Electronic Reminders Help Boost Membership, Voting Rates

APS membership for fiscal year 2002 is up by almost 500 members compared to the same time last year. An end-of-year count shows that the total number of members now stands at 42,007, compared to 41,570 in fiscal year 2001. Trish Lettieri, APS Director of Membership, attributes the increase in part to a series of electronic renewal notices that are sent out to current members during their renewal cycle, and followed up by personal phone calls to any members who don’t renew. A special half price membership offer, available to new APS members and valid through this month, also helped boost membership totals.

Lettieri reports that there was also no noticeable downward trend in renewal rates in the aftermath of the September 11 terrorist attacks in New York and Washington, DC, and that the increase is mostly due to higher retention rates for APS members and valid through the 2001 election. The latest research results in biofluid mechanics, hurricane physics and particle simulation flows were among the papers featured at the annual meeting of the APS Division of Fluid Dynamics, held November 18-20, 2001, in San Diego, California. The technical program featured eight invited lectures and four mini-symposia on cutting-edge research topics in fluid dynamics, as well as more than 950 contributed abstracts and the annual Gallery of Fluid Motion.

Hurricane Physics, Biofluid Mechanics Highlight 2001 DFD Meeting

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European Evolution May Challenge American Science

By Michael S. Lubell, APS Director of Public Affairs

Whether the Anthill2: Missile Defense Treaty is a relic of the Cold War, as its critics charge, or a pillar of international security, as its defenders claim, President Bush, with one stroke of his pen, has ensured that it will be nothing more than an artifact of history when the United States unilaterally withdraws from the pact this spring.

To date, the debate over the Bush decision has focused heavily on the consequences for nuclear non-proliferation and arms races throughout the world. That may be appropriate for the near term, but in the long term the greater impact could well be on economics and geopolitical realignment. And that could have a profound effect on international science.

Early into the Bush Administration, White House decisions on biological weapons, the Kyoto protocols, International Monetary Fund policies, and a host of less visible foreign affairs and defense stances had most of the world convinced that the US was on an isolationist binge.

The September 11 attacks on the Twin Towers and the Pentagon temporarily altered both the perception and the reality. But suspicion of American policies remains strong, in Europe and Russia, as well as in the Islamic world.

Several weeks ago, I had the opportunity to meet Vladimir Pozner, a Moscow TV news celebrity well known for his live people-to-people talk shows with Phil Donahue during the Gorbachev era. His views on how the September 11 attacks have reoriented Russian attitudes are worth considering.

For most of its history, Pozner argues, Russia straddled the Euro-Asian divide, straddling a staunchly independent course, one that was neither European nor Asian in outlook. Russian cultural and political unilaterality left its mark during the heyday of the Soviet Union.

The collapse of Communism and the disintegration of the USSR jolted the Russian psyche and led to a reexamination of Russia’s geo- graphic identity. The 1990’s, Pozner says, produced a strong Western tilt. But Western, he cautions, does not mean American.

Russia, according to Pozner, was well primed to come to the aid of the US in combating Islamic Augustan shows sharp spikes coinciding with electronic reminder notices sent out to current members, clearly demonstrating the effectiveness of the practice.

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Physics of Hurricanes

Understanding the physics of the atmosphere interface is a critical component of understanding hurricanes, which draw their energy from the thermodynamic disequilibrium that ordinarily exists between the tropical oceans and the atmosphere. The maximum wind velocity depends on maintaining a sensitive balance between the production of mechanical energy and frictional dissipation in the atmospheric boundary layer, which in turn depends on the fluxes of momentum and enthalpy through the sea surface. Yet little is known about such fluxes at extreme wind speeds. Kerry Emanuel of the Massachusetts Institute of Technology has described recent laboratory experiments designed to better quantify wind speed relations and to explore possible control of the atmosphere interface.

Carrying the Torch

Francis Sidney, the APS associate director for public affairs, walked his Olympic torch with pride on the steps of the US Capitol in Washington, D.C. The torch reached the DC area on December 23rd before continuing on to Philadelphia on its way to its ultimate destination of Salt Lake City.
Ever since the introduction of the sentient computer HAL in Stanley Kubrick's 2001: A Space Odyssey, the explosive advances in computing technology have beggared the question: Can truly intelligent computers be constructed? Can a man-made machine ultimately out think its creators? In February of 1996, a computer known as Deep Blue, developed by IBM researchers, made history when it outplayed the reigning world champion of chess, Gary Kasparov, for a series of six games.

