“People were dreaming of cinema long ago,” says Pavle Levi, an assistant professor in Stanford’s Art and Art History Department and its new Film and Media Studies Program. The camera obscura, a device for creating images that later would give its name to a film studies journal, appeared in ancient China and then in Greece. Much later, in early modern Europe, optics became a source of entertainment; a “magic lantern” presented in 1659 was perhaps cinema’s first ancestor.
ever since Frederick B. Terman, dean of the School of Engineering, came up with his notion of steeples of excellence in the 1950s, research grants have fueled Stanford by drawing money and ensuring that the university remains the home of some of the world's greatest scientists.

Grants are still a prime source of energy for many Stanford schools and departments, and they are still on the rise. Sponsored research in fiscal year 2005 accounted for 37 percent of the university's operating revenue, or $973 million, up 5 percent from the previous year.

What's different about grants today and grants in Terman's day, aside from the raw numbers, is that today's are increasingly complicated and multifaceted. As multidisciplinary research becomes the rule in all scientific schools and departments, grants can get difficult to administer, on the one hand, but also can become more responsive to scientific needs and inquiry, on the other. The match is by no means perfect; researchers and grant makers sometimes seem to be in a race to stay apace of each other's agendas. But certainly the matchmaking is increasingly successful, and the results can be seen especially in Stanford's schools of Engineering and Medicine.

The NSF has embarked upon a variety of initiatives to encourage multidisciplinary research and training. Since the late 1980s, the agency has funded Science and Technology Centers, which bring together scientists from a broad range of disciplines. In 1995, the NSF set up an Office of Multidisciplinary Activities, whose name is self-explanatory. A program specifically designed to help recent Ph.D.s acquire the cross-disciplinary training necessary for successful careers, the agency's Integrative Graduate Education and Research Traineeship (IGERT) since 1998 requires that applicants propose a comprehensive interdisciplinary theme.

More recently, the NSF funded an 18-month report titled "A Multi-Method Analysis of the Social Science Research Council (http://hybridvigor.net/publications.pls?x=interdis)." In similar fashion, the Roadmap initiative of the National Institutes of Health (NIH) outlines the crucial importance of changing the nature of the grant-giving business by removing traditional barriers (http://nihroadmap.nih.gov/researchteams/index.asp). The NIH provides more money than any other single source for university research nationwide.

"Although research teams have included individuals from multiple disciplines," the website states, "integrating different disciplines holds the promise of opening up currently unimagined scientific avenues of inquiry and, in the process, may form new disciplines with which to tackle increasingly complex questions." To that end, the NIH, like the NSF, has over the past decade been funding multiple-year large team projects, sometimes called centers, sometimes called glue grants. Bringing together an array of researchers, they often embrace several institutions and include training (and cross-training) as well as research funding. A new NIH translational research grant launched in October, for example, explicitly encourages medical schools to provide a home for disciplinary-based lab scientists.

It was not always that way. Stanford's dean of research and graduate policy, Arthur Bienenstock, remembered when his Synchrotron Radiation Laboratory received its very first NSF funding in 1972. But the agency just wouldn't commit.

"It was like they were interested in sex without marriage," Bienenstock said. "They kept insisting on three-year renewals. There was no mechanism—we were driving the loop, we were pushing for a long-term multidisciplinary view, and it was clearly against for them."

But today, he laughed, "NIH almost looks like Bio-X!" Bienenstock, who now works at the Social Science Research Council (http://hybridvigor.net/publications.pls?x=interdis).

The second aspect is that graduate students can cross departmental boundaries, so I have students applying physics, biophysics, etc., and they can all work together.

As for the bumps, they are of various sorts. Managing complicated multidisciplinary grants issued by interdepartmental and interagency agencies is no easy task. It is sometimes a challenge just to make researchers aware that they can breach boundaries and that there is money available to

The grants that make the research possible

Today, NIH almost looks like Bio-X! Bienenstock said, referring to the federal agency's new dedication to cross-disciplinary research. 

Jeff Koseff

Anne Hannigan

"Before the 1990s, we weren't able to follow molecules except by measuring a large number of copies at once, which only gives an average," McAdams explained. "Now we can look closer and ask, Do all these molecules march to the same drummer?"

Similarly cross-disciplinary research is going on at other big universities, of course, but Stanford has an edge, said McAdams, who with Judith Frydman was a co-recipient of one of the first Bio-X Interdisciplinary Initiatives grants in 2000.

"There are two aspects that make Stanford special," he said. "We have a close physical connection between the basic sciences, engineering and the medical community. They're all within a few hundred yards of each other. That is very rare, and the proximity really facilitates collaboration. The second aspect is that graduate students can cross departmental boundaries, so I have students in my lab from the physical sciences, chemistry, applied physics, biophysics, etc., and they can all work together.

