineers to come up with innovative solutions to problems quickly and efficiently. Several of the other articles are about industrial electronics.

The response to **The Industrial Physicist** has exceeded expectations, according to editor/associate publisher Ken McNaughton. About twelve thousand subscription requests came from the first issue, which was mailed with **Physics Today** in July. Surprisingly, about 50% of these requests came from people who don't subscribe to **Physics Today**, indicating a very high pass-along rate for the new magazine.

The next surprise was when the December issue mailed, again with **Physics Today**. Subscription requests sustained a remarkable 85% of the volume generated by the July issue. In order to satisfy this high level of interest, a subscription card for **The Industrial Physicist** will be placed in each issue of **Physics Today** throughout 1996. There will also be subscription cards in all issues of **The Industrial Physicist**. At press time, subscription requests numbered around 20,000; distribution of the March issue is closer to 30,000, which includes bonus distribution at various meetings.

For a sample copy, author guidelines or further information, contact Ken McNaughton at **The Industrial Physicist**, One Physics Ellipse, College Park, MD 20740-3843; tel. 301-209-3051; fax. 301-209-0842; e-mail tip@aip.org; or on the World Wide Web (http://www.aip.org/tip/tip.html).

Report from the FIAP Secretary-Treasurer

FIAP is now the largest forum in APS, and has operating funds from membership fees of approximately $15,000. These funds have been used to deliver member communications (such as the newsletter, election ballots, and volunteer appeals), to pay for miscellaneous expenses at the FIAP general meeting at the March meeting, and to initiate a new World Wide Web-based resume listing service for members (coming soon!).

FIAP Volunteers Respond

by Abbas Ourmazd, Len Brillson, and Barrie Ripin

We have had an excellent response to the recent mailing of a Volunteer Interest Form. Over 200 returned forms in just the first 2 weeks, and dozens continue to flow in daily. Kudos to the many FIAP members who have stepped up to offer their valuable time and talents to help FIAP and the APS to enhance its efforts in the following areas:

- Career and Employment Development - by participating in career work shops at meetings, acting as mentors or contact points for members interested in industrial careers, and by other means.
- Industrial/Academic Cooperation - by participation in the Industrial and Applied Speakers List, intern programs, and the like.
- APS Meetings - by helping organize or participate in industrial application symposia, short-courses, etc.

Members who are interested in volunteering, but have not yet filled out the form, may still return it by mail or fill out an online version via the APS Home Page [http://aps.org/units/fiap/fiapvolapp.cfm under the Forums, FIAP page]. On behalf of the members of the APS, thank you for your wonderful response.

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FIAP's Employment Opportunity Working Group

As part of our efforts to improve employment opportunities for APS members, FIAP has formed an Employment Opportunity Working Group. This group aims to address both career development for members already working in industrial and applied physics and identification and creation of job opportunities for physicists interested in industrial employment. Len Brillson (FIAP), Fred Dylla (CAP), and Barrie Ripin (APS) are leading this initiative, a joint effort between FIAP and the Committee on Applications of Physics (CAP). The group has already organized employment activities at the March Meeting in St. Louis and on the World Wide Web.

As part of the Careers Workshop at the March Meeting, FIAP volunteers from many different companies will be available throughout the week for both small group sessions on how to develop marketable skills for industry as well as for one-on-one career discussions with interested physicists. This year the Careers Workshop will begin with sessions on Sunday, March 17th, at 1:00 p.m. and again at 6:00 p.m. FIAP members are invited to counsel/mentor individuals and groups and, as employers seeking qualified personnel, to interview job applicants. For more information on how to volunteer, see the FIAP page of the APS Home Page [http:\\aps.org].

FIAP members may also network over beer and hors d'oeuvres in an informal session at the St. Louis meeting. We hope the interactions you have stimulate new ideas on ways for FIAP to move forward and you will take the opportunity to express them in future Newsletters.

The Employment Opportunity Working Group also has begun to construct an electronic careers network, available through our APS/FIAP Web page. This network will incorporate an engine for generating input for both job seekers and employers. Such a network will provide a wider diversity of options than might otherwise be considered by physicists seeking employment. For example, both engineering and scientific talent are currently in high demand in the microelectronics industry as it gears up for programs in the National Technology Roadmap for Semiconductors. Future opportunities may be greater in small- to medium-sized

companies than in the large corporations which have been traditional employers of industrial physicists. The careers network will establish electronic links to several technical recruiting companies looking for experienced scientists and engineers to fill some of these positions.

We welcome FIAP volunteers who wish to contribute to FIAP Web pages on career development. FIAP would like to coordinate activities with other APS units concerned with employment, such as the Forum on Physics and Society, the Forum on Education, and the proposed Careers and Professional Development Forum. Indeed, Len Brillson will represent the FIAP at a joint meeting of several forums organized for Sunday evening, March 17th, in St. Louis. The FIAP Business Meeting at the March Meeting on March 19th will be another opportunity to attract new ideas and greater participation in improving employment opportunities. We look forward to seeing you there!