Stanford Technology Brainstorm

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View from the Top: Interview with Arthur Bienenstock

As Stanford's Vice Provost and Dean of Research and Graduate Policy, Arthur Bienenstock is responsible for the support of research and graduate scholarship, including the Office of Technology Licensing. Prior to this appointment, Dr. Bienenstock was the director of the Stanford Synchrotron Radiation Laboratory (SSRL) and served as the associate director of the White House Office of Science and Technology Policy (OSTP) under President Clinton. When Dr. Bienenstock was recently presented with the DOE Distinguished Associate Award, U.S. Secretary of Energy Samuel Bodman said "You have elegantly brought together diverse ideas, peoples, and institutions to work together." When *Brainstorm* interviewed Dr. Bienenstock, Secretary Bodman's statement rang true - Stanford's Dean of Research works to improve science and technology by bringing people together.

As Vice Provost and Dean of Research and Graduate Policy, Dr. Bienenstock oversees the activities of OTL.

Brainstorm: Tell us about some of the highlights of your career. What experiences have shaped your opinions on research and innovation?

Arthur Bienenstock: Consulting had a dramatic effect on my outlook because I began consulting very early in my career, for a highly creative inventor, and got a sense of the way inventors function. It was amazing to watch as a person takes some new scientific fact and very soon afterwards makes a new product available.

The second thing that had an enormous effect on me was directing the Stanford Synchrotron Radiation Laboratory. One of the big impacts that experience had on me was to see the need for different types of people in a large, complex operation. You want highly creative scientists who think of the way-out things. At the same time, you need the scientists and engineers who can transform the way-out ideas into reality. I think some people overvalue one sort of person, or some overvalue the other type. In fact, if you're going to have a cutting edge facility of that sort, you need both types. And what's more, you gain appreciation for the infrastructure people – the people who make sure that you know exactly how much money you have, as well as purchasing and receiving, the value of a very good receptionist, all of these things became apparent to me in a way that I hadn't really thought about prior to being the SSRL director.

B: Your appointment to the OSTP was a significant achievement during your career. How has having a national perspective on research influenced your role as Dean of Research (DOR)?

AB: I had become aware, as SSRL director, of the importance of the government- university research partnership. What I became aware of at OSTP is that we can influence it.

At the moment we've got a very significant challenge from Washington, and that is a proposed change in the rules involving export. There is a phenomenon known as deemed exports, and that is giving any technical information to foreign nationals. Universities are excluded from these deemed export rules. And it's really important for the country that universities continue to be excluded

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OFFICE OF TECHNOLOGY LICENSING
STANFORD UNIVERSITY

STANFORD TECHNOLOGY *BRAINSTORM*

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Stanford Technology BRAINSTORM is published to provide information about OTL and general information of interest to the licensing community, both within and outside Stanford.

OTL's services are available to any Stanford faculty, students, or staff who invent technologies which may benefit the public or be of commercial value.

To learn about a specific technology or to disclose one of your own, contact us by any of the above means.

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because a significant portion of our science and technology workforce comes as a result of students from other countries coming to the United States to study and to stay on. What's more, it would mean that we would have to secure probably every laboratory that has an instrument such as a high end computer or Global Positioning System (GPS). And that would change the nature of this university.

Another thing that came out of that was a sense of the importance of building alliances with both industry and government laboratories, to insure the voices of science and technology are very impartial.

B: You've stated in the past, "The university must continue to seek better ways of facilitating research at the intersections of the disciplines, while maintaining the strengths of the disciplines themselves." How are you moving this initiative forward and what

Licensee Spotlight: Congratulations to Tableau Software

At the Office of Technology Licensing, our charter is to help turn scientific progress into tangible products. It is our licensees who do the work of creating the product. In just a few short years, Tableau Software has licensed an invention born in the Computer Science Department and developed it into an award-winning product.

Tableau was recently named Overall Winner of *DM Review* Magazine's 2005 Data Visualization Competition from a field of more than 40 submissions. Tableau's entry was selected based on its ability to effectively and efficiently present graphical solutions that communicate the data and intended message. Tableau was also the winner for depicting two of the four scenarios prescribed by the contest.