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do that. Chris Webb, a former genome scientist who stepped over into the administrative side of research, is in charge of helping professors at the School of Medicine put together multidisciplinary grants. He said he saw plenty of colleagues struggling to do research on their own, unable to figure out how to link up with others.

“They needed a nice cover story,” he said, referring to the challenge of showing one researcher that her narrative, as it were, could also be part of someone else’s story. Webb’s boss, Senior Associate Dean for Research Harry Greenberg, added that “most researchers are already maxed out” with their own work, “so Chris is a bridge.”

The School of Medicine pulls in more research money than any other unit at Stanford, and it generally takes care of its own grants. Like everything else, though, the story varies as one wanders across the campus. Stanford’s other schools do not have someone like Webb, and Anne Hannigan, associate vice president for research administration, says she wishes they did. Her department does what it can, she said, but younger faculty members need more assistance.

“We don’t serve them well. That’s a goal of mine, to serve them better with research products,” she said.

All in all, however, “Stanford is in good shape,” she said. But financial administration of grants is a complicated business, with different incentives and disincentives across the university, and “the funding structure makes it more difficult for people to do business together.”

For example, in the case of a proposal coming from more than one school (chemistry is in Humanities and Sciences, engineering is in Engineering, radiology is in Medicine and bioengineering straddles two schools), to which agency should they apply? Who should be the principal investigator, or PI? How should credit be apportioned? How should different departments and schools reconcile their accounting methods? (See related article, this page.)

There is also the problem of money. More than one person interviewed for this story remarked glowingly that federal research budgets will remain flat for at least the short run. The Clinton administration in 1998 embarked upon a five-year plan to double the NIH’s budget, a task completed under the first George W. Bush administration, but since then “we’ve seen a steady state at best,” said Marcia Hahn, of the agency’s Office of Policy for see FUNDING, page 11
In the 1870s, Eadweard Muybridge’s photographs of galloping horses marked the beginning of a new revolution in representation. His images' direct proponent, film, would become the definitive cultural form of the 20th century. Today people no longer dream of cinema; they study it. When the first film studies programs began appearing, they generally were housed in literature departments. Movies, after all, conveyed stories, and the art and theory of criticizing narratives on paper were, it was thought, easily transferable to narratives on a screen.

In the 1970s, Marshall McLuhan's ideas about the massaging influence of the “mass media” gave new prominence to the technology of film, the subject of study, and the subject drifted into media and communication departments. That is where it has resided at Stanford until now. The announcement last fall of the university’s born-again Film and Media History program, in the Department of Art and Art History, signaled not only the state of the field, but the program and degree program but the resolution of a disciplinary journey.

Film is generally studied in two ways, said Associate Professor Scott Bukatman, the director of the graduate program for the program: as an art in and of itself (as in “the art of Fellini”) or as the bearer of ideology. The name “Film and Media Studies” encompasses both the artistic and the cultural meanings of the medium, he said, acknowledging that film can be studied as an art form or, for example, as a vehicle of ideas about gender, race or class.

But it cannot be studied as an on-screen version of literature, Bukatman said. “Film is different. You can’t reproduce film like you can reproduce a quotation or a painting. It’s ‘something else,’ and that ‘something else’ is more fundamental than narrative.” And, he pointed out, “there are also non-narrative aspects of film. It’s not just a story. It’s not just what happens on screen, but the medium, how it is shot, how it is edited, what the relationship between the audience and the performer is.”

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There are lots of intersections with other fields, “but there also must be limits,” Samuelson said. “We have to embrace faculty who teach film, but it can get complicated.” The new program therefore will include a rigorous core series taught by film studies faculty. “We have to delicately but clearly establish the parameters,” she said. By film studies faculty. “We have to delicately but clearly establish the parameters,” she said.

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adaptable, interactive screen images.

“We need to define what we study and what we don’t,” Levi said. “We live in a completely image-saturated society, and film studies has to adapt itself. That’s the good side of the shift. Film scholars are well equipped to address these expanded forms of moving images.”

In exactly that vein, Bukatman, in his Blade Runner essay, commented on “the emergence of a new subjectivity constructed at the computer station or television screen,” that is, the construction “of a new position from which humans could interface with the global, yet hidden, realm of data circulation.”

The curator for the new film studies program is Henry Lowood, co-director of the Stanford Humanities Lab and curator of the Germanic and History of Science and Technology collections at Stanford University Libraries. Lowood has a good head start as curator of the film studies collection, Bukatman said, because Stanford has an excellent collection of films and interactive software and games.

