THE QUANTUM TIMES

NEWSLETTER OF THE APS TOPICAL GROUP ON QUANTUM INFORMATION, CONCEPTS, AND COMPUTATION

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Two Kinds of Outreach

Our topical group has grown tremendously in the last year, reflecting widespread interest in the field, but I think we can grow further. Anyone who does research on, or cares about, quantum information from a physical point of view, should be encouraged to join. Why? Because, in exchange for negligible effort and expense (at least if they are already APS members), they can help raise the profile of our field, in particular at the March and DAMOP meetings, enabling us to nominate more fellows, have more focus sessions, and eventually if we grow above about 1400 members, become an APS division. This is not to deny that we have already achieved considerable recognition. Fortunately the day is long past when people routinely asked "but is this real physics?"

The prominence our field has achieved, and the attendant public curiosity, give us a rare opportunity to do a more important kind of outreach: to help the lay public appreciate the excitement of science. We are a fashionable field within an unfashionable profession--most people view science, especially physics, as hard to understand and less rewarding than other pastimes and professions. Even superstitions like astrology are considered more fun and accessible. We know that we have some of the most fun ideas in all of science, ideas that are not complicated but simple, strange, and beautiful, ideas whose strangeness fades over time but whose beauty remains. Our usual way of expressing these ideas, though, involves a little mathematics--not hard math, just a little geometry and algebra---but already that is too much for most people. We should all strive to figure out how to explain the excitement of quantum theory to people with high school math or no math. Unfortunately our task has been made more difficult by some of the fathers of quantum mechanics, who said "if this doesn't make your head hurt, you're not paying attention," or words to that effect. Such utterances were aimed at classically-trained physicists, to help them open their minds enough to understand the then-new field, but unfortunately did a lot of collateral damage, confirming ordinary people in their belief that quantum physics was way too hard for them. Fortunately public interest is now such that lay people are overcoming their fears and asking us questions like "What is a quantum computer?", "How can a particle be in two places at once?", or "How can observing one particle affect another particle?" By coming up with intelligible and respectful answers to these questions, we will be doing our profession, and our fellow humans, a great service.

-Charles H. Bennett
TGQI Chair
IBM Corporation

In This Issue

This issue marks an important milestone in our fledgling topical group as we are soliciting feedback concerning the group's name as well as issues related to the by-laws. The importance of beginning these discussions cannot be understated and is discussed by Chair-elect Carl Caves on **page 3**. Here you will also find a report from our Secretary-Treasurer Barry Sanders. To the left of this box, be sure to read Chair Charlie Bennett's article on outreach which is arguably of equal importance. In addition we have included information on our next election (on **page 3**).

I have tried to balance these rather serious and perhaps mundane topics with a few news items including new feature I'm calling "Quantum News Briefs" (on **pages 7-8**). There are also two articles on honors and awards recently won by GQI members (see **pages 2-3**) and a report on a quantum cryptography and computing workshop at the Fields Institute. I've also included a somewhat less serious look at the connection between scientists and bacon – well, sort of (see **pages 5-7**).

Peppered throughout are reminders of deadlines and online resources for those seeking additional news, information, and gossip on the quantum community (including my newish blog, Quantum Moxie: [quantummoxie.blogspot.com]).

-Ian T. Durham
Editor

Zoller wins ICTP Dirac Medal

Perhaps one of the most exciting bits of news within the GQI community recently was the announcement on August 8 that Peter Zoller, Member-at-large of GQI's Executive Committee and Professor at the Institut für Theoretische Physik at the Universität Innsbruck (Austria), was awarded the 2006 Dirac Medal from the Abdus Salam International Center for Theoretical Physics in Trieste, Italy. The Dirac Medal is one of two awards named in honor of the late British physicist Paul Dirac, one of the founders of modern quantum mechanics. The ICTP's Dirac Medal (Britain's Institute of Physics awards the Paul Dirac Medal and Prize) is awarded every year on Dirac's birthday, August 8, with the first award coming in 1985. The ICTP's award is not awarded to Nobel laureates, Fields medalists, or Wolf Prize winners, though some past Dirac medalists have gone on to win these awards (in fact the first co-recipient of the Dirac Medal, Edward Witten, is also a Fields medalist). The award is to honor significant contributions to physics.

Many within the GQI community are familiar with Peter's work. His primary foci over the years have been quantum optics (primarily theoretical), atomic physics, and, of course, quantum information. Perhaps the best known of his many contributions was his suggestion that trapped ions might be used for quantum computing. Another of his seminal works described how to realize the Bose-Hubbard model and associated phase transitions in ultracold gases. ICTP specifically cited these two contributions in its announcement of the award.