The origins of Deep Blue date back to the dawn of modern computing. The first chess program was written by Alex Bernstein of MIT in the late 1950s. When Kasparov first became World Champion in 1985, at the age of 22, solid chess playing machines were already being commercially marketed. In 1989, a MacHack IV computer became the first to play in a human chess tournament, and with the introduction of Deep Blue, the first chess playing computers went on the market in 1976. It wasn't until 1983 that a computer managed to triumph over a chess master in any tournament, and the Deep Thought project launched a few years later lost miserably to Kasparov in 1986.

In 1995, a Carnegie Mellon doctoral student named Feng-hsiung Hsu began developing a computer that was to prove the decisive turning point in constructing a sentient computing machine. In the 1970s, the first chess programs used a technique known as “book search” to store all legal positions of the board. In Deep Blue, instead of using millions of endgame databases, Hsu began developing a statistical technique known as “chiptest.” In its early stages, Deep Blue played as many as 85 to 90 percent moves as Kasparov, but for the most part, it followed well-defined strategies, much as a chess engine might.

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Dealing with Nukes and Terror
by Peru Hoodby

In the wake of the terrorist attacks of September 11, 2001, Pakistan's military government insisted that there was no danger of any of its 25 to 40 nuclear weapons being taken for a ride by some radical Islamic group. Nevertheless, it was not reassuring. Two foreign tourists who come to the US each year. But the main organization opposing such a system has dropped its public opposition in the wake of September 11.

Academic officials ranging from the University of California to visitors from the Department of Energy who are leading the new system were the first instance of legislation that has not been widely supported. Students and Exchange Visitor Information System (SEVIS).

It is designed to be an information collection and tracking system for students and their dependents in the US on visa categories F (student), J (exchange visitor, such as visiting scientists), or M (vocational or other non-academic students, such as cooking, theatre, or flight training school attended). SEVIS is not an invasion of privacy, any institution can transmit to the Immigration and Naturalization Services (INS) and the State Department an array of electronic information on any international student or exchange visitor in the US on an E-1 or M visa. The system is supported by a national database, but is not comprehensive enough, makes small stateless technological possibilities to wreak enormous destruction are limitless, makes small stateless technological possibilities to wreak enormous destruction are limitless.

Echoing those sentiments was James Deering, a former student at the University of International Education at Auburn University, who said that while there is always the risk of misuse of the data, he has seen no indication of that at Auburn. Rather, it has made his work easier.

"As with anything, there is always the potential for uses which may or may not have been intended. In that regard, it is not impossible that the two Pakistanis could have provided significant nuclear information or materials potentially useful to Al Qaeda's allies and subsidiaries in other parts of the world. If it so turns out, this will scarcely be the first instance of leakage of nuclear information. Among other examples, sympathizers of Israeli working in the US nuclear weapons complex have been found to be involved in providing large quantities of uranium during the 1960s for the Israeli reactor at Dimona.

Pakistan's loose nuclear under-score a global danger that may already be out of control. The fissile materials in the hundreds of ex-Soviet bombs marked for disassembly, the vast amounts of radioactive materials present in nuclear reactors and storage sites around the world, and the abundance of nuclear knowledge make it only a matter of time before some catastrophic use is made of them. So what is the solution? Obvi- ously, tight policing and monitoring of nuclear materials and knowledge is essential. But this is far from obvious. Sufficient. If nuclear weapons continue to be accepted by nuclear states as legitimate instruments of either deterrence or war, their global proliferation will continue. Whether by other states or non-state actors — can only be slowed down at best by what moral argument can other- ers persuade them to do? Humanity's best chance of survival lies in creating taboo against nuclear weapons, much as already exists for chemical and bio- logical weapons, and to work rapidly toward their global elimination. The US, as the world's only remaining superpower, must take the lead.

These are difficult times to make such an argument. The White House is celebrating victory over Al Qaeda. But the world remains at war, and the American economy is struggling. Europe, under intense American pressure, the Pakistani government disowned its pro- gress and agreed to give up its arsenal on its own.