Lowood also knows a thing or two about Bukatman’s interest in subjectivity and screens. He co-directs (with Tim Lenoir, formerly of the History Department) “How They Got Game,” a many-timbed project at the Humanities Lab about video games (http://shl.stanford.edu/research/how_they_got_game.html). Among its spin-offs was an exhibit at the Yerba Buena Center for the Arts in San Francisco called “Bang the Machine: Computer Gaming Art and Artifacts” (http://www.ybca.org/inside/press/press03/games.html). Among its spin-offs was an exhibit at the Yerba Buena Center for the Arts in San Francisco called “Bang the Machine: Computer Gaming Art and Artifacts” (http://www.ybca.org/inside/press/press03/games.html). Where Lowood shares common ground with Bukatman is in his interest in the creative interaction of players (or performers), technology and spectators. In October 2004 he was a referee at the World Cyber Games in San Francisco (which drew a mere 5,000 viewers); in their home, Korea, they attract 100,000 spectators; in their home, Korea, they attract 100,000 spectators.

As for space, for the past several years there has been talk of concentrating Stanford’s various arts program in one place to create an “arts district” adjacent to the Cantor Center for Visual Arts. Samuelson believes strongly that studio art, art history, film and design (including the School of Engineering’s new Hasslo Plattner Institute of Design) need to be in the same place. Like people at the Medical School or the Engineering School or any other academic site where new disciplinary partnerships are being forged, she recognizes that proximity is key.

While the new buildings would be fantastic, of course, Bukatman says it’s the $500 million that’s really essential at the moment. The program can start without them. Indeed, it has. When he introduced Williams at the Humanities Center, saying he was doing so on behalf of the “Film Studies Program in the Art and Art History Department,” he stopped, amazed at what he had just said. “I would never have believed I’d ever be saying those words together,” he explained.

Lowood teaches a course called History of Computer Game Design, taken mostly by students from Computer Science or the Interdisciplinary Studies in Humanities honors program (http://www.stanford.edu/class/its145/). He is less interested in game development than in game participation, and the issues raised in his classes include matters such as: How does the structure of a game propel the narrative? Why have games been treated as if they were linear, authored media? To what degree are players consumers or producers? And what sort of community do they create?

Those are all questions that one could imagine being echoed, or at least adapted, in the context of film studies. Indeed, Lowood drew a close comparison. “Game studies means research on game development and the social and cultural contexts of digital games,” he said. “The relationship between the development and study of games is similar to art versus art history,” or between filmmaking and film studies.

The film studies program will form a vital part of Stanford’s fourth multidisciplinary initiative, devoted to arts and creativity, which is being spearheaded by Bryan Wolf of the Art and Art History Department and Jonathan Berger of the Music Department.

But, as with everything else at Stanford, space and money are issues. The latter was alleviated somewhat when alumnus and film director Jay Roach gave $1 million in flexible endowment for the program, which was matched by the William and Flora Hewlett Foundation.

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“What I love most about Stanford is that from my first day here, there was an insistence on multidisciplinarity,” he said. “Film studies can thrive here. We’re positioning ourselves in the best possible way.”

Professor Kristine Samuelson, above, the director of the new Film and Media Studies Program, last year produced Point 25, a cyber-spectacle in Wallenberg Hall involving musicians in Sweden and Stanford, below. Opposite page: Eadweard Muybridge’s photographs of Leland Stanford’s galloping horses marked the beginning of a new revolution in representation.
A System of the Structures of Multidisciplinarity

New center on longevity

To be independent or to seek a home with others? The road to becoming an independent lab is neither short nor easy. Some researchers might think the costs outweigh the benefits. For others, such as Laura Carstensen, a lifespan developmental psychologist, independence is essential for the integrity and success of the research project.

The future Stanford Center on Longevity, directed by Carstensen, is likely to become the university’s next independent lab. The center’s ultimate aim is to improve the well-being of aging individuals, which means everybody. Carstensen takes great pains to point out that longevity is not a synonym for old age.

She began the march to independence in 2004, when she met with President John Hennessy, Provost John Etchemendy and Dean of Research Arthur Bienenstock (the latter two former directors of independent labs), as well as with potential donors, to propose a bold, multidisciplinary, freestanding research center.

According to the report issued by the Provost’s Exploratory Committee on Longevity, which came into existence as a result of Carstensen’s proposal, Stanford is home to a multitude of researchers in an array of fields relevant to longevity who nonetheless have no way of working with each other or even of knowing about each other’s work. The report furthermore states that basic research is often difficult to translate into policy or to implement in such a way as to make a difference in people’s lives.

“This will be more interdisciplinary than anything else on campus,” Carstensen said confidently in the fall. “The nature of the subject naturally embraces all seven disciplines. There were deans who would have liked to house it [in their schools], because it will bring in money, but that was not the point.

Declining the deans’ offers of hospitality, Carstensen instead chose to work with Bienenstock, whose job, she said, “is to ensure the good of the university as a whole.”