Peter received his PhD at Innsbruck in 1977 and has held a tenured professorship there since 1981. Since 2003 he has been the Scientific Director of the Institute for Quantum Optics and Quantum Information of the Austrian Academy of Sciences. He has received numerous awards including the 2005 Max Planck Medal from the Deutsche Physikalische Gesellschaft (German Physical Society) and the 2005 Niels Bohr/UNESCO Gold Medal. Having attended Gymnasium (the Austrian equivalent of high school and college) in Innsbruck, the city to which he is still intimately tied, it is no surprise that he counts the 1981 Award of the City of Innsbruck among his many honors.

Congratulations Peter, from all of us at GQI! For more information on Peter Zoller, visit http://bozon.uibk.ac.at/qo/zoller/.

-ITD

More medals, awards, and fellows

Continuing with the theme laid out in the previous article on Peter Zoller's receipt of the Dirac Medal, this year's Fields Medalists were awarded on August 22. The most surprising news of this year's awards was that Grigori Perelman, one of the honorees, declined to accept the medal or appear at the congress at which the awards were presented. Perelman did not give a reason for declining the award. Perelman's most seminal work is his proof of Thurston's geometrization conjecture which also provides a long-sought answer to the century-old Poincaré conjecture. Very loosely speaking, the latter suggests that, given some three-dimensional space that looks fairly normal but is finite and has no boundaries, if a loop in that space can be tightened to a point, it essentially looks like a three-dimensional sphere.

Aside from the Perelman surprise, however, there was some news of interest to the quantum information community. One of the recipients of this year's award, which is given out every four years at the International Congress of Mathematicians, was Terence Tao, a Professor of Mathematics at UCLA. The connection between some of Tao's work and quantum information was discussed by fellow Australian Michael Nielsen on his blog recently. In addition to noting, quite proudly, that Tao is the first Australian ever to receive the Fields Medal, Nielsen discusses Tao's work with Allen Knutson on something known as Horn's Problem. Horn's Problem asks the question: given A + B = C, where A, B, and C are Hermitian operators, what can be said about the eigenvalues of A, B, and C? Tao and Knutson made a significant contribution to the solution of this problem. Sumit Daftuar and Patrick Hayden and, independently, Alexander Klyachko drew the link between Horn's Problem (and related mathematical issues) and quantum information theory. In particular, the former discuss a connection between Horn's Problem and Nielsen's Theorem (proposed in 1999 by the aforementioned Australian).

Outside of the Fields medals, at least two members of GQI received awards from the APS recently. Yale University's Steven M. Girvin was a co-recipient of the Oliver E, Buckley Condensed Matter Prize for "fundamental experimental and theoretical research on correlated many-electron states in low dimensional systems." Girvin is Professor of Physics and of Applied Physics at Yale where his primary goal is to answer quantum computing's $64,00 question: can a real (i.e. practical) quantum computer actually be built? Of

course, the technical aspects of his research don't quite roll off the tongue as well as that, but, in short, they are centered around studying the quantum behavior of large collections of atoms, molecules, and electrons in superconductors, magnets, and transistors. In addition he has worked on quantum and classical phase transitions and extensively on the quantum hall effect. Despite the overwhelming lack of confidence our colleagues in another organization (that will remain unnamed) showed for the prospects of a practical quantum computer, one suspects Girvin shares in our general confidence that the answer to this question is not "if" but "when."

In addition to Girvin's honor, William Wootters of Williams College, who was interviewed in the last issue of *The Times*, won the Prize for a Faculty Member at an Undergraduate Insitution, "for his pioneering work on quantum teleportation, his widely cited contributions to quantum information theory, and his prolific engagement of undergraduate students in this research at the foundation of quantum mechanics." While I could "gush" over Bill and his work, particularly about how he serves as a terrific role model for those of us at largely undergraduate, liberal arts institutions, I will let Bill speak for himself through his interview in the last issue (which also serves as a good excuse to read it if you missed it!).