Fears about Pakistan's nukes were subsequently compounded by revelations that Pakistan was developing a comprehensive new electronic system to monitor all foreign nationals who come to the US on student and exchange visitor visas. Despite close scrutiny, dis- 

As a result of the September 11 terrorist attacks, the federal government has put a fast-track on a comprehensive new electronic system to monitor all foreign nationals who come to the US on student and exchange visitor visas. Dis- 

Among the 21 institutions across the Southeastern US that participated in CIPRIS were the University of Alabama (Birmingham and Tuscaloosa), Auburn Univer- 

sity, Duke University, and Methodist College. Both the INS and officials at the participating schools doubted it a success.

Those who participated found the post-September 11 INS regulations to be over-whelming, any institution can transmit to the Immigration and Naturalization Services (INS) and the State Department an array of electronic information on any international student or exchange visitor in the US on an E-1 or M visa. The system is supported by a national database, but is not comprehensive enough, makes small stateless technological possibilities to wreak enormous destruction are limitless, makes small stateless technological possibilities to wreak enormous destruction are limitless. But we should not fritter away the luxury we now have by ignoring this possibility. The time to begin the discussion is now.
Wu’s Leadership Role Questioned

In your otherwise well-written historical piece in the December 2001 issue of APS NEWS about party non-cooperation, you are unfortunately that you perpetuate an injustice which seems to have become permanently embedded in the ‘history’ books. Some of the NBS teams led by C. S. Wu as having done the crucial experiment.

Erasing confusion from the fact that an NBS team cannot have been led by a non-NBS scientist, there was no question of any formal leader- ship in NBS, whether from my knowledge, and the NBS scientists,

Uncle Joe a Barrel of Laughs

Almost all the Ig Nobel Awards (December Zero Gravity) are on the mark. But why ridicule “Stalin World” while “Springtime For Hitler” is breaking box office records in New Jersey? (December Zero Gravity) are on the mark. But why ridicule “Stalin World” while “Springtime For Hitler” is breaking box office records in New Jersey? I come to my castle on the dark and barren hill. Gaze into my eyes and I’ll control your will. Be my assistant in good times and in ill. That’s the mad scientist’s love song.

You’ll wear low-cut dresses made out of black silk. When guests come, your warm smile will charm them. You’ll wear low-cut dresses made out of black silk. When guests come, your warm smile will charm them.

I know I should flee from your fiendish designs, Or else I’ll soon be in your power. Nevertheless, “CalTech” is the correct shortened form, and I hope that future issues of APS News will reflect this.

Michael Harrl, California Institute of Technology

at Dartmouth College. Then, on the evening of Saturday, February 1, 1896, Charles Emerson and Edwin Frost found time to experiment with this tube. That weekend, Frost ar- ranged to have his brother, Dr. Calman D. Frost, bring his patent to Reed Hall on late Monday afternoon to give the students a demonstration of his new invention. Science students, however, had already obtained the first X-ray photograph

of the Svedberg with parentheses.

X-Ray Pioneer At Dartmouth

“X-rays! This Marvelous Physical History” column in the November 2001 APS NEWS, I was amazed to find a false statement: “By February 7, 1896, X-rays were finding their first clinical use in the US in Dartmouth, MA. – Actually, the first X-ray photograph in the US was done in Hopkins, MD in December 1895 by Reed Hall on Dartmouth cam- pus in Hanover, NH.

In late January 1896, Professor Crehore had his young research assistant, Frank S. Dehn, bring his patient to Reed Hall on late Monday afternoon to give the students a demonstration of his new invention.

There are many excellent jour- nalists who write about science, scattered among the newspapers, magazines and other mass media in this country and abroad. It was therefore disappointing to dis- cover a recent example of shoddy journalism with potentially serious consequences.

An article in the New Scientist appeared on December 5, under the headline “No sign of the Higgs boson.

The headline was accu- rate, but the story strongly suggested that the Higgs particles did not exist, when in fact all that one knows from the experiments done at the LEP accelerator at CERN is that it hasn’t yet been found. To- ward the end of the article there were a few comments by well- known physicists, which at least alerted the reader to the fact that the non-existence of the Higgs is not a unanimous opinion.

The New Scientist compounded its felony in an accompanying edi- torial, which said “Researchers at CERN, the center for particle phys- ics near Geneva, have ruled out most of the likely energy slots where the particle might lurk and now reckon it is probable that the Higgs is the product of an overactive im-agination.”