Carstensen envisions a place, a physical place, where people will be able to meet. If the funding goes well, which she expects it will, the center should be up and running in five years. The building would be a permanent home for staff and a temporary home for researchers, professionals and policymakers from Stanford and elsewhere. The center would fund translational research by, for example, patent attorneys and entrepreneurs, and would have what Carstensen called a department of cultural change, where academics, journalists and survey-takers could study and share information about the aging process. Projects would be clustered among five research sections: brain and mind; social innovations; sensation and locomotion; healthy living and disease prevention; and disparities, focusing on social and genetic risks faced by specific individuals or groups.

“The goal is to change the nature of human aging,” Carstensen said. “We’re not going to cure disease. We want to change the way people live at all ages.”

Within that perspective, Carstensen and others believe that our lives are organized around a chronology that makes little sense.

“The extra years don’t have to come at the end,” she pointed out. “Why not pay Social Security benefits to people raising children, for example, when they need to be at home? Many old people are perfectly capable of working and might not need the income then, particularly if they’ve earned well throughout their lives.

Changing our notion of age, she said, “involves talking to children, changing the way universities operate, setting up businesses, intervening in national policy. We can turn an average of 30 extra years into an extraordinary advance in human life.”

To that end, engineers and physicians and social scientists and entrepreneurs need to put their heads together. “This coming together is possible because we all face a common problem,” Carstensen said, “and we all need each other in order to fix things.”

Carstensen is no stranger to interdisciplinary research and collaboration. From 1997 to 2001 she was director of the Institute for Research on Women and Gender, where for two years she led a project on aging under the rubric of IRWGs “Difficult Dialogues” program. Participants from Stanford and elsewhere concluded that there is a clear correspondence between gender and race, on the one hand, and difficulties in aging, on the other. How one ages has a lot to do with who one is. Most obviously, the world of the very old is a female world. And it’s an increasingly populous world.

When Carstensen said that changing our notion of age involves talking to children, she specifically mentioned the Stanford Center on Adolescence, run by education professor William Damon, one of the members of the Provost’s Exploratory Committee on Longevity (http://www.stanford.edu/group/adolescent.ct/).

The Center on Adolescence was founded in 1996 with a $1.2 million, two-year grant from the Carnegie Corporation of New York to promote multidisciplinary research and training. The two centers, which have plans to work together and might even eventually live together, are models of the different routes leading to multidisciplinary research. When Damon, an expert on moral development, was hired in 1995 from Brown University after a wide-ranging nationwide search, he was given...
Collaboration

It's essential that departments and schools continue to exist .... They are literally the foundation of the university,' Vonder Linden said.

The system of collaboration would never have come into existence. It needed to be an independent lab, he said.

"Stanford organizes interdisciplinary research in different ways; sometimes it's attached to departments, to the extent that the department is interdisciplinary," he said. "Sometimes it's attached to schools. So partly it's a bureaucratic arrangement, but Stanford has always supported weird groups of faculty getting together."

"Sometimes," said Carol Vonder Linden, the assistant dean of research, "a center needs to be standalone to get the attention it deserves. But sometimes not."

Some centers affiliated with a school later became independent labs. In other instances, as with the Institute for Research on Women and Gender and the former Center for Chicano Research, it's the other way around. Independent labs are not assumed to be permanent entities, either physically or administratively. They have a life cycle.

"When faculty request an independent lab, it means they're collaborating already," Vonder Linden pointed out. "They say, 'We need a structure, we need an animal to care for the administration of this.'"

Because each one of these "animals" requires new space, even if it doesn't have its own building, and new administrative and research resources, petitioners must be vetted by department chairs and the relevant deans before a formal proposal is even submitted. Once vetted, the matter goes to the dean of research, and from there to the provost. University policy RPH 2.9 (http://www.stanford.edu/dept/DoR/rph/2-9.html) states specifically that independent labs are "exceptions to the principle of organizing our research programs within regular academic channels," and the organizers of the new venture therefore must make an ironclad case that their purposes cannot be fulfilled by ordinary means.

Even with those administrative guarantees in place, there are some who believe more attention will need to be paid to structural issues as multidisciplinary research becomes the order of the day.

"Stanford needs to find a better way of managing interdisciplinary work other than setting up independent labs, because eventually the whole university is going to be an independent lab," said Amy Balsom, senior associate dean for finance and administration at the School of Earth Sciences. "We're going to get more and more fragmented."

That's one scenario; another is that Stanford will run out of space, of which there is a finite amount. Faculty researchers in independent labs generally have two offices or spaces; one at the lab, another at their department. Provost John Etchemendy (himself the former director of an independent lab) told Stanford Report in October that there is no unallocated space left on campus, though there is unoccupied space. Allocation is made through schools and departments, yet one of the reasons for the pressure on space is the growth of multidisciplinary research. Moving off campus, which is one solution, would relieve the pressure, but it also would work to counteract that long Stanford tradition of mixing it up on campus, and would make it more difficult for students to participate.