And, finally, we would like to congratulate two members of GQI who were recently elected Fellows of APS. The first is Dietrich Leibfried from NIST in Boulder, Colorado. Leibfried has been at NIST since 1995 when he joined David Wineland's group as a post-doc. Since 2001 he has been a permanent staff member. Leibfriend received his doctorate in 1995 under Nobel laureate Ted Hänsch at the Max Planck Institute for Quantum Optics in Garching, Germany where he worked on precision laser spectroscopy. Upon arriving at NIST he almost immediately began work on quantum computing, particularly developing experiments to demonstrate ion trap-based quantum computation, then recently proposed by Ignacio Cirac and the aforementioned (and GQI Executive Committee member) Peter Zoller. Since then Leibfriend and the Wineland group have continued to develop new techniques for quantum gates in the quest for larger scale and more robust quantum computing.

And that's all, folks… Wait, did I forget someone? I think there was another Fellow elected from GQI, if I only could remember who it was. Oh, that's right! How could I forget my quantum conscience, Barry Sanders? Yes, that's correct, GQI's Secretary-Treasurer Barry Sanders was elected to Fellowship status. Barry is the iCORE Professor of Quantum Information Science at the University of Calgary in Alberta, Canada, where he also serves as the Director of the Institute for Quantum Information Science (IQIS). He is also Adjunct Professor of Quantum Information Science at Australia's Macquarie University. Barry is best known for his contributions to a variety of quantum information-related areas including to theories of quantum-limited measurement, highly nonclassical light, practical quantum cryptography, and optical implementation of quantum information tasks. As iCORE Professor and Director of IQIS he has tried to focus research in Calgary on achieving practical, short-term successes by focusing on topics such as protocols for quantum teleportation and finger printing, for example. Most of these they try to achieve optically which Barry is particularly suited for considering his background in optics.

GQI would like to extend our warmest congratulations to all of our members and colleagues (perhaps some of whom might be recruited for membership, hint, hint) on their honors. Cheers to all!

-ITD

GQI Election

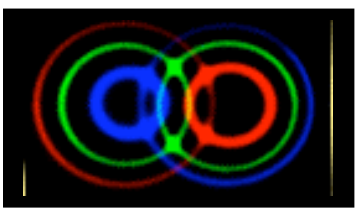
Just a reminder that elections are here. We will be voting on the following:

Vice-chair (vote for one)
Lieven Vandersypen
David DiVincenzo

Member-at-Large, 2 years (vote for one)
Julia Kempe
Chris Fuchs

Member-at-Large, 1 year (vote for one)
Sam Braunstein
Raymond Laflamme

Voting has commenced and you should have received an electronic ballot. If not, contact Barry Sanders (bsanders@qis.ucalgary.ca). **Don't forget to vote!** This is *your* group!



Name That Group

There has been a discussion of the best name for our topical group, which is currently called the Topical Group on Quantum Information, Concepts, and Computation. The Executive Committee is seeking your input on an appropriate name.

The name has to include the word Quantum, probably right at the beginning, and here are our ideas of other words (listed alphabetically) that, perhaps combined into phrases, could go into the name:

Coherence	Computation
Coherent	Computing
Concepts	Science
Communications	Technologies
Cryptography	
Foundations	
Information	

The challenge is to come up with a name that conveys our members' interests without being unwieldy, and we ask you to take up the challenge by sending your naming ideas to Ian Durham (IDurham@Anselm.Edu), together with a concise explanation of the reasons for the name you propose. We'll summarize the results in a future issue of *The Quantum Times* and discuss the issue at the TGQI Business Meeting at the March Meeting. After that, the Executive Committee will select from the proposals a short list to be voted on by the entire membership.

Members should note that the Draft Bylaws posted on the TGQI web page include a name, but that name is just a placeholder. The name and the Bylaws will also be presented to membership for approval after further discussion at the March Meeting.

-Carlton Caves
TGQI Chair-elect
University of New Mexico

Sec.-Treas. Report

GQI has rapidly grown from a concept three years ago to 720 members effective 21 September 2006 and is still growing. To put this number in perspective, membership is approximately half the level required for the Topical Group to apply for Division status. As GQI services grow, so should the membership. The newsletter is the beginning of GQI services. Soon a GQI web page, which will permit discussions (such as the final name and by-laws of the Topical Group) and where annual meetings should be held, will be established. As an early-stage Topical Group, we do not have much money yet in our coffers (around $6600) but this number will grow and could be used towards prizes and financial support for speakers, for example.

In short, we have made a great deal of progress in the past few years and look forward to a bright future, perhaps as a Division.

-Barry Sanders
TGQI Secretary-Treasurer
University of Calgary

QIP Workshop 2007 Reminder

This is the second announcement for the tenth QIP (Quantum Information Processing) Workshop, to be held in Brisbane, Australia, from January 30 through February 3, 2007. The submission deadline has passed. The deadline for early bird registration is November 24, 2006.