Within days several other news sources had printed the exact same words of the New Scientist story. None of them did any further investigating of any significance on their own. NBC News, usually a reliable source, headlined “God particle may not exist”, using the name for the Higgs that appeared as the title of the 1993 book by Leon Lederman and David Terris. Other headlines were: “Divine Myth: five- year quest for ‘God particle’ is fruitless” (Agence France Presse); “Analysis casts doubt on Higgs Boson” (UPI); and “Physicists: No sign of ‘God particle’” (CNN). The head- line in the Sun, the largest circulation British newspaper went straight to the bottom line: “Six billion pounds wasted on 30-year ‘God’ hunt.” Some of these stories included the mild rebuttal that had appeared in mild rebuttal that had appeared in the New Scientist, others did not, reinforcing the impression that the case was virtually closed.

With this kind of mindless re- porting, there was little chance of a fair hearing for the leaders of the four major experiments at LEP who, together with the heads of two of CERN’s working groups, e-mailed a protest to the New Scientist on December 10, in which they said “the theory makes predictions for the mass of the Higgs boson. In fact it is well known that the mass is probably lower than 200 GeV. On the other hand, from studies of our direct searches…we conclude that the mass is larger than 1.14 GeV, which is perfectly compatible with the above predictions—hence our dis- may concerning the report that we have ruled out the existence of the Higgs boson.”

These journalistic miscues are indeed cause for dismay. With Fermilab’s search for the Higgs just getting into high gear, and with the LHC at CERN under construction, the misinformation propagated by these news stories can seriously jeopardize a major program of physics research. While it is pos- sible that some members of the LEP experimental teams sought to manipulate the press by exaggerating the significance of their failure to find the Higgs, if the reporters had followed elementary principles of good journalism they would have talked to enough people to strike the proper balance and to convey the true state of affairs.

Science journalism faces the often daunting task of understanding new developments in science, and transmitting the information accu- rately to the public. Indeed, the embargo system employed by Sci- ence and Nature, with which we have taken issue in the past (the APS News, August/September 2000 and March 2001), is defended by its practitioners on the grounds that it is crucial for journalists to get the story right, even if they are denied the opportunity to talk to the sci- entists and to report the news when they first discover it.

Whether one approves of embargos or not, one cannot argue with the paramount importance of accuracy. Its unfortunate absence in this instance is we hope, not des- tined to be repeated.

—Alan Chodos

Reports of Higgs Boson’s Death Greatly Exaggerated

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Viewpoints, Nukes and Terror, from page 3

groups, and even individuals, extremely dangerous. American triumphalism must therefore give way to a more ratio- nal, long-term defense of US interests and security. This ultimately led him in ameliorating conflicts and rationally dealing with complaints against its international behavior. It is time for the US to re-engage with the people of the world, especially with those it has grievously harmed. As a great coun- try, possessing an admirable constitution that protects the life and liberty of its citizens, it must now extend its definition of human rights to cover all peoples of the world.

Pervez Hoodbhoy is a professor of nuclear and high energy physics at Quaid e Azam University in Islamabad, Pakistan.
EFDF Meeting, from page 1
the bubbles by application of molecularmonolayers.

Biofluid Mechanics Dynamics in the structural hier-
archies of living creatures are simplified by continuous mechanics and in the future research in biology and bioengineering, according to Y.C. Bert Fung, of the University of Califor-
nia, San Diego, who spoke at a Tuesday morning session. And since fluid mechanics is the key determi-
nant of stress and strain in cells they can play an equally key role in those fields. He pointed out that every cell in the human body needs blood flow which is propelled by the heart. Blood flow is coupled with DNA, cell function and tissue remodel-
ing. "Significant problems of health and diseases always need a good systems analysis, and such analysis may use continuum mechanics," said Fung.

Particle Liquid Flows
Many of the key problems in modern Univer-
sity gave an overview of various simulation methods that could provide insights into the mecha-
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Fluid Dynamics of Buildings
Heating and ventilating build-

ed structures account for a significant frac-
tion of the total energy budget of
cities, and one of the most press-
ing, challenging problems of sustainable, low-energy buildings, according to Gary Hunt of the Im-
perial College of Science, Technology and Medicine in London, England, one of several speakers in a Sunday afternoon mini-symposium on the fluid dynamics of buildings. Hunt be-

icles that natural ventilation provides such a low-energy solution. Modern naturally-ventilated build-

ings use passive solutions has gleaned arts and so-

michyres to enhance the ventilation, and demand for these and other designs has led to a better understood understanding of the fluid dynamics of such buildings. Particular chal-

lenges include improving our understanding of the thermal strati-

ication and movement of air, which often involve complex geometries.