Not all independent labs require new buildings or physical proximity. The decision seems to depend on the subject matter, existing collaboration and the individuals involved. Yet clearly some physical contact is necessary, if just a meeting room with a good coffee maker.
The logic of language and learning

It should come as no surprise that the interface between human beings and technology is an area teeming with researchers at Stanford.

What exactly goes on in that interface? People use technology to study how people learn. They observe how people react—physically, cognitively, emotionally—to technology. They invent software that speaks to users in a language that makes sense to them; figure out if babies actually learn something from computer screens; study the similarities between human and artificial brains. In short, they explore the limitless facets of communication among and between humans and machines.

An enterprise like this is an obvious candidate for independent labs, which provide not only a space, physical and/or virtual, for cross-disciplinary collaboration, but also the flexibility and autonomy to go wherever the research needs to go.

At present much of that activity is taking place at two such labs: the Center for the Study of Language and Information (CSLI) and the Stanford Center for Innovations in Learning (SCIL).

Their missions and research often overlap. The director of CSLI, Byron Reeves, for example, is also the director and co-founder of Media X, a network with private companies devoted to studying interactive technology. Media X is housed in the tech-rich Wallenberg Hall, which is managed by SCIL. Reeves also co-directs a project of CSLI, called LIFE, dedicated to figuring out how people learn and also located in Wallenberg.

Longevity

"Youth purpose," an approach that emphasizes the aspirations and potential of young people rather than the pitfalls and dangers they encounter. When he arrived at Stanford, he said, the hallway of the pre-existing center was lined with depressing posters announc
ing the numbers of teen suicides, teen pregnancies and teen drug overdoses. They’re gone.

Young people have a different attitude toward aging than older people, Carstensen said, noting that Damon’s work therefore will be invaluable to his project. Damon called their shared interest “successful aging.”

"Young people see time as infinite, we recognize limits," she said. “Older people gather less information and are more concerned with past things. But when younger people's interest "successful aging."
Disciplines, according to Bienenstock, “are like parallel structures that aren’t interfacing nicely.” As with any momentous change, if all the parts don’t transform together and at the same speed, there are bound to be imbalances and inequities, don’t transform together and at the same speed, one for many of the leading players. One of the reasons the environmental and international initiatives have legs is precisely that they will include other billets not confined to any particular school. Vonder Linden is emphatic that “it’s essential to keep disciplines strong.” But, he added, “there are bound to be imbalances and inequities, don’t transform together and at the same speed, one for many of the leading players. One of the reasons the environmental and international initiatives have legs is precisely that they will include other billets not confined to any particular school.

Recently, Carstensen issued a request for multidisciplinary proposals, some outstanding

The Center for the Study of Language and Information, which is housed in Cordura Hall, is among the independent laboratories with their own building.

Altogether, Reeves said, there are some 10 centers, labs or groups on campus studying language-related technologies and the intersection between the humanities and science and technology. Back in the 1980s, when Apple was hiring philosophy graduate students to apply their powers of abstract thinking to the challenges of computers, a group of scholars at Stanford founded CSLI to study the emerging science of information, computing and cognition. They hailed from linguistics, philosophy, education, psychology and the relatively new field of computer science. Their mission was to develop software and other technology that responded to the structures and needs of human intelligence and language.

“The aim was to get computers to be more intelligent,” recalled John Perry, the Henry Waldgrave Stuart Professor of Philosophy and a former CSLI director. “Understanding how people did complex projects, we thought, would help us improve computers. So philosophy was an important part of the mix. You had computer scientists reading Heidegger, for goodness’ sake.” But as the computers got much, much smarter, the philosophers became less valuable.

When CSLI was born, it was well funded thanks to a start-up grant from the Systems Development Foundation, an indirect offspring of the RAND Corporation. (The foundation had issued a request for multidisciplinary proposals, and when those from Stanford, SRI International and Xerox PARC looked similar, SDF suggested they combine their efforts, which they did.) The money went into projects, some outstanding

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One solution is to adjust the rules on hiring, promotion and tenure. Over the years, schools have occasionally shared posts (Bienstock, in fact, was hired in 1967 by Engineering and Humanities and Sciences). Such Über-billets are definitely in Stanford’s future, according to virtually all the center directors and researchers consulted for this article. The prospect is a truly exciting one for many of the leading players. One of the reasons the environmental and international initiatives have legs is precisely that they will include other billets not confined to any particular school.