For further information:
http://qipworkshop.org/

March Meeting Reminder

Don't forget that GQI is once again sponsoring a full slate of sessions at the 2007 March Meeting. The meeting will be held March 5-9, 2007 in Denver, Colorado. The deadline for the submission of abstracts is fast approaching. All submissions must reach APS by **5:00 PM EST, November 20, 2006**. The deadline for early bird registration is January 2, 2007.

For further information:
http:// www.aps.org/meet/MAR07/

Tales from the Crypt

From October 2 through October 6, the Fields Institute in Toronto, held a workshop on Quantum Cryptography and Computing organized by Richard Cleve, Claude Crépeau, Michele Mosca. The workshop was partially supported by the Institute for Quantum Computing at the University of Waterloo.

The main theme of the workshop was information security in a quantum setting. The event brought together classical (or "non-quantum", as one speaker preferred) and quantum cryptographers in an effort to bridge the gap between the two worlds.

The week's talks could be roughly divided into three subjects:

(i) One group of talks addressed protecting classical information using quantum techniques such as quantum key distribution (QKD); here, talks addressed a variety of topics, including security definitions for QKD, experimental and commercial projects, and the relationship between key distribution and quantum communication. Some speakers also talked about the protection of classical information in the context of quantum computation, addressing the security of classical cryptosystems.

(ii) Another set of speakers discussed protecting quantum information, focusing on encryption of quantum states using perfect or approximate quantum encryption schemes.

(iii) A large number of talks were concerned with foundations for secure quantum computation. These talks addressed quantum versions of many classical secure computation problems, such as zero-knowledge, string commitment, coin flipping, and secure distributed or multi-party computation, but also addressed some topics only relevant to quantum computation, such as ensuring that a quantum circuit performs the intended operation.

In addition to a range of theoretical computer scientists and mathematicians, attendees heard from experimental physicists on implementations of quantum key distribution (QKD) and from industrial researchers on deployments of QKD in a real-world environment. Most talks included a vigorous question-and-answer session, demonstrating the intensity of ongoing research in the field.

The highlight of the week was the panel discussion featuring cryptographers of all backgrounds addressing two questions: "What are the killer apps for quantum key distribution?" and "What are the main obstacles to widespread QKD use?" While quantum cryptographers argued that the long-lasting security of QKD (both in terms of the security of transmitted information as well as the long-lasting utility of a QKD infrastructure, once installed) might be the killer app for QKD, the non-quantum cryptographers noted that killer apps are rare in practice and that getting well-known backers (such as government agencies) to support the technology might itself be a killer app. Panelists noted that current limitations on distance and the present lack of quantum repeaters are certainly obstacles to widespread adoption, but so too is the lack of standardization, certification, and verification of devices.

The panel, and indeed the workshop, concluded with a sentiment of cautious, but realistic, optimism for the future applicability of quantum key distribution, emphasizing the need for continued theoretical and experimental research in the area.

-Douglas Stebila
Institute for Quantum Computing
University of Waterloo

Hey cutey, what's your number?

I'm in search of a number. No, not that kind of a number – I've been happily married for nearly ten years, thank you. The number I'm in search of might actually be more elusive than anything one might hope to be handed in a dark, crowded bar. It is so obscure and difficult to obtain that a mere sixteen (some say seventeen) people have ever obtained this number (though, loosely, I believe that number to be much higher). In fact it is not a single number at all but rather a variable with a minimum (and most desired, but impossible to obtain) value of 1. The lowest *known* instances of this number, however, are a handful of 3's. Curious are you? Not enough bad television to watch? This number happens to be the answer to the question: what do Bill Gates, Richard Feynman, Hank Aaron, and Natalie Portman (AKA Padmé Amidala, Darth Vader's former love interest) have in common?

As it turns out they are all in possession of an Erdös-Bacon number. While most of us in science and mathematics probably have an Erdös number, only a handful of people possess an Erdös-*Bacon* number.

For the uninitiated, you are in possession of an Erdös number if you can trace a series of collaborations (officially via co-authorship) back to the enigmatic mathematician Paul Erdös. Erdös himself had an Erdös number of 0. Anyone who coauthored a paper with him (and he had at least 509 coauthors) had (or has) an Erdös number of 1. Anyone who coauthored a paper with one of *them* has an Erdös number of 2, and so on.