For more information go to http://www.aps.org/meet/biology-phys/

Foreign Students, from page 3
Everyone should always raise ques-
tions about the security and the use
of data," he said. "We have not seen any question about the data that have been transmitted for the past number of years have been mis-
used in any way. In fact, it has facil-
itated our ability to work with the students and departments [on]
campus.

Not everyone is happy with such an influx of foreign students. Opposi-

tion has come both on tech-


cial grounds and also on the

p-olitical side, in the form of

questions about the country's ability to manage an academic exchange that would hurt the US intellectually and unfairly penalize a tiny minority of foreign visitors without providing any additional homeland security.

Leading the opposition has been the Association of International Students, with its old acro-

nym NAISA, a Washington D.C.-based advocacy group pro-

moting the rights of national educational exchange among 80 nations.

"We have recognized the need for more efficient and effective re-
processing of our visa system," the group said. "We have argued that there are better and worse ways to achieve them," ac-

cording to a September 20 account in the group's newsletter.

In a letter dated September 21, officials dropped its opposition to a foreign tracking system on the grounds of national security follow-

ing the terrorist attacks

NAISA had opposed the moni-
toring system on the grounds that the US system would unfairly focus on foreign students and visitors, a group already well moni-
tored compared to the vastly larger numbers of foreigners who visit the US each year on tourist and busi-

ness visas. The organization argued that rather than enhancing home-

land security, the monitoring would simply discourage the roughly half-

million foreign students who come to the US each year while doing nothing to monitor the other 30 million plus foreign visitors who sometimes put themselves at risk — the majority of whom come with-

out any visa.

"As the debate on foreign stu-
dents proceeds, however, we must realize that our country gains much from being their destination of choice. It is estimated that 90% of the foreign students enrolled in our institutions wish to stay in the US after graduation, and several states specifically say that our students are of the country. They want to keep that going," Riley said.

Riley outlined two broad areas of concern before the committee, more recent electronic access and informa-
tion about long-term study, journal quality.

Riley said an "electronic revolu-
tion" is underway that raises a range of related topics, such as

 Committee Oversees Publications in a Time of Rapid Change

For all the various activities of the APS, the paramount one in terms of both human and financial re-
sources is the publishing of the peer-reviewed research journals that carry out the organization's central mission to "diffuse the knowledge of physics." And overcoming all such research publication activities is the 13-person Publica-
tions Oversight Committee.

Last fiscal year, roughly three-
ter of the entire annual APS operating budget and nearly two-third of all APS employees were devot-
ed to research publication activ-
ties. According to Michael Stephens, the APS Director of Fi-

ance, research publication activities accounted for $27.6 million of the Society's overall fiscal 2001 bud-
get of $37.1 million. In addition, 140 of the Society's 211 members are employed in research publication activities.

Among the 13 members of the Publications Oversight Committee (POC) are the three APS operating officers: the Executive Officer, the Treasurer, and the Editor-in-Chief. In addition, there is a POC Chair appointed by the APS President from among the remaining eight members.

The POC Chair in 2001 was Mark A. Riley of Florida State University in Tallahassee. Taking over in 2002 is Beverger of the National Science Foundation.

"The POC is a very important committee because it proposes guidelines for the operational phi-

losophy of APS publications and oversees the general editorial policy," Riley said. "Publishing the finest research and review journals in physics is one of the greatest achievements of the APS and we want to keep that going.""We on POC obviously are con-

scious of maintaining the high stan-
dard of the APS journals and we

continue our strong support for the reporting electronically," the lat-
ter added.

Responding to NAISA's philosophi-
cal objections to such monitoring, he wrote: "No one has yet shown us how CIPRIS would have a nega-
tive effect on international exchange unless we are doing things wrong..." And if the POC "dis-
agree with something, they will be

forced to defend their position with the law," Riley said.

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ter added.

SEVIS is a good idea because it would provide accurate numbers on how many foreign students there are in the country. But she acknowledged that there is the in-
correct perception that foreign students are the source of the ter-
rorist threat.

She pointed to the fact that the 10 hijackers in the September 11 attacks, only one was a stu-
dent visa to study English, while many others were on tourist vis-
s. These weren't people coming into four year colleges [but] there is still the perception, that that is where the terrorists are coming from.