Continued on next page
the mind works. It sucks up the best students like dents can study both operating systems and how studies the intersection of linguistics and com the Computational Semantics Laboratory, which former CSLI director and the current director of the National Science Foundation and at various military agencies. Linguist Stanley Peters, for example, another former CSLI director and the current director of the Computational Semantics Laboratory, which studies the intersection of linguistics and computer science (also called computational linguis tics), is working on a project funded by the Office of Naval Research to see how (or if) robots can teach humans in a language that is mutually intel lligible and accessible. One of CSLI's earliest offspring was not a project at all but a program: Symbolic Systems, which currently is authorized by the Faculty Senate to grant bachelor's and master's degrees through 2008 (http://symsys.stanford.edu/).

"John Perry and I were running CSLI," linguist Tom Wasow said, "and John said, 'You know, we really ought to start up an undergraduate pro gram.' I said, 'Great idea,' and we contacted peo ple in computer science, philosophy, psychology and linguistics. We hammered out a curriculum, I wrote the boilerplate text on the reasons for the program, and we got it approved."

The program, administratively housed in the Linguistics Department, today graduates between 40 and 60 students a year. Beyond occupying some of its space, SymSys affects Linguistics in another way only fitting for an interdisciplinary program. Over the years, Wasow said, because SymSys and Linguistics students take many of the same classes, the far more numerous techies end up driving the debates, and Linguistics has changed as a result. SymSys is one of the most successful IDPs [inter disciplinary programs]." Wasow said proudly. "It fills a huge gap, because no other program combines fuzzy and techie work like it does. Students can study both operating systems and how the mind works. It sucks up the best students like a magnet." Reeves, the current CSLI director, is the Paul C. Edwards Professor in the Department of Com munication. His office is in Wallenberg Hall, with Media X and SCIL, but across campus from Cor dura Hall. So what does being or not being an independent lab mean? Above all, he said, the value is practical. The labs administer multidisciplinary research, manage grant money and aren't bogged down with instruc tion and hiring decisions like departments are. However, they are not necessarily physical enti ties.

"New buildings are overestimated," he said, though he admits he likes Cordura Hall. "The question is, what level of administration and formalism is necessary to create interdisciplinarity?" In his view, you need a light rather than a heavy model, you need "stuff you can do, with boots on the ground." If you've got that, then a common building, while nice, is less important. "But faculty can't do that on their own," he added. "So we stake out a middle ground, try to create a hub for a virtual network, which is incre dibly valuable. The lighter you stay, the easier it is for institutions to come and go. If they have their own building, they never go."

In celebrating CSLI's existence, Peters and Wa sow particularly praised its internship program, funded by the university, which pairs undergradu ates with professors or postdocs over the summer. Bragging on Wasow's behalf, Peters said he has between three and five SymSys interns a year at the Computational Semantics Laboratory and they're all wonderful. For Perry, the independent labs "have to pro vide people with something they don't have from their departments, and that varies from depart ment to department." Some people need money; that was the case with the philosophers when CSLI started. Others need more space for them selves; still others need a venue where they can meet with researchers from other fields, which was the case with the people from SRI Interna tional.

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The present-day Wallenberg Hall occupies the last portion of the Quad repaired after the 1989 Loma Prieta earthquake. With a grant from two of the private Swedish Wallenberg foundations, supplemented by the university, the building was gutted and then equipped with offices and class rooms. Five of the classrooms are managed by SCIL, though they can be used by anyone who applies; they are showcases of what technology (both high and low) can do for learning.

In a marriage of genius and common sense, the five "flexible classrooms" allow students with laptops to use their own cursors to get onto big common screens, save their work on a common website, and work collectively on collapsible whiteboards and then photograph their results onto the website. This ability to employ technol ogy while simultaneously recapturing and nur tur ing the collaborative mood of the classroom is emblematic of the mission of SCIL, which was launched as an independent lab in 2002. The top floor of Wallenberg Hall provides space for some of the more remarkable endeavors of SCIL, CSLI or both.

Chief among them is the Learning in Informal and Formal Environments (LIFE) project, which in 2004 received a five-year, $2.5 million grant from the National Science Foundation (NSF). In conjunction with colleagues from the University of Washington and SRI International, researchers here are using technology to, in the words of Roy Pea, co-director of SCIL and a professor at the School of Education, "develop a science of learning." Reflecting the NSF's willingness to embrace multi-institutional and multidisciplinary projects, there are five PIs; Pea is one, and one of the re search "strand leaders" is Reeves. "We could never have done this without the independent labs," said Reeves, referring to the fact that the LIFE award was made to SCIL. "It combines neuroscience, anthropology, curriculum development and the humanities, and it's multi-campus. LIFE itself has spawned some 30 re search projects."