There is an old saying, "a picture is worth a thousand words" and the same can be true for pictures of data. Tableau's products help create these pictures directly from databases, enabling the visual analysis of data. By analyzing data this way, users can spot trends, outliers and relationships quickly, leading to better insights. The contest judge, Stephen Few, said "I get very excited whenever I'm shown true innovations in the field of data visualization." OTL gets very excited when a great product is developed from a Stanford innovation.

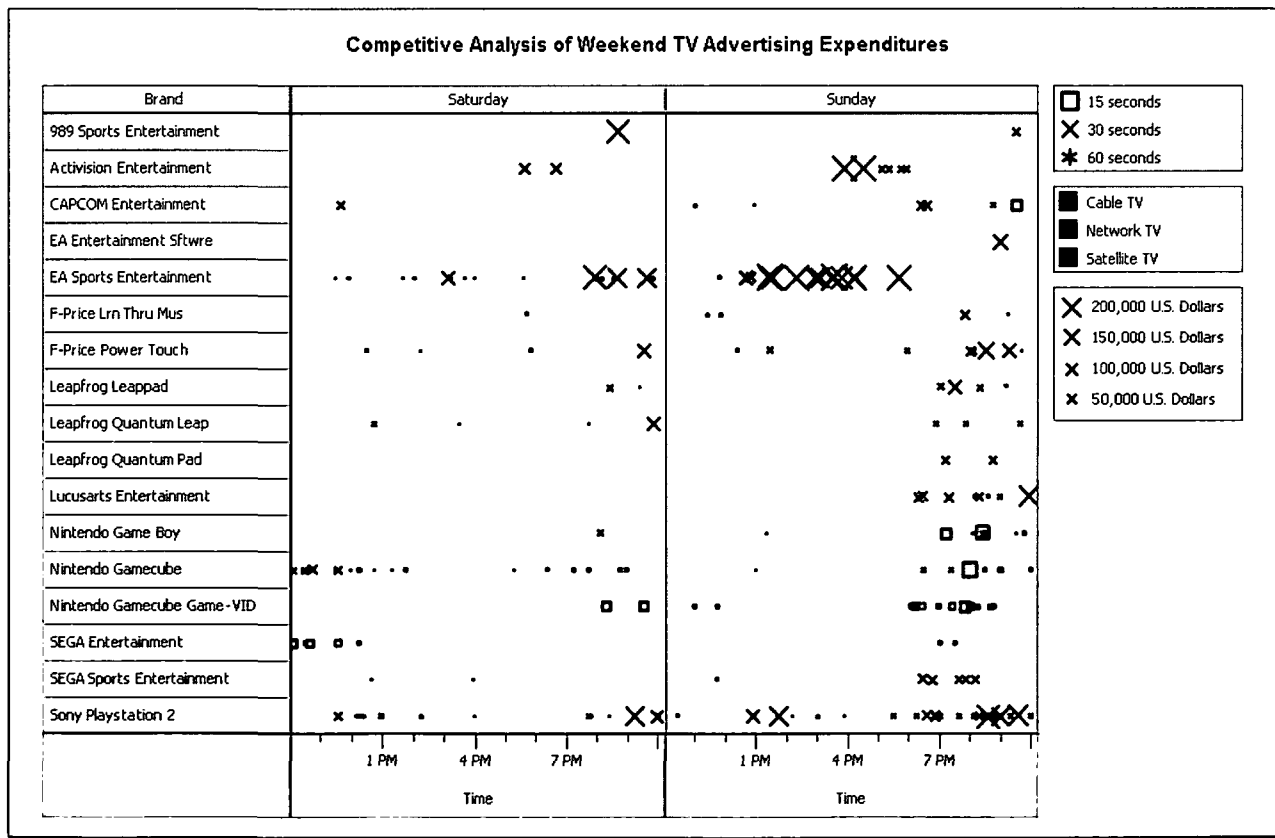

Tableau Software's winning data visualization. This graphic was created to help analyze the advertising strategies of video game companies.

"I continue to believe that some of the most exciting research is at the intersections of the disciplines. And this institution is moving to foster the research in which our faculty and students from different schools and different departments work together."

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challenges have you encountered along the way?

AB: I continue to believe that some of the most exciting research is at the intersections of the disciplines. And this institution is moving to foster the research in which our faculty and students from different schools and different departments work together. I'm working with the directors of the interdisciplinary programs that report to this office, and trying to stay very close to the Deans of the Schools of Humanities & Sciences, Engineering, and Medicine. Sometimes the goals of different departments are in conflict and you've got to manage those conflicts so that you keep both the disciplines and the interdisciplinary programs strong.