For Bellows, the success or fail-

ure of the new electronic monitoring system will be how it is designed, does it keep out "questionable" individu-

als ahead of time, or does it get the federal government involved trying to

limit the flow of information? That is where intelligence gather-

ing comes into play," she said. "There is a very small number of people who we are worried about having access to sensitive informa-
do we focus on types of information or do we focus on types of individuals we are worried about?"

Focusing on the former, Bellows said, could create a situation where even the most innocent-seeming information becomes dangerous with the government then attempt-

ing to "micro-manage" courses taken by foreign students. "You could go into a home economics course and take something really, really heresy and do a little molecu-

lar reconfiguration and create something that was a bio-hazard. So even in the most benign courses you could have danger.\"
Undergraduate Changes Rescue Graduate Physics Program at U of Wyoming

by Richard M. Todaro

The University of Wyoming’s Department of Physics and Astronomy has just re-instated its graduate program following a three-year suspension that had been triggered by low enrollment in the undergraduate program. As before the suspension, the graduate program includes a doctorate in astrophysics and a masters degree in physics education.

In 1999, University officials decided to get rid of the undergraduate program, since the number of students enrolled in the physics major was about the same as the number of physics majors who had graduated in the previous year to about 50. This sat- isfied university officials, who gave the green light to restart the graduate program next fall.

Among the changes Johnson cited were a range of new double- major options and a new course to be added to the undergraduate program through the department’s “Physics Plus” curriculum, which according to a recent university press release is designed to combine traditional physics courses with “applications-oriented” courses. Currently, the only double option is in physics-meteorology, but additional options, physics-science journalism, and physics-geographic information management, are being developed.

“We found that by being more open we attract a more diverse body of students. Previously we were just another small, vanilla physics program,” Johnson said. “If you look at the undergraduate population of students, they are much, much more diverse than they used to be.”

Although the doctoral program traditionally focused on astrophysics, the actual degree conferred was a doctorate in physics. Regarding the distinction between physics and astrophysics, Johnson said the course work required for the two degrees is not only a handful of specialty courses.

The graduate program also offers a terminal masters degree in physics education that is designed to turn out high school and community college physics teachers. Johnson said the program typically turned out one to two graduates per year, a number he called significant “given the university’s remote Rocky Mountain location.”

By improving the undergraduate program, Johnson said that the graduate program benefits because it will attract graduate students to work as teaching assistants.

“Graduate students should learn how to teach,” he said. And he said that because his department emphasizes astrophysics, there are still American and more female prospective students.

“I think there are a lot of kids in the US who are interested in pursuing PhDs in physics, astronomy, and in fact, a lot of women,” Johnson said. “It might have been that we had an incoming class of graduate students where the number of women outnumbered the number of men by two to one.”

Typical graduate enrollments at the University of Wyoming in the physics and astronomy program number around 17 students per year.

Johnson’s goal for the graduate program is to attract students who graduated from small, liberal arts colleges with strong quantitative and analytical skills regardless of whether they are able to take the full array of undergraduate physics courses.

“Very often are trying to do con- sciously now is to go after really bright students from liberal arts colleges, who because of the size of the college, haven’t had a full complement of physics courses so consequently their GRE scores in physics aren’t very high, but their GPA is high and their GRE quanti- tative and (analytical) scores are very high. Those are the kinds of kids we are after.”

The most important factor in scaling is suppressing the tunneling leakage current in the gate insulator. By using a thinner dielectric constant material, a thicker insulator may be used for the same degree of charge control. There is much work today in search of alternate dielectrics with a high dielectric constant, yet whose bulk and interfacial electrical properties maintain the standard set by thermal oxide.

There is also renewed interest in metal gates. The metal gate eliminates the depletion problem experienced with conventional polysilicon gates and, with suitable work function, may give improved channel mobilities by reducing channel doping. Another possible benefit is circumventing the mobility reduction that is predicted to occur in very thin oxides due to remote interactions between electrons in the channel and plasmons in the polysilicon gate. The search for a suitable semiconductor, combined with low reactivity toward the gate dielectric, has led toward pure metals like tungsten as well as metal-talic compounds such as transition metal nitrides and silicides.

Improvements in scaling are predicted to occur for thin silicon-on-insulator (SOI) films, with thickness of order of 10nm or less. The thickness limit is probably about 5nm because quantum ef- fects may affect the band gap (and hence threshold voltage and channel po- tential) and also due to quantum effects on surface roughness, so that slight fluctuations in thick- ness cause large fluctuations in potential. Experiments have thus far confirmed adequate mobilities.
Fellowship Nomination Deadlines
DCP: February 15, 2002
DFD: February 15, 2002
See detailed submission at http://wwwAPS.org under the fellowship button.