Also on Wallenberg's fourth floor—what Pea called the "mix-it-up space"—is another child of CSLI, Media X, where Reeves wears yet another of his hats. Media X brings together researchers, faculty members, students and industry design ers to study and develop interactive technology. Among the dozens of projects it has funded since 2002 is one led by Pea called "Science Educa tion Network of Sensors," one led by Reeves in vestigating how computer-supported stories can change people and one led by Wasow on "Learning English via Robust Conversation." Many of the Media X projects are funded by the industry, and in Washington, D.C. "We'll work out a mechanism," Bienenstock said, with the wisdom acquired from years of ad ministerative and policy work, both at Stanford and in Washington, D.C. "We'll face problems with the times, both catching up to innovations and anticipating solutions."

"Let me make something clear," he said. "Whenever you go down a new path, you're bound to encounter problems." The implication, of course, is that those who seek them will also encounter solutions. 

Arthur Bienenstock, dean of research and graduate policy, oversees the university's 13 independent labs.
Foreword

The NSF has made it very easy. I’ve got to hand it to them,” said Koseff.

The obvious problem, Antonakos pointed out, is that making departments ultimately responsible for what is supposed to be interdisciplinary in some way undermines the whole point. But bureaucratic arrangements can move only so quickly.

“The nature of science has changed,” the NIH’s Hahn said. “It’s time for us to catch up.”

WINTER 2006

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Extramural Research Administration. The president’s latest budget request, announced 6 Febru-
ary, leaves the NIH below the rate of inflation for research expenses for a fifth straight year. The NSF did better, however, as Bush promised to double the agency’s budget by 2016. His 2006 budget request, presented last month, would have funded the NSF at an annual rate of 7.9 percent over the previous year. The 2006 budget represented about a 2.4 percent increase over 2005.

Speaking weeks before the 2007 budget request was announced, Jean Feldman, of the NSF’s office of Extramural Research Administration, said she did not expect a qualitative change in funding priorities even if the budget were to remain flat. “A good proposal is a good proposal,” she said, referring to multidisciplinary grants, “but we’ll be able to support less.”

At the same time, the federal government is increasingly reluctant to reimburse universities for certain expenses. According to the Chronicle of Higher Education, which cited a study by the Council on Governmental Relations, research universities are losing several million dollars annually in unreimbursed costs. Overhead rates are not growing in tandem with research expenses. “What I see is just more unfunded mandates coming down the line,” Stanford’s Bienenstock told the publication in August.

For Jeff Koseff, a civil and environmental engineering professor whose funding generally comes from the NSF, a shrinking pot is the decisive impediment to multidisciplinary research. Koseff, co-director of the Stanford Institute for the Environment, said the NSF’s centers are sometimes less than what they appear to be, and he expressed optimism that the university to some degree will be able to make up the difference by funding adventurous multidisciplinary projects on its own.

But there’s a clear limit to what universities can do, he said, and the financial ones must be on the federal government. University presidents “need to go to the White House and make a statement and argue that [multidisciplinary environmental research] is important for the world,” he insisted. Big corpora-
tions have no time to make sure that their long-run interests are at stake (what happens when we run out of air, water, and oil, for example?), un-
doubtedly a substantial contributor, he said, and if they can be made to play by the same rules as the gov-
ernment regarding freedom of research and intel-
cultural property, then Koseff sees no problem.

Beyond the question of resources, there are impediments of a more scholarly sort. There is a place for large-scale multidisciplinary research, some scientists say, but there also are drawbacks.

Like a lot of people, not all scientists enjoy working with each other. As Antonakos and Feldman admit, they do not always at least not all the time. That Feldman and Koseff at the School of Medicine said that in fact the best research is usually conducted by indi-
viduals, the notion that large interdisciplinary centers such as his is the best place in the world for grants,” he said, and most of that money goes to individuals or small groups.

James Ferrell, a biochemist and chair of the Department of Molecular Pharmacology, also has his doubts, though, like Greenberg, he sees advan-
tages on both sides. “I’m ambivalent about interdisciplinary re-
search,” he said. “The upside is that it’s always the case that on the boundaries of different disci-
plines and subdisciplines there’s a chance to dis-
cover something that’s really new. When you’re in the middle, you discover incremental things. They’re important, but exciting things happen at interfaces. So the idea that funding agencies might want to fund interdisciplinary research is appealing to me.”

What can get lost, he said, is the intimacy of small-group research and the possibilities it al-

ows. A research director and a postdoc with the same sort of training can easily shift direction, improvise, step around a problem as its contours change: large interdisciplinary groups usually do not.