My quest to obtain an Erdös number actually began *after* I had unwittingly obtained one. A decade ago, fresh out of engineering school (which I can't refer to as "college" with an entirely straight face), I found myself stuffed into an anonymous cubicle somewhere near Washington, DC. It didn't take long for the Dilbertesque reality of government contracting to suck out my soul. And so, within two years, I, along with my wife who at the time was having her own reality problems at a large DC law firm – drum roll please – published a paper. The paper led to a company (which predictably failed) and eventually, via a very circuitous route, to here. But let's return to that paper for a moment.

My wife and I had three coauthors – a kinesiologist and astronaut from Penn State; my wife's father, a now retired teacher and school technology specialist; and my own father, a now retired high school English and Drama teacher who has a role to play in this quest a bit later. It is via the kinesiologist that I (and the other authors of that paper) obtained an Erdös number of 6.

Oddly, despite a doctorate in mathematics from St. Andrews (you may be familiar with them from the GAP project or, perhaps, from my former advisors' pet project, the MacTutor History of Mathematics Archive), that one paper marks my only path to Erdös. I have had virtually no coathors in succeeding years (which may be due to the utter obscurity of my research – I'm a world expert on the unification theories of Air Arthur Eddington – I'm sorry, I seem to have lost you). Anyway, the point is that I nonetheless have an Erdös number. What I don't possess is a Bacon number which means I also don't possess an Erdös-Bacon number which is the sum of one's separate Erdös and Bacon numbers.

So what's a Bacon number anyway? If you're currently ravenous, as am I, this might conjure up images of strips of pork sizzling on a griddle (apologies to "Old Ben" and the 880 pound porker at this year's Fryeburg Fair in Maine). Or perhaps this conjures up images of the venerable Quantum Pontiff, AKA Dave Bacon, who was recently seen at London's Royal Society impersonating Newton. In fact, it has nothing to do with either (as far as I know). One's Bacon number traces a path (officially through film roles, semi-officially through film credits, and unofficially through association) back to actor Kevin Bacon. Now, while I do not formally possess a Bacon number, as of yet, I've come close and could claim an unofficial or *pseudo*-Bacon number based on more than one association.

One of my closest associations stems from the fact that one of my good friends is the nephew (and, until recently, subterranean houseguest) of the chairman of Warner Brothers. Almost thirteen years ago, while on winter break, this friend and I spent a week relaxing in said uncle's Malibu beach house which used to belong to the late Steve McQueen (whose son Chad was still the neighbor). As it happens, the week was mostly spent in the company of my friend's grandmother, so no luck there in obtaining a *direct* Bacon number, though this friend of mine is currently working for an Australian film company (and his uncle is still Warner Bros. chairman), so there's still hope.

Now I happen to have a few other Hollywood connections. As it happens, my hometown of East Aurora, New York has produced a disproportionately high number of Hollywood types. Two of the better known have direct connections to nearly everyone in my family via a local community theatre group, though appearing onstage with an actor (or serving on the crew of a production) does not technically qualify one for a Bacon number. So, despite the fact that the actress who played the since murdered Mrs. Huber on *Desperate Housewives* was on the first date I had with my wife (long story), and despite the fact that my wife, a few years later, babysat her nephew (who is now approaching six feet tall), I struck out again.

But the utter irony in all of this is that it is actually conceivable that my father (affectionately known to certain people – primarily former students – as "Beard") just might have an Erdös-Bacon number. Since he was a coauthor on the same paper as the "astrokinesiologist" (who happens to be one of his former students), he has an Erdös number of 6. Since he was a long-time Drama director and coach (as well as English teacher), a number of his former students have gone on to theatre-related jobs. One, in particular, gave Hollywood a try (you might remember him as creepy lawyer Roy Cohn in a flashback episode of

The X-Files or Principal Cole in *Donnie Darko*). In any case, I have a vague recollection that my father appeared in an independent film (ok, that's really, really a stretch on more than one level) with him many years ago (I'll have to confirm this at some point, but if I don't it makes for a more interesting story). *If so, my father – the retired high school English and Drama teacher – would have an Erdös-Bacon number of 8*! That's one better than Natalie Portman (whose Erdös number was obtained under her real name, Natalie Hershlag), and is tied with physicists Fred Alan Wolf and John Hagelin as well as linguist Geoffrey Nunberg.