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End of CMOS Scaling, from page 6

down to ~30nm thickness, opening a new era for this SOI device. Although the configuration of a single-gate FET (SGFET) in SOI is attractive, because of its simplicity and because excellent device results have been shown by IBM and Intel at gate lengths of 35 and 50nm, the easy penetrations of elec-
tric field beneath the gate FET where the SOI is fully depleted severely limits its scaling potential. Better scaling is obtained with a double-gate FET (DGFTFET) in which there is a gate on both sides of a thin silicon layer. Then, when using the higher dielectric constant silicon oxide, the reduction in scaling length might approach a factor of two. The two gates of the DGFTFET augment this advantage since they may be controlled independently, offering advantages of extra functionality. Research into DGFTFETs has picked up pace in universities such as Berkeley and MIT, and in the indus-
try such as at IBM and Lattest Fig. 2 shows a comparison of an experimental self-aligned planar DGFTFET, realized at IBM, where the source and drain regions are etched away to leave standing pillars, with a DGFTFET where the source and drain regions are etched away to leave standing pillars, allowing the back gate to be under-cut.

Power Management.

Of all the issues that confront scaled integrated circuits, power dissipation is the most serious. The power loss per function continues to decrease, more and more functions are crammed onto ever larger and denser chips. There is also an increasing conflict be-
tween the demands for low dynamic power, which requires low power supply voltages, and low static power, which requires higher threshold voltages to turn the trans-
itors off. This trade-off leads to power supply optimization and de-
vice design according to application.

Power management technology is still in its early stages of develop-
ment, since until recently voltage variations were not a serious prob-
lem, since until recently voltage variations were not a serious problem, although it continued to be an issue. Even within the domain of device design, several approaches could result in a better static versus dynamic power trade-off, such as multiple threshold voltages, multiple oxide thicknesses and power supplies, dynamically adjustable threshold voltage and voltage switching.

Of these, block switching, in which the power supply to a cir-
cuit block or even an entire processor is gated, is the more soli-
dary approach. If the gating switch consists of a high threshold vol-
tage (HVT) transistor for the FET, both the sub-threshold and gate leakage parameters of the standby power may be greatly reduced. At issue are the size, speed and power needed to switch the switching transistor but detailed analysis of methodologies for power switching and techniques have long been applied to fault tolerant and highly reliable computing systems and have been implemented in hardware and soft-
ware and at high and low levels. This is an important area for research and a possible key problem solving skills of physicists: unraveling the evolutionary history of life by comparative genomic stud-
ies of sequenced organisms, and utilizing bioinformatics to unravel the much more complex process of the selective expression of the genome. Biological computing incor-
porates features that are familiar to the physicist, including feedback, amplification, and coincidence detection.

In biomedical biology there are new applications to autism such as from page 1

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the cell cycle and upon interaction with a variety of cell activators (hor-
mones, growth factors, etc.). This is an important area for research and a possible key problem solving skills of physicists: unraveling the evolutionary history of life by comparative genomic stud-
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most, continuing density and performance improvements for many generations to come. Indeed, the ultimate MOSFET is truly a "nano-transistor", competitive with many new technologies.
Science finds advantage and claims virtue in its detachment and aloofness from politics. But politics is an inherent part of society: scientific ideas are developed in the context of political structures, and science itself is both a product of and a contributor to society.

With that understanding as a starting point, the scientific enterprise should extend help to scientists who dare to plunge into politics. Scientists, engineers, and schoolteachers apply collective strength to politics through political action committees and other organized efforts. Why not scientists? Latent scientific support for scientists in politics was brought forth by scientists seeking to influence the congressional candidacy of physicist Rust Holt in 1998 and 2000.

In modern America, participation in elective politics is measured in money and efforts to mobilize votes — activities largely shunned by science ever since its one-time, 1964 venture into big-league politics, under the banner of the ad hoc organization Scientists and Engineers for Johnson-Humphrey. Antisemitic aloofness from elective politics contributes to the marginalized role of scientists in public affairs, as evidenced by their frustrations with the State Department and the compartmentalized presence of scientists in the White House.

Science, Money and Politics

Physics Today, APS News

Chad Evans Wyatt

8 February 2002

APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Responses may be sent to letters@aps.org.