Yet Ferrell buys into multidisciplinary research sufficiently that he recently applied for a large con-
sortium grant from the NIH in systems biology. “My bet is that if we had some people with expert knowledge in multiple disciplines, people who don’t have to worry about expenses versus budgeting, that would glue together the discipline and make us more effective, sort of like someone with an M.D. and a Ph.D.,” said Ferrell, who himself has both degrees. “People who have real expertise in real physical and biological science are a real hope for the future. I don’t really think you can be a sophisticated biologist in the physical sci-
ences. You can train people to do both.”

Both NIH and NSF are trying to be progress-
ive, but it’s hard because nobody’s got a great idea on how to separate a crackpot experiment from a real experiment,” he said. “It’s easy to tell if a project is definitely going to work—that’s incremental science. It’s harder to come up with ways to fund imaginative science.”

At times, multidisciplinary research at Stan-
ford comes to resemble an ensemble performance. McAdams, for example, is also a co-principal investigator in interdisciplinary centers which study the interaction of hu-
man and primate languages, and he also works with Ferrell. In October, McAdams won what he ear-
er described as “a pretty darn big grant”— an $18 million Department of Energy microbiol-
ology award comprising a dozen researchers at six institutions. “Somebody has to take the bull by the horns,” said the former Lockheed physicist, whose grant-writing ability has aided many colle-
agues, including his wife, molecular biologist Lucy Shapiro.

If money and habits can get in the way of changes in research and funding practices, an even greater problem is the disjuncture between categories of knowledge and the structures that literally house those categories.

“Since the genome revolution, we’ve had a huge need for computer people, for cross-talk,” said Greenberg of the Medical School.

Funding

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therefore, there is a scientific need for new in-
vestigator types who can bridge the gap between disciplines, but there is also a financial need for such individuals. "That’s it."

Weissman has submitted collaborative proposals, each one a subset of one large project, each one with its own prin-
cipal investigator and budget. “The NSF will have a far easier road than the NIH because we’ve already solved a lot of these problems,” said Hahn’s counterpart at the NSF, Jean Feld-
am. “And we’ll continue down that road.”

While the agency now calls such collaborative investigators or co-principal investigators will become multiple principal inves-
tigators, for example. “But in terms of sub-
stance and in terms of how it allows us to support multidisciplinary research, we’re already doing it a lot.”

One Stanford researcher who fully agrees with Feldman is Jeff Koseff, a professor of civil and environmental engi-
nering, director of the Stanford Institute for the Environment, and long-time advocate and pro-
ponent of interdisciplinary scientific research.

“The NSF has made it very easy,” he said. “I’ve got to hand it to them.”

Senior Associate Dean Eleanor Anton-
akos, also at the Engineering School, explained that adjusting a grant’s man-
gagement to the facts of divided research responsibility is not difficult. The lump sum is divided into subcontracts, with credit apportioned to each one. If one subcontractor fails to deliver the goods, the corresponding department pays the price. The NSF, meanwhile, stays out of the way.

“The obvious problem, Antonakos pointed out, is that making departments ultimately responsible for what is supposed to be interdisciplinary in some way undermines the whole point. But bureaucratic arrangements can move only so quickly.

“The nature of science has changed,” the NIH’s Hahn said. “It’s time for us to catch up.”
From left: Historian Estelle Freedman was a founder of Feminist Studies; English Professor Andrea Lunsford served as director during the 2004-05 academic year; Linguist Penny Eckert is the current director.

Feminist Studies: ‘Making connections’

A few years ago, when the feminist studies major was coming up for its periodic renewal, someone in a position of authority asked the program’s director why Stanford even needed such a thing. Why feminist studies? Why an interdisciplinary program at all?

The program’s founder, historian Estelle Freedman, was not present at that conversation, but she has an answer.

“Look at the world,” said Freedman, the Edgar E. Robinson Professor in United States History. “Read the newspaper through the lens of gender. It’s everywhere. Internationally, look at Iraq, look at rape, look at birth control. Domestically, the hot political issues of the day are gay marriage and abortion. Students, no matter what they end up doing in life, have to be educated.”

We wanted to be at the edge, we wanted to apply a critical, analytical perspective and explore everything through the lens of feminism,” she added, referring to the program’s foundations.

What is called the Program in Feminist Studies at Stanford may be called something else at other universities. Some of the women’s studies programs dating back to the 1970s have changed their names in recent years, usually adding “gender.”

Program Director Penny Eckert, a linguist, is proud of the name here. “Feminism implies critique,” she says. “Gender implies a more agnostic approach.”

It also implies crossing disciplines, or at least redefining them. For Myra Strober, a labor economist and a founding director of Stanford’s Institute for Research on Women (IRWG), feminism is multidisciplinary, not interdisciplinary. “Gender implies critique,” she says. “Feminism implies critique.”

Her training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics. One day, however, she came across a paper by another economist, Julie Nelson, who seemed to impossible to Strober, whose disciplinary training was deeply rooted in economics.