B: You have identified the following as priorities: attracting more members of underrepresented groups into advanced studies and obtaining faculty and student access to instrumentation that is extremely expensive. Have you made any progress on any of these goals?

AB: Attracting more members of underrepresented groups into advanced studies is probably the harder and the more important problem. Just as the nation needs foreign nationals to enter science and technology, it needs our women and our ethnic minorities to enter these fields. Our immediate efforts are aimed at ensuring that those we admit actually enroll. We are also following up on a suggestion of the Diversity Committee of the Graduate Student Council. That is, we're going to explore what we can learn from successes that might be applied to the areas where we've been less successful.

I said that I wanted to keep working on access to instrumentation that is expensive to purchase, operate and maintain. I'm serving on a committee of the National Research Council (chaired by Professor Robert Sinclair), that is looking at how the government might provide medium-sized facilities that could be very expensive. We are examining our own policies to ensure that we can meet not only our own needs for expensive instrumentation, but the needs of other academic institutions around our area. I think that there will be instruments that not only our own students should have access to, but so should the students of San Jose State, and other universities. I was really pleased when Professor Sinclair proposed to team up with the community colleges that train students in using that type of sophisticated instrument. We want to ensure that our policies permit faculty and students from other such institutions to have access to our facilities.

The Stanford Synchrotron Radiation Laboratory is an example of such a facility. It provides very modern instrumentation to the whole area. I think that it opened up for the nation, a new kind of facility where people could come in, use it for a few days or a week and leave. People from academia and industry from around the country, in fact from around the world, could come and use SSRL. We at Stanford benefited from the facility, but also from the interactions with outstanding scientists from around the country and the world, so I like that model very much. I think it's been

Selection of Licenses Granted by OTL in 2005

Docket(s)	Title	Uses	Licensee	License Type
S99-175	"Carbon Nanotubes as Sensors"	Molecule detection	Nanomix	Nonexclusive
S01-042	"Dynamic Spectrum Management for Digital Communication"	DSL maintenance	ASSIA	Nonexclusive
S02-093 and others	"Mechanisms for Imaging Intravascular Intervention"	Ultrasound imaging	Fluid Medical, Inc.	Field Exclusive
S04-041 and others	"Antifoams for Scale-Up of Cell-Free Protein Synthesis"	Protein production	Fundamental Applied Biology, Inc.	Option
S05-097	"Micro-Reservoirs for Localized Chemical Delivery"	Stem cell research	Arrowhead Research	Exclusive

adapted widely now and will continue on.

B: Many view Stanford as an innovative research university on multiple levels. What are additional ways in which we can foster innovation?

AB: First of all, we have to keep getting great faculty and students, and that means that we cannot ignore issues like export control. My fear is that foreign nationals will cease to come to the United States in the numbers that they have been. Central to everything is good people. The second is that we have to insure that the faculty, the staff, and the students have the infrastructure and the instrumentation they need. And the third, in which this institution is so good, is to ensure that the barriers between departments and schools remain very small. Stanford is different from most universities in this respect and I think that fosters innovation. You can see it in the strength that we have in fields like computer music.

"I take seriously the responsibility of universities to get their innovations out into the marketplace so they strengthen the nation's economy. That is the primary goal – not to make money, but to get the inventions out into the market."

B: What is your view on technology transfer?

AB: I take seriously the responsibility of universities to get their innovations out into the marketplace so they strengthen the nation's economy. That is the primary goal – not to make money, but to get the inventions out into the market. OTL does that very well and, as a consequence, we make a lot of money and also acquire valuable friends. That money is used partly to give our young faculty a chance to try new things. Part of it is used to get new scientific instrumentation.

In the long run, this institution thrives when our economy thrives, and we have good relationships with our industrial neighbors. Consider, for example, the debt that we owe to the Hewletts, the Packards, and the Varians, and the people like that who've supported us through the years, not through licensing income, but through gifts. Also, the companies around Palo Alto play an important role in helping to educate our graduates and undergraduates. So, we want to see an economy around us that's thriving and innovative, and licensing is one of our ways in helping in that endeavor.