But I suppose that's stretching it a bit. In fact, Hank Aaron's Erdös-Bacon number is also a stretch since it is derived from the fact that Aaron and Erdös once happened to sign the same baseball which doesn't really count as a publication I suppose. The others are entirely real, though, including Natalie Portman's. And remember Winnie Cooper from *The Wonder Years*? That would be Danica McKellar (who more recently appeared on *The West Wing*), who has an Erdös-Bacon number of 6. And in case you're wondering who possesses those 3's, that would be Hank Aaron (if the baseball counts), Paul Erdös himself (his Bacon number is 3), and MIT applied math professor Daniel Kleitman whose Erdös number is 1 (he was one of the 509 coauthors previously mentioned) and whose Bacon number is 2 (thanks to his appearance in and consultation on *Good Will Hunting*).

And so my quest continues. But I'm still relatively young and my wife thinks I'm rather dashing (at least I hope so). And perhaps, someday, someone will make a film about Eddington…

-ITD

Newsletter information

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Quantum News Briefs

/The Search & Discovery section of the November issue of *Physics Today* featured an article on recent work by Cornell's Keith Schwab and others including Dartmouth's Miles Blencowe, Nottingham's Andrew Armour, and McGill's Aashish Clerk, in which they successfully measured the back-action effects in a nanoresonator, showing in the process that they were very near the quantum detection limit. Their work employs superconducting single-electron transistors (SSETs). In related theoretical work, Blencowe, Armour, and others found that the SSETs could be used to cool the nanoresonators./

/Sadly, Pedro Pascual of the University of Barcelona passed away in late October at the age of 72. Though he was most known for his work in QCD, he had increasingly turned to quantum information in recent years while also helping to start the Benasque Center for Physics, located in Huesca in the Spanish Pyrenees. The center combines lectures on recent developments with collaboration by researchers at sponsored meetings. Quantum information sessions at Benasque have included presentations by Juan Ignacio Cirac of the Max Planck Institute for Quantum Optics and Artur Ekert of Cambridge University./

/Researchers at Los Alamos National Laboratory (LANL) and the National Institute of Standards and Technology (NIST) have set a new distance record – in fact two new distance records – for distributing keys (or codes) for quantum encryption. In the September issue of the *New Journal of Physics*, the team reported generating and transmitting secret quantum keys over a distance of 184.6 km through fiber optic cable. The previous record was 122 km. This record is against reasonable attacks meaning that laser adjustments used in this case have only a moderate probability of generating more than one photon per pulse. The team also broke the record for the *absolute* secure transmission of keys (at least some of the detected photons must have come from single-photon pulses), setting the bar for future teams at 67.5 km (the previous record was 50.6 km)./

/Entanglement has been achieved in superconducting wires by John Martinis of UC-Santa Barbara and others. The process involved constructing two qubits, each of which was a complicated coil of aluminum wire, and joining

them on a sapphire substrate which boosts the duration of the superposition. Cooling the aluminum to superconducting temperatures allowing current to flow despite the presence of an insulating gap. A microwave pulse was then used to create two slightly different currents flowing in the same direction such that one qubit was a superposition of these currents. Entanglement was achieved by passing the superposition to the second qubit which was confirmed to be the mirror image of the other. The report appeared in the September 8 issue of *Science*./

/The University of Maryland, the National Institute of Standards and Technology (NIST), and the National Security Administration (NSA) have announced the formation of a joint institute dedicated to research on the forefront of quantum physics. The Joint Quantum Institute (JQI) as it will be called, will be located on the University of Maryland's campus in College Park and will have an annual budget of $20 million with 20 scientists on staff, roughly half coming from the university and half from NIST.(no word on precisely what the NSA's involvement will be, but I suppose they'd have to kill us if they told us). One of the more prominent staff members of JQI will be Nobel Laureate William Phillips who is currently both at NIST and the university. The co-directors of JQI will be University of Maryland professor of physics Christopher Lobb and Carl Williams, chief of NIST's Atomic Physics Division./

Quantum resources

Meetings list (courtesy of Daniel Lidar):
http://qserver.usc.edu/confs/
Quantum wikis:
http://www.quantiki.org
http://qwiki.caltech.edu
The latter include links to job lists, research groups, journals, blogs, and even quantum-related videos on the web.

TQGI Executive Committee

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Contact information, including APS-sponsored meetings and conferences, back issues of the newsletter, current by-laws, committees, and other information can be found at our website:

http://units.aps.org/units/gqi/

Having persuaded their co-authors to go first to establish safety and efficacy, Jozsa and Bennett depart Japan using the new facility.

Photo: courtesy Charles H. Bennett