

January 15, 2008

To: Ann Arvin, Vice Provost and Dean of Research

From: Roy Pea, Co-Director, H-STAR
Byron Reeves, Co-Director, H-STAR

Subject: Annual Report for H-STAR for FY 2006–2007¹
(Response to memo of December 5, 2007)

Prepared by: Keith Devlin, H-STAR Executive Committee

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¹ Some confidential personnel and financial details have been deleted from this posted version.



1. Overview

H-STAR is an interdisciplinary research institute, with independent lab status. It includes two research centers, CSLI and SCIL, each with its own faculty director, and runs an industry partners program, Media X.

H-STAR was created in FY06 by merging CSLI and SCIL. The rationale for this merger was threefold:

1. **When you look just beneath the surface, the research interests of both CSLI and SCIL have much in common.** Both focus on cognition, learning, and information flow, and on technology as it relates to all three. The big questions in this area can no longer be addressed successfully within any one discipline, nor even within centers such as CSLI or SCIL, whose interdisciplinary foci are simply not sufficiently broad. H-STAR has enough breadth to encourage and support interdisciplinary research that can have major impact, and to secure external funding to support such research.
2. **Media X had been created in 2002 as a joint CSLI–SCIL industry partners program.** The two centers joined forces in this initiative in recognition of the fact that both would be seeking memberships from many of the same companies, and (in this case) cooperation would be better for all than competition. (H-STAR and Media X have the same research spans; H-STAR works from an academic perspective, Media X has an industry focus.)
3. **In order to eliminate duplication of administrative work, and thereby achieve (significant) cost savings,** in 2003 CSLI and SCIL combined their administrative support units into a single Shared Services Unit.

The wisdom of creating Media X and H-STAR is indicated by the rapid growth of both the Media X Industry Partners Program and the H-STAR University Partners Program.

A total of 35 Academic Council faculty carry out research for which a major and essential locus is H-STAR, and an additional 25 faculty are actively involved in H-STAR activities. H-STAR also provided the research base for 42 (non-faculty) researchers who are working on projects led by faculty PIs.

H-STAR researchers produced (approximately)² 439 research papers and published 11 books. A complete list is provided as an appendix to this report.

H-STAR employs 41 staff (academic and non-academic), of which 8 employees are performing shared administrative support functions, such as research administration, financial, human resources, and building management in three locations, Wallenberg Hall, Cordura Hall, and Nora Suppes Hall. In FY07, under academic staff, we

² The actual totals may be higher, since a number of H-STAR faculty/researchers did not submit their lists by the deadline for preparing this report; on the other hand, some papers were jointly authored by two or more H-STAR researchers and those are listed more than once. The figures quoted are calculated directly from the list provided.

supported 38 graduate students, working mostly for SCIL projects.

H-STAR Institute Headcount				
	FY06	FY07	FY08	FY09 (est)
Core Faculty	35	35	35	35
Affiliated Faculty	25	25	25	25
Total Faculty	60	60	60	60
Academic Staff: Sr. Research Scholar, Research Associate, Visiting Professor	18	15	17	18
Staff	25	31	22	23
Post-docs	1	3	2	2
RA	40	38	49	49
TA				
Total Staff & Students	84	87	90	92

The total volume for federal and non-federal sponsored research in H-STAR in FY07 was \$5M, of which \$1.5M was F&A (indirect cost charges).

2. H-STAR mission

H-STAR’s primary research focus is on people and technology — how people use technology, how to better design technology to make it more usable (and more competitive in the marketplace), how technology affects people’s lives, and the innovative use of technologies in research, education, art, business, commerce, entertainment, communication, national security, and other sectors of society. H-STAR is also the locus of basic research into the nature of information processing by humans and machines. Among the large, complex, global problems that are at the heart of the H-STAR research agendas are:

- **Reducing complexity of technology** to enable its universal and creative uses for work, learning and other vital sectors of life
- **Closing digital divides** across class, race, gender, age, languages and nations, so that access to and fluencies with technologies can provide equal opportunities to learn and work productively for personal and societal well-being
- **Accelerating innovation** in the creation and diffusion of products and services that better identify and meet human needs
- **Solving security and trust problems** of computing, communications, and information systems at home, work and in governmental affairs
- **Ensuring pervasive safety and health** of people over the lifespan with human-centered technology innovations

