BASIC

BAY AREA SCIENCE AND INNOVATION CONSORTIUM

Innovators

SERIES

Number 1

FEATURING

Robert J.T. Morris, Ph.D.
BASIC Chairman Emeritus
Vice President, Assets Innovation
IBM Global Services

Regis B. Kelly, Ph.D.
BASIC Chairman
Executive Director
CA Institute for Quantitative Biomedical Research (QB3)

BASIC

Bay Area Science and Innovation Consortium

Innovators Series

Innovation matters. As the late great scientist Stephen Jay Gould showed in his studies of evolution, being at the forefront and establishing a niche is a key to competitiveness. The San Francisco Bay Area has earned a vaunted reputation for being one of the nation’s regional leaders in technological innovation. It is home to five national scientific laboratories and a host of other federal and non-profit research facilities, some of the country’s finest research universities and top private industry R&D firms, and a plethora of cutting-edge start-up technology companies. This abundance of R&D capabilities, in combination with a proud history of intellectual openness and a pioneering spirit, has drawn many of the nation’s brightest minds and scientific talent.

Bay Area scientists and engineers are striving to uphold the region’s reputation for technological innovation by serving at the vanguard of exciting new research in a wide range of fields, including biology, advanced materials, energy and computation. Breakthroughs in any of these fields hold forth the promise of a bright and prosperous future for the region, the State of California, and our nation as a whole. In the BASIC Innovators Series, key Bay Area innovative thinkers share their thoughts on the science today that will lead to the technology of tomorrow.

BASIC Innovators Series

An Interview with

DR. ROBERT J.T. MORRIS

BASIC Chairman Emeritus
Vice President, Assets Innovation
IBM Global Services

Innovative research is the buzzword in the world of research and development today, with seemingly every scientific institute or high-technology company claiming to be a home to innovation. But how do you define "innovative research?" Are there critical requirements that must be met? Is it strictly a matter of newer technology? How does the Bay Area rate? As a region, are we at the front of the pack? And how does all this innovation translate to concrete benefits for society? To get an informed perspective, BASIC posed these and other questions to its outgoing chairman Robert J.T. Morris.

Morris is the Vice President for Assets Innovation at IBM Global Services, where he is responsible for increasing the technology content of IBM's services business. Prior to that appointment, he was director of IBM's legendary Almaden Research Center. A veteran of nearly three decades in the field of information technology, Morris has also worked at IBM's T.J. Watson Research Center in New York, and at Bell Laboratories. He has published more than 50 articles in computer science, electrical engineering and mathematics literature, holds 11 patents, is a Fellow of the IEEE and a member of the IBM Academy of Technology.

BASIC: There has been much talk about the GRIN technologies – genomics, robotics, information and nanotech – as being the innovations that will drive the economy in the future. What will be the key to the economic success of these technologies?

MORRIS: A key indicator of the economic success for these technologies, as it has been for major technological advances in the past, will be their degree of human impact. Innovation is not just a matter of creating a new technology or product, it is not important until it is accompanied by that kind of impact. For example, over 70 percent of the U.S. economy is not products at all, but services - an area which is wide open to new kinds of innovation. U.S. companies and institutions have a choice to make: they can conduct their businesses as usual and throw in some "labor arbitrage" (possibly including offshoring), but ultimately this is a losing proposition. Or they can invoke what has always been the Bay Area recipe for success, and that is "in your face" (or human-impacting) innovation. An example from Information

Technology is that of data storage – a technology that started right here in San Jose in 1955, when the first disk drive (called the RAMAC) was invented. As of today, the raw cost of storing a gigabyte of data is less than a dollar. Throwing in the software to help organize or search that data might cost $10. But putting the human services around that data to keep it safe, secure and easy to use might easily raise the cost to hundreds of dollars. It's pretty clear where we should focus our innovation.

BASIC: You have said that innovation has become the arbiter of competitiveness. What do you mean by that?

MORRIS: The economies of the United States and the western European nations are facing new realities that significantly challenge their capability to create and deploy innovation for prosperity and growth. Nations such as China, India, Brazil and Russia are replicating the characteristics that have made Western nations the hotbeds of innovation -- open markets, R&D investment and highly-trained workers – and could be well positioned to leapfrog to new business designs. In the U.S., we need to refocus on the human pain points, and where value is going to be generated in the future. Indeed, we should be pleased that the status quo will not be a viable option.

BASIC: You have often been quoted as saying that technology transfer is obsolete. Does that refer to the need for a new innovation paradigm?

MORRIS: Yes, the old industrial-age model for innovation basically went like this; someone does some research, usually laboring for years in isolation, finally invents something, then looks to transfer it to development and then the market by throwing it over a wall and hoping that somebody picks it up. From what we've been saying, you can guess why that doesn't work any more. If the researcher isn't in there understanding the real problem, in situ, he or she won't be able to focus on where the value is, and that is increasingly right at the point of human interaction with the new service or product. That test will determine success. If you're stuck on the old model, there just won't be time to go around and try again. On a networked planet, all discovery and opportunity will flow immediately to whatever environments are most fertile and hospitable. Being the original source of a seed is less important than being the most receptive environment. In creating that environment, we'll have to use every arrow in our quiver. That includes our outstanding academic institutions, support to cultivate fledgling ideas in novel commercial settings, the stability of established trusted companies, and all this embedded in a public policy environment that supports basic research through public programs, and keeps national priorities paramount through our network of national labs. We'll need to encourage collaboration between the public, private and academic sectors like never before. And this collaboration will need to be focused on key new agendas including services leadership, energy self-sufficiency, nanotechnology and public health and security, just to mention a few.

BASIC: You have also said that future prosperity lies in placing innovation at the heart of public policy, yet there seem to be political and societal pressures wedded to preserving the old ways. How do we gracefully ring out the old and bring in the new?

MORRIS: This has always been a difficult problem and is at heart of striking the right balance between research freedom and economic success. There's a trick I learned in running research labs, and that is that "pull" is always better than "push". The annual GDPs of China, India and Russia are all growing at a substantially faster rate than that of the U.S. Not so long ago, it was thought the way for the federal government to promote innovation was to simply increase (push) R&D budgets, but it's becoming more widely recognized that, in addition to greater capital investment, public policy also needs to pull for changes in the right areas. One example of how policy can help is in the area of IP and open standards. The more enlightened tech practitioners want to compete based on superior technical content and not on who got control of an interface. Nor should intellectual property get in the way of innovative partnerships between private industry and academia – there's far more to be gained than lost in an open collaboration model. The National Innovation Initiative (NII) was launched by the U.S. Council on Competitiveness, an organization of more than 200 CEOs, university presidents and labor leaders, to come up with a plan to restart America's innovation engine. Among its recommendations were the development of new incentives and support for business creation, a new intellectual property regime, and a national investment plan tailored to support America's most promising areas for innovation and ensure its research competitiveness in the future.

BASIC: **Speaking of education, according to a recent report from the National Academy of Sciences, other nations, most notably China and India, seem to be churning out far more science and engineering majors than the U.S. How might we do better?**

MORRIS: Well, kids are voting with their feet because they've heard that there might not be jobs. That may well be a self-fulfilling prophecy if we fail to capture the imagination of the brightest kids. We need concrete new programs to bring the magic and joy of science and technology to kids at an early age - that will have far more impact on the future than trying to assuage their fears that some other country may take their jobs. Strike their interest sufficiently and a quest for innovation will take over and carry us through. This is an area we have to address with heart as well as mind or wallet. My advice to students considering the study of science or engineering is to experience their options and then look for a particular field that they find intriguing and that they believe they would enjoy. People who have a passion for what they are doing have a better chance of being successful.

BASIC: **What is your prognosis for the future of R&D in the San Francisco Bay Area? What are the technologies that are ripest for innovation? Is there a good formula for picking technology winners and losers?**

MORRIS: There's no question that if you look at our resources here in the Bay Area, we have great strengths in nanotechnology, biotechnology and information technology, and I've already explained that by placing a "services spin" on how we exploit these technologies we can get out ahead. The secret is to differentiate ourselves from other regions in the country and the rest of the world. I reject the idea that it's only about picking technological winners and losers. What is important these days is to keep an eye on how the flat world is changing some of the basic equations. Globalization can't be defeated so we ought to be focused on making it work for us – that means continuing to be the innovation leader so that game isn't won on who has the lowest labor cost. Now you can see why I'm so interested in innovation in services – it's going to be at the heart of our competitiveness. There are three things that have made the Bay Area a leader in technological innovation: great universities that provide strong educational resources; an availability of investment capital, and a great location that draws a diversity of talented people, including immigrants. And that's not even mentioning that we have the best climate and environment anywhere. These are the area's birthrights and we must challenge anything that threatens them. For example, we must not let student visas and other immigration issues reduce our supply of talent. As an immigrant, I want future immigrants to feel as welcome as I did. If we keep an eye on both the basics and new issues we've talked about, the Bay Area has the potential to be stronger than ever. ■

BASIC Innovators Series

An Interview with

DR. REGIS B. KELLY

Executive Director,
California Institute for Quantitative Biomedical Research (QB3)

Photograph: Karen Preuss, courtesy of UC San Francisco.

After Regis "Reg" Kelly stepped down as Executive Vice Chancellor of the University of California's San Francisco campus, at the end of January in 2004, he literally sailed off into the sunset. He and his wife had taken up ocean sailing and had became accomplished enough to sail their own boat from the Bay Area down to Mexico. It seemed a fitting and graceful closure to a distinguished academic career at UCSF that began in 1971, when Kelly joined the faculty as an assistant professor of biochemistry and biophysics. Most of his research was in the field of neuroscience, with pioneering investigations into proteins critical to long-term memory. In October, 2001, he was named the Vice Chancellor, responsible for the half-billion dollar a year UCSF research enterprise. From this post, Kelly spearheaded the development of UCSF's new Mission Bay campus, becoming the public face for an endeavor in which new research partnerships between the university and private industry were forged. Surely, he had earned his time at sea.

Yet, shortly after the voyage began, it was announced that Kelly would return to accept the position of executive director of the California Institute for Quantitative Biomedical Research. QB3, as it is called for short, is a research consortium between UCSF and the UC campuses of Berkeley and Santa Cruz, aimed at gaining a better understanding of critical biological systems at all levels of complexity, and at fostering partnerships with private industry that will help create new technologies in the fields of biology and medicine. Since its inception in the year 2000, QB3 has grown to where it now involves more than 140 scientists at several locations, including its headquarters at the UCSF Mission Bay campus. QB3 is being widely hailed as a ground-breaking new approach to collaborations between university and private industry R&D. As executive director, Kelly is responsible for setting QB3's future course. Most recently, Kelly also agreed to serve as chairman of BASIC's Board of Directors, replacing Robert J.T. Morris, of IBM. BASIC had some questions for its new Chairman of the Board.

BASIC: **What prompted you to come out of retirement to take on the directorship of QB3?**

KELLY: Frankly, I was a failure at retirement. All the fun for me in learning to sail had been in going from zero knowledge to becoming an ocean sailor. After that it was boring. I soon concluded I'd made a mistake in leaving my career. Fortunately, the opportunity at QB3 came along and it was a good fit. There weren't too many qualified people who could take the job of executive director on such short notice.
I still have a great love for science and this, I believe, is the best way in which I can continue to be of service. Instead of doing the research myself, I am helping my colleagues add value to their research.

BASIC: **The scientific mission of QB3 seems oriented towards problem-solving. Isn't this a departure from the traditional idea of academic research being driven by intellectual curiosity?**

KELLY: The first priority of QB3 is to conduct scientific research of the highest quality that will satisfy intellectual curiosity. However, at the same time, we must also think about the purpose of that research. Doing scientific research is a privilege, not a right. At QB3 we have a mandate to help society. Our research will be of the highest academic quality, and we will be passionate in our pursuit, but we will always keep in mind that the ultimate goal is to benefit society. For QB3, these benefits will mainly center on economics and public health.

BASIC: **Recently, other research institutes have initiated collaborative efforts in the biological sciences that are either similar to that of QB3, or in actual collaboration with QB3, which indicates that the timing for QB3's approach is right. Why is this?**

KELLY: I think that we are seeing a bit of a crisis in the biological sciences. For example, the government has doubled the funding of NIH over the past decade, but we've seen no corresponding increase in the number of therapeutic drugs being developed. If you were in private industry and you doubled your investment in research without seeing any significant gain in return, you'd have to wonder if you were doing something wrong. As scientists in the biological fields, maybe we're not doing anything wrong, but we have to examine whether we could be doing better. QB3 is an experiment, a first try at doing biological research better by modeling it after the physical sciences.

BASIC: **Is that what you mean when you say that the mantra of QB3 is to make biology an engineering science?**

KELLY: Yes. If you look back, physicists have often made fundamental discoveries that were of little practical value at the time. Engineers, however, took that knowledge and used it to generate practical applications that were of great benefit to society. For example, quantum physics led to the development of the transistor, the laser and the microchip. In their efforts to develop technologies that would have wide public applications, engineers have also developed a culture which rewards those who become skilled at interacting with private industry. At QB3, we want to emulate this culture and improve the skills of biologists in working with private industry. The ultimate goal is to make biology a more productive science in terms of serving the public good.

BASIC: **The growing number of UC scientists who have chosen to become affiliated with QB3 indicates you are meeting a need. Why would a UC scientist want to become affiliated with QB3?**

KELLY: QB3 adds value to a UC scientist's research by attending to the administrative requirements for forming collaborations, either with other UC scientists or with private industry. A university researcher is very busy what with teaching, getting grants, and actually doing science. Even though that researcher may want to collaborate with others, particularly private industry, the time demands pose a formidable obstacle. At QB3, we can facilitate the collaboration process and we can find suitable industrial partners.

BASIC: **QB3 has already formed several industrial partnerships with prominent R&D firms. Is there a basic one-size-fits-all model for these partnerships, or is each one unique?**

KELLY: Each industrial partnership at QB3 is unique because each is a quid pro quo agreement, tailored to meet the specific needs of the industrial partner, while at the same time enriching the research of the UC collaborating scientists. For example, in our partnership with General Electric, QB3 scientists are helping GE researchers develop a new type of MRI (magnetic resonance imaging) technology for clinical use. GE has a large facility for MRI research in Schenectady, New York, but does not have access to patients for clinical trials. For this, they needed to collaborate with an academic health center, like UCSF. Under this partnership, GE and QB3 are looking to substantially increase MRI sensitivity to tissue metabolism, which would improve diagnostics and therapeutics. The GE partnership is quite different from our partnership with Nikon, which calls for the development of new and improved microscopy techniques and related imaging technologies. For that partnership, QB3 is serving more as a marketing tool. We will provide space and support for a new Nikon Imaging Center, which will house state-of-the-art microscopy systems that researchers from around the world can come here to use. The research that gets done here then becomes an effective sales tool for the use of Nikon instrumentation elsewhere. We also have a partnership with Genentech that will enable QB3 scientists to receive funding to do basic research. Genentech needs answers to specific questions and are willing to pay for someone to do the required research.

BASIC: What areas in biotechnology do you see as being the most ripe with opportunities for future industrial partnerships with QB3?

KELLY: Currently, the biotech industry is emphasizing therapeutic technologies. Diagnostic technologies have been somewhat ignored, like a poor relative. I think this is going to change over the next five years, and that diagnostic technologies are going to become very important. There's an especially huge future for blood-borne diagnostics. Combinations of DNA and protein markers that will enable us to diagnose diseases as well as monitor the effectiveness of therapies are coming along very fast.

For both diagnostic and therapeutic technologies, the pursuit of systems biology is going to be critical. People are realizing that there's not going to be a silver bullet for therapy or for diagnostics, one technology that will do everything. Instead, we're going to need an array of therapies and diagnostics. It's like a military needs more than one type of weapon because it will be confronting more than one type of enemy under different situations. The concept of systems biology will be imperative. Another highly important area is that of personalized medicine, in which individual genetic makeup will be used to determine which array of diagnostics or therapies should be deployed to help a specific patient. I expect global health issues, such as diagnostics and therapeutics for epidemics, will also be very important. QB3 has the expertise and will look to form industrial partnerships in all of these fields.

BASIC: What are some of the major challenges to forming collaborative partnerships between academic and private researchers?

KELLY: Traditionally, the biggest challenge to partnerships between academic and private industry researchers has been the negotiation of intellectual property rights. This process can take several months to complete, which often makes collaborations more trouble than they're worth for private industry. At QB3 we have been setting up template contracts that will enable a partnership with private industry to be in place within a week. There is also the challenge of identifying opportunities for partnerships where the strengths and interests of each side complements the other. Those are concrete challenges, but there's also a significant cultural challenge that must also be overcome. It is important for those in private industry to know that the results of academic research cannot be bought. Academic science can never be an R&D arm of private industry. Conversely, academic scientists must understand that money from an industrial partnership is not a handout. They need to think of partnerships with private industry as a social contract, one that will produce results which will be of benefit to society. ■

B A S I C
Bay Area Science and Innovation Consortium
Innovators
S E R I E S

Bay Area Science and Innovation Consortium
is a program of the Bay Area Economic Forum, co-sponsored by the Bay Area Council and the Association of Bay Area Governments.

201 California Street
Suite 1450
San Francisco, CA 94111
Phone: (415) 981-7117
Fax: (415) 981-6408
Email: basic@bayeconfor.org
www.bayeconfor.org/BASIC