B: What do you think university-industry relations will look like in 10 years?

AB: I think we're seeing a trend of industry looking towards academia for long-term basic research. I find them increasingly acting as spokespersons for government funding of academic research, and as consortia members that provide financial assistance for long-term innovative research - the sort of generic research the whole industry will use in twenty years. We see the semiconductor industry as a leader in that; I suspect we will see other industries go more and more in that direction.

OTL Fiscal Year 2004-2005 Numbers

Total royalties received from licensees:	$48.0M
Liquidation of equity from Google™ license:	$336.0M
Number of inventions producing income:	428
Royalty Range:	$7.44 - $25.0M
Number of inventions producing $100,000 or more:	43
Patent expenses:	$4.4M
New invention disclosures (calendar year 2005):	433
Total new licenses:	84
Nonexclusive:	46
Exclusive:	23
Option:	15
Number of companies Stanford took equity in:	12

Inventor Portal Opens the Door to the Licensing Process

Office of Technology Licensing

Inventor Link

Say you are a Stanford inventor. It is midnight and you would like to do some online Christmas shopping. But, before you get started, you want to know if you will be getting a royalty check this year. Now you can find out with a few clicks of the mouse.

One of our biggest challenges at OTL is to keep inventors informed about the status of their inventions. Toward this end, we introduced the "Inventor Link," which allows every inventor to go to a secure Web site and review the status of his or her inventions. This includes information relating to the invention, including the patent status, marketing progress, licensing activity, industry feedback, the gross royalty income per invention per year, and the inventor's personal royalty distribution. An inventor can also use this site to update OTL if his or her contact information changes. This is one example of the "customer relationship management" system OTL is implementing.

If you are an inventor, you can check out OTL's Inventor Link at **http://stanfordtech.stanford.edu/4DCGI/invlogon**. If you have any questions, suggestions, or feedback regarding the Inventor Link, please let us know by emailing us at **brainstorm@otlmail. stanford.edu**.

Technology Spotlight: DNA Display – Evolving a Better Drug

Deoxyribonucleic Acid (DNA) encodes the instructions to build every living organism, from *E. coli* to humans and everything in between. The genetic alphabet of DNA consists of just four letters that are used to write the genetic code which serves as a blueprint for assembling an organism. So why not use a DNA blueprint to build new drugs? Inventors Pehr Harbury and David Halpin have harnessed the basic DNA alphabet to write a different code. Instead of assembling an organism, the DNA Display code can be used for assembling small molecules on a laboratory bench.

The process begins with a library of special DNA sequences; each with a chemical building site attached to the end. Then, step-by-step, using the DNA sequence to guide the synthesis, a series of different chemical or enzymatic reactions is performed on the building site. Repeating this for four or more rounds creates a library of small molecules, each attached to its distinctive set of DNA instructions. The small molecules that make the best candidates for new drugs are then selected from the chemical library.

Amplify and Iterate for the Best Results

But that is only the beginning. Because each compound was synthesized using a genetic blueprint, the DNA sequences from promising compounds can be amplified, mixed and matched to "evolve" a molecule with even better characteristics (for example, tighter binding or enhanced specificity). In each subsequent generation, the properties of the synthetic compounds are refined. At the end of this iterative process, the entire small molecule library consists of good drug candidates that can easily be identified and recreated by reading the attached DNA instructions.

Libraries of a quadrillion compounds can be encoded, synthesized and screened with this technique by an individual scientist on a standard laboratory bench without the use of technically advanced equipment. Although this approach was designed with drug discovery in mind, it can also be used to develop novel industrial catalysts or research reagents.

"Genius"

If you think that this invention sounds like it might be the work of a genius, there are others who agree with you. For his work in this area, Dr. Harbury recently received a prestigious National Institutes of Health Director's Pioneer Award and a MacArthur Fellowship – an honor frequently called a "genius grant."

The MacArthur Award will join a mantle full of other national awards Dr. Harbury has received. He has received the 2004 Schering-Plough Young Investigator Award, the Searle Scholar Young Investigator Award, and a Burroughs-Wellcome Young Investigator Award. He was also named one of 100 Young Innovators by MIT's Technology Review magazine in 1999.

For more information about licensing the DNA Display Technology contact Kirsten Leute at kirsten.leute@stanford.edu, (650) 723-4374.

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