3. H-STAR mission and the Stanford Challenge

Of the eight specific targets listed in the Stanford Challenge, no less than four are highly central to the activities of H-STAR:

1. *International Initiative*. See Section 7 of this report for the list of H-STAR's extensive activities in the international arena.
2. *Multidisciplinary Research Across the University*. H-STAR's mission is to promote and support interdisciplinary research campus-wide. Over the past four years, H-STAR's Media X program has used income from industry partnership fees to fund around \$2.5M of (predominantly interdisciplinary) faculty research across five Schools.
3. *Improving K-12 Education*. SCIL is the only organizational unit on campus focusing on the multi-disciplinary core of theory, research, and methods that are needed for world-class work on the central topics in K-12 learning sciences and technology design. See also section 8a for a description of the NSF funded LIFE Center's research on these issues.
4. *Extending the Renaissance in Undergraduate Education*. While the mission of H-STAR is university research, the H-STAR faculty are among campus leaders in undergraduate education. Of particular note, the Symbolic Systems Program, an initiative of CSLI, continues to be one of the most popular and, measured in terms of its graduates, most successful undergraduate majors on campus.

4. How H-STAR works

H-STAR provides affiliated Stanford faculty and researchers with office space, physical and "virtual" meeting rooms (via IP videoconferencing), lecture rooms, lab space, seminars and lectures, printing and copying facilities, secretarial services, the services of administrative, financial and technical support personnel, assistance with identifying and securing funding for research, and, through the Media X program, contacts with industries relevant to their research pursuits. Most of the faculty in H-STAR are in social science and humanities-affiliated departments (rather than engineering and research-equipment intensive disciplines such as physics), which do not have the extensive infrastructure needed to support the interdisciplinary research projects they wish to pursue.

The primary means for funding H-STAR research is external grants, secured by the faculty and researchers. The administrative and financial support staff of H-STAR provides help and support for faculty in proposal preparation and grant management. H-STAR also takes the initiative to secure large-scale, institute-level research funding that provides support to many institute faculty, when the opportunity arises. For example, we are currently initiating the fourth year of the LIFE Center (Learning in Informal and Formal Environments), a \$25 million, five-year grant which established one of the first three national Science of Learning Centers (SLCs) in partnership with

the University of Washington and SRI International.

H-STAR supports and funds activities across the campus, but the main loci of research are in Wallenberg, Cordura, and Nora Suppes Halls. H-STAR has its main administrative offices in Wallenberg Hall and Cordura Hall. SCIL is housed in Wallenberg Hall, CSLI occupies all of Cordura Hall and one half of the adjacent Nora Suppes Hall. Media X has two offices and an administrative staff workstation in Wallenberg Hall. An open area of the top floor of Wallenberg Hall is currently used by Media X for housing some research projects (for limited periods of time). In addition, CSLI Publications has some storage space in Pine Hall.

5. Major units within H-STAR

5a. CSLI. As a major center within H-STAR, CSLI promotes and supports basic research in language, communication, interaction, reasoning, and computation, broadly construed, with a strong focus on language technologies, including natural language processing, voice recognition systems, interactive publishing, machine learning, computer agents, language translation systems, and ubiquitous computing environments. Among the activities designed to promote increased interaction among CSLI researchers, CSLI organizes a bi-monthly CogLunch speaker series and CSLI collaborates with EPGY (Educational Programs for Gifted Youth) to organize a weekly tea for faculty, researchers, students and staff.

5b. SCIL. SCIL conducts scholarly research to advance the science, technology and practice of teaching and learning. It has a strong focus on the multi-disciplinary core of theory, research, and methods that are needed for world-class work on the central topics in learning sciences and technology design. Recognizing that the processes of knowledge creation, discovery and communication in the disciplines make continually deeper uses of technologies that are transforming the very nature of inquiry and scholarly practice, SCIL seeks to make transformative advances in learning and teaching with technologies by bringing together disciplinary faculty to work with experts in education and the sciences of learning as well as with leading designers and technologists.

5c. Media X. H-STAR's industry partnership program, Media X, is a self-funded program that seeds campus-wide research and coordinates industry interest. The program has included 30 industry partners. The program supports and funds research initiatives on domains involving people and technology, rather than by discipline. Since the program began in 2001, Media X has supported more than \$2.8M of Stanford research, spread across over 80 Stanford faculty PIs, receiving over 200 proposals, representing faculty from all seven schools, and involving over 100 graduate students. Research funding from Media X has been in the form of seed grants to support early investigation of promising ideas that show likelihood of leading to larger projects. Media X research funds are open to all researchers in the Stanford community, and preference is given to novel interdisciplinary collaborations. Many of these "seed" funded projects leverage large federal and foundation grants (bringing faculty and student work closer to societal impact through commercial diffusion.) A significant

number have led to new interdisciplinary proposals for federal and foundation grants that build on the Media X seed projects.

6. Faculty and researchers in H-STAR

6a. Core faculty members of H-STAR

The following 35 Academic Council faculty carry out research for which a major and essential locus is H-STAR:

1. Anttila, Arto (Department of Linguistics)
2. Bailenson, Jeremy, (Department of Communication)
3. Bresnan, Joan (Department of Linguistics)
4. Barron, Brigid (School of Education)
5. Blacker, Chip (Institute for International Studies)
6. Boroditsky, Lera (Department of Psychology)
7. Clark, Herbert (Department of Psychology)
8. Eckert, Penny (Department of Linguistics)
9. Etchemendy, John (Department of Philosophy and Provost)
10. Goldman, Shelley (School of Education)
11. Hagstrom, Stig (Materials Science and Technology)
12. Hakuta, Kenji (School of Education)
13. Heller, Craig (Department of Biology)
14. Klemmer, Scott (Department of Computer Science)
15. Leifer, Larry (Department of Mechanical Engineering)
16. Manning, Chris (Departments of Linguistics and Computer Science)
17. Nass, Cliff (Department of Communication)
18. Nasir, Na'ilah (School of Education)
19. Pauly, Marc (Department of Philosophy)
20. Pea, Roy (School of Education)
21. Perez-Granados, Deanne (School of Education)
22. Perry, John (Department of Philosophy)
23. Peters, Stanley (Department of Linguistics)
24. Reeves, Byron (Department of Communication)
25. Rickford, John (Department of Linguistics)
26. Sag, Ivan (Department of Linguistics)
27. Schwartz, Daniel (School of Education)
28. Sheppard, Sheri D. (Department of Mechanical Engineering)
29. Suppes, Pat (Department of Philosophy, Emeritus)
30. Valdes, Guadalupe (School of Education)
31. Wagner, Anthony (Department of Psychology)
32. Wineburg, Sam (School of Education)
33. Winograd, Terry (Department of Computer Science)
34. Van Benthem, Johan (Department of Philosophy)
35. Wasow, Tom (Department of Linguistics)

6b. Affiliated Stanford Faculty

The following additional 25 Academic Council faculty are affiliated with H-STAR, and participate in H-STAR programs. Those that have received research funding from H-STAR (mostly through Media X) are marked with an asterisk.

1. Altman, Russ (School of Medicine)*
2. Bratman, Michael (Department of Philosophy)
3. Carstensen, Laura (Department of Psychology)
4. Chafe, Chris (CCMRA)*
5. Clark, Eve (Department of Linguistics)*

6. Cutkosky, Mark (Department of Mechanical Engineering)*
7. El Gamal, Abbas (Department of Electrical Engineering)*
8. Guibas, Leonidas (Department of Computer Science)*
9. Hinds, Pamela (Management Science and Engineering)*
10. Iyengar, Shanto (Department of Communication)*
11. Jurafsky, Dan (Department of Linguistics)*
12. Kay, Martin (Department of Linguistics)*
13. Koller, Daphne (Department of Computer Science)
14. Krawinkler, Helmut (School of Engineering)*
15. Levoy, Marc (Department of Computer Science)*
16. Lewenstein, Marion (Emeritus, Department of Communication)
17. McClelland, Jay (Department of Psychology)
18. McDermott, Ray (School of Education)
19. Mints, Grigori (Department of Philosophy)
20. Pratt, Vaughan (Department of Computer Science)
21. Ramscar, Michael (Department of Psychology)
22. Salisbury, Kenneth (Departments of Computer Science and Surgery)*
23. Taylor, Ken (Department of Philosophy)
24. Tomlin, Claire (Department of Aeronautics and Astronautics)*
25. Wandell, Brian (Department of Psychology)

6c. Stanford researchers in H-STAR

The following 42 Stanford and Stanford associated researchers have a significant affiliation with H-STAR (an asterisk indicates that the researcher has received funding from H-STAR, mostly through Media X):

1. Barbagli, Federico (Computer Science)*
2. Barker-Plummer, David (CSLI)
3. Bender, Emily (University of Washington & CSLI)*
4. Berger, Eric (Computer Science)*
5. Bratt, Elizabeth Owen (CSLI)
6. Chen, Helen (SCIL)
7. Chin, Doris (SCIL)
8. Dev, Parvati (SUMMIT)*
9. Devlin, Keith (CSLI and Consulting Prof. in Mathematics)
10. Ehlen, Patrick (CSLI)
11. Fern, Veronica (SCIL)
12. Flickinger, Daniel (CSLI)*
13. Fogg, B.J. (CSLI and Consulting Prof. in Computer Science)
14. Fong, Vivienne (Department of Linguistics)*
15. Frampton, Matthew (SCIL)
16. Fruchter, Renate (Engineering)*
17. Go, Janet (SCIL)*
18. Grossman, David (Center for Design Research)*
19. Guimaraes, Marc Perreau (CSLI)
20. Harbott, Lene (EPGY)
21. Hayes-Roth, Barbara (Consulting Prof. in Computer Science)
22. Huang, Camillan (SCIL)
23. Israel, David (SRI and Consulting Prof. in Philosophy)
24. Kaplan, Ron (PARC and Consulting Prof. in Linguistics)
25. Kunz, John (Civil and Environmental Engineering)*
26. Langley, Pat (CSLI and Consulting Prof. in Symbolic Systems)*
27. Levitt, Raymond (Civil and Environmental Engineering)*
28. Macken, Betsy (EPGY)
29. Martin, Caitlin (SCIL)*
30. Nodelman, Uri (CSLI)

31. Perrault, Ray (SRI and Consulting Prof. in Philosophy)
32. Pugh, Carla (SUMMIT)*
33. Purver, Matthew (CSLI)
34. Rosen, Joseph (SCIL)*
35. Rosenberg, Duska (CSLI and Royal Holloway University, London)
36. Van der Loos, H.F. Machiel (CDR)*
37. Varma, Sashank (SCIL)*
38. Verplank, William (Computer Science and CCRMA)*
39. Warlick, Alicia (CSLI)
40. Wellings, Paula (SCIL)*
41. Wong, Dik Kin (CSLI)
42. Zalta, Edward (CSLI and Consulting Prof. in Philosophy)

Much of the research carried out at H-STAR is done by doctoral level researchers, postdocs, graduate students, and academic and industrial visitors who are based in Wallenberg, Cordura, or Nora Suppes Hall.

7. International activity

Through CSLI and SCIL, H-STAR has a long history of international activities, with ongoing academic and industrial research collaborations throughout Europe and Asia. The most significant today are listed below:

7a. WGLN II - Wallenberg Global Learning Network

The Wallenberg Global Learning Network II (WGLN II) is a collaborative program launched in late 2004 between Stanford and Sweden, and is open for participation by all Swedish universities. WGLN I, the predecessor to WGLN II, was established in 1999 as part of a larger gift from the Knut and Alice Wallenberg Foundation, which helped create Wallenberg Hall's advanced resource classrooms and research space. The mission of WGLN II (<http://www.wgln.org/>) is to help students achieve better learning outcomes, to support faculty investigators in producing new knowledge for best learning practices, and to develop pedagogic and technical solutions suitable for innovative use in a variety of university and pre-college settings.

To achieve this mission, WGLN II has established a competitive faculty grants program led by an impartial faculty review panel from academic institutions in Sweden and the U.S. Funded projects represent close collaborations between Swedish and Stanford faculty with the goal of improving teaching and learning. During 2007, a total of \$1,752,531 in grant funds was awarded, split roughly equally between Stanford and Sweden. This amount comprised 4 grants in Medicine/Biological Science, 2 in Engineering/Computer Science/Physics, 1 in Humanities, and 2 in Pre-college Education.

The WGLN II Board of Directors includes Stanford Professor of Biological Sciences H. Craig Heller as Chair, Stanford Dean of the School of Education Deborah Stipek, former Stanford Dean of Research, Arthur Bienenstock; Stanford President and Professor Emeritus Donald Kennedy, and Dr. Hakan Mogren, Dr. Bjorn Svedberg and Mr. Johan Stålhand of Sweden.

7b. The Wallenberg Research Link

Formerly led by Professor Emeritus Stig Hagstrom, and now by special assistant to Stanford's president for federal research policy (and former Dean of Research), Arthur Bienenstock, the Wallenberg Research Link serves as a contact center to initiate and support contacts with Swedish researchers, Swedish students and their counterparts at Stanford.

7c. Finland

For the past three years we have developed several collaboration initiatives with Finnish universities and research organizations:

Tekes: The governmental research/industry organization Tekes has entered into a formal partnership with H-STAR. As part of the partnership agreement, a number of Finnish university researchers will visit Stanford each year, to a current maximum of 36 person-months for 2007-08, with the intention of building the program to provide for visitors totaling 60 person-months each year. In addition, a number of Stanford faculty are expected to make visits to Finland during the year. Tekes is providing the funds to cover all aspects of the program.

CICERO: Since 2005, we have been collaborating with the Finnish university educational research consortium CICERO (a multi-university organization having a similar research focus as SCIL). We held a joint SCIL–CICERO conference in fall 2005 (over 20 faculty), and since then have had a number of conference events and planning meetings in Finland and at Stanford, with the view to developing joint research projects, some of which are already underway.

7d. Denmark

In fall 2007, we entered a formal partnership agreement with DASTI, the ministry of the Danish Government, which is funding an H-STAR visitor program analogous to the TEKES program from Finland. Funding provides for two visitors for the first year period and a Media X Affiliate Partner fee. Visiting researchers are selected from a Danish competition and in terms of interdisciplinary research match to H-STAR faculty.

7e. Germany

Several H-STAR researchers have strong links to colleagues at German universities. For several years, CSLI had a major research collaboration with a consortium of German universities — the *Verbmobil* Project — funded by the DFG. *LinGO*, the project that constituted CSLI's part of *Verbmobil*, has continued, and still involves German collaborators. SCIL faculty have also co-developed and participated in an international series of research workshops, funded by NSF in the USA and the DFG in Germany, on network-supported collaborative learning, which have led to joint publications and enriched mutual influences across a knowledge network of 10 American universities and 7 German universities (University of Cologne, University of Münster, University of Tübingen, Knowledge Media Research Center-Tübingen, University of Mannheim, University of Duisburg-Essen, University of Freiburg). One new journal, the *International Journal of Computer-Supported Collaborative Learning* (iJCSCL, published by Springer/Kluwer) was initiated as a result of these

developments, and H-STAR Co-Director Roy Pea is on its Editorial Board. In addition, during the last few years, Professor of Computer Science Wolfgang Effelsberg, from Germany's Mannheim University, spent a half-year sabbatical at SCIL, and was followed by postdoctoral fellow Dirk Farin and doctoral candidates Nicolai Scheele and Anja Wessels – all contributing actively to ongoing programs of H-STAR research. Finally, Roy has been collaborating in 2007 with Professors Friedrich Hesse and Carmen Zahn of the large DFG-funded Knowledge Media

7f. Norway

CSLI has had research collaborations with academics in Norway for many years. Dan Flickinger and Stephan Oepen have appointments at CSLI and in Norway, and some Norwegian funding has been provided for work carried out at CSLI.

7g. Netherlands

- Philips Research Labs in the Netherlands joined Media X as an affiliate in 2004.
- For a number of years, CSLI has had a loose but ongoing research partnership with the Institute for Logic, Language, and Computation at the University of Amsterdam, involving occasional visits in both directions.
- In 2005, CSLI formed a new partnership with the Human-Computer Studies Laboratory at the University of Amsterdam.

7h. Ireland

Discussions were begun in 2005 with several groups in Ireland (Enterprise Ireland, the Investment and Development Agency of Ireland, Science Foundation Ireland, several Irish universities, and the leaders of several multinational high tech companies with large facilities in Ireland) with a view to creating an Ireland–Stanford Link, modeled on the Edinburgh Link. Current discussions envisage a five-year program (possibly renewable) funded by SFI at a level of EUR 25M a year. There are already a small number of research collaborations between H-STAR researchers and colleagues at Irish universities.

7i. Australia and New Zealand

The Spoken Syntax Lab in CSLI has formal collaboration links with the ICT Human Research Lab in Brisbane, Australia and the ONZE Lab in Christchurch, New Zealand.

7j. Japan

- Every year for the past several years, one or more researchers from Japanese universities and companies have spent the year visiting CSLI.
- Over the past ten years, several Japanese companies have partnered with, Media X (e.g., OMRON, NTT, ATR, Fuji-Xerox, NHK, KDDI, Toyota, e-Zuka, Matsushita, Yamatake, DNP).
- Through Media X, several Stanford faculty members are collaborating with Japanese companies.
- Some H-STAR affiliated faculty members are collaborating with researchers in Japanese universities and research institutions.

- Following Roy Pea's visits and keynote addresses in Japan during November 2006, a subsequent visit to Stanford by Keio University Vice President Jun Murai has led to a gift of approximately \$150K of computer hardware and displays to SCIL to establish a Stanford University node in the Japanese government funded project called "Global Studio" – uses of a high-resolution broadband Internet teleconferencing solution for fostering international discussions to promote a creative and innovative global society. A recent Global Studio event linked together sites and academic talks from Stanford, Tokyo (Keio University), and Beijing (Tsinghua University) with public audience participation at the Tokyo site. The Global Studio facility at Stanford has been developed to be 'mobile' (on carts) – and can be setup anywhere on campus that faculty or university leadership would like to establish a broadband interactive presence with global academic institutions and faculty at other Global Studio sites (<http://www.dmc.keio.ac.jp/en/studio/globalstudio.html>).

7k. Taiwan

SCIL developed a partnership with the Center for Learning Sciences and Technology at Taiwan's National Central University, invited by Center Director Professor Tak-Wai Chen and a delegation to Stanford including Taiwan's Deputy Director of the Ministry of Education. SCIL Co-Director Roy Pea has advised Center Director Tak Wai-Chen in his formation of the G1:1 initiative, in which SCIL is a partner. G1:1 is a global one-to-one computer to learner initiative with participation for over twenty countries, a devoted website to projects, results, tools and datasets, and a sponsor of over about a dozen conferences on the subject with professional societies such as IEEE. The aim is developing global collaborative research models on 1:1 personal (and increasingly mobile) computer learning (<http://www.g1on1.org/>). This partnership spawned the international conference on computer-supported collaborative learning (CSCL-05) in June 2005 at the Taiwan campus, with strong Stanford representation in leadership and paper presentations.

8. Research Programs within H-STAR

8a. *The LIFE Center*

After its third full year, the LIFE Center has underway over 40 different studies of learning from infancy through adulthood, incorporating diverse methodologies such as brain imaging, comparative experimentation, ethnographic inquiry and virtual reality. Stanford faculty leading LIFE projects include LIFE leadership group Professors Brigid Barron, Roy Pea (Stanford Co-PI), Byron Reeves, and Daniel Schwartz, and contributing faculty, Professors Jeremy Bailenson, Shelley Goldman, Na'ilah Nasir, Anthony Wagner, and Vinod Menon. Over twenty doctoral students, postdocs and staff are involved in LIFE Center research work each year as well. The third-year budget for this project in FY07 was \$1,327,552.

The LIFE Center's projects are grouped into three strands of inquiry: informal learning, implicit learning and the brain, and designs for formal learning and beyond. Historically these three areas have operated independently of one another. LIFE's purpose is to identify and investigate key research questions that draw on cognitive, developmental, neurobiological and socio-cultural theories and their related methodologies to advance the sciences of human learning and guide the design of learning technologies and environments (see <http://life-slc.org>). Some specific LIFE Center projects carried out recently include:

Informal Learning – “Technology Fluency Development in Peer and Home Contexts” is examining the content and contexts (e.g., peer and family) of male and female middle-school students' learning in technological activities outside of school and how they contribute to the establishment of learning ecologies that span out-of-school and school-based learning.

Implicit Learning and the Brain – “Linguistic & Social Factors in Foreign Language in Infancy” is investigating whether brief periods of natural exposure to non-native language (Spanish) lead to phonetic and word learning and also exploring the role of social interaction in such learning.

Designs For Formal Learning and Beyond – “Studies of Instruction that Emphasize Efficiency vs. Innovation” is focusing on the debate over direct instruction as the best teaching method. The study will look at potential flaws in thinking about learning, transfer and assessment and advance an alternative approach called “Preparation for Future Learning.”

During the past year, LIFE Center projects have been directed to bringing interdisciplinary teams together in efforts across these three strands to contribute to deepening our understanding of *multiple pathways to the development of expertise*. The five initiatives in which LIFE projects are organized have distinctive thematic emphases: (1) New views of expertise, transfer and assessment; (2) Learning within and across settings; (3) Roles of interactivity in learning; (4) Issues of self, other and identity in development; and (5) Language, bilingualism and representational systems.

8b. SemLab

Professor Stanley Peters' Semantics Laboratory focuses on projects that involve semantics, at the intersection of linguistics and computer science. A unifying theme in the lab's research is an emphasis on the role of context in determining meaning. Lab researchers are particularly interested in theoretical models of communication, language, dialogue, computation, and inference that take into account the context in which these activities are occurring. The lab also has a strong record in applying research results to practical applications and real-world problems. Current or recent projects have been in the areas of information retrieval, natural language processing, dialogue systems, machine translation, programming languages, and cooperating

software agents. The lab's research budget for FY07 was approximately \$1.2M, supporting the research of 5 postdoctoral research staff and 2 graduate students.

8c. *The Openproof Project*

Headed by University Provost John Etchemendy, the Openproof project is developing a system to manage and record multimodal reasoning in a structured way. Project researchers are pursuing commercial applications in industries where designs and problem solutions are created, assessed, communicated, and recorded in collaborative settings. The project currently has a fulltime staff of two researchers, supported by two graduate students. Its budget for FY07 was \$350,000.

8d. *Brain Research Group*

This project is led by Professor Patrick Suppes, the budget for this project in FY07 was \$377,000. During the year, the project had two full-time researchers, one visiting professor, one postdoctoral student, and one graduate student.

8e. *Spoken Syntax Lab*

Led by Professors Joan Bresnan and Tom Wasow, and located in Cordura Hall, the Spoken Syntax Lab provides resources for collaborative work on syntax using multiple sources of evidence and modern statistical models. The Lab is developing repositories of aligned phonetic, parsed, and contextualized data as well as advanced search and analysis tools. The lab currently has four Academic Council faculty members (Bresnan, Anttila, Rickford, and Wasow), one lecturer (Fong), and five students. The lab has been awarded an NSF grant of \$250,000 per year for a three year period starting in 2007.

8f. *Stanford Encyclopedia of Philosophy*

Sponsored by Philosophy Professor John Perry, the SEP was launched with the aid of a \$150,000 NEH grant and a \$190,000 Hewlett Foundation grant. Perry and CSLI Researcher Dr. Edward N. Zalta (who runs the project on a day-to-day basis) have developed a long-term funding plan that moves the project off short term grants to a protected endowment for future years. To raise a \$4.125 million endowment, Stanford University is raising \$1.125 million and world-wide library organizations are raising \$3 million. So far, the world- wide library community has pledged \$1.5 million, and the National Endowment for the Humanities has offered the SEP \$500,000 in funds to match the library contributions.

8g. *LILAC (Logic, Information, Language, Interaction, Communication, Cognition)*

Led by a faculty group comprising Johan van Benthem, Marc Pauly, John Perry, Stanley Peters, and Tom Wasow, this highly multidisciplinary research collaboration was formed early in 2006 to investigate basic scientific questions about information and interaction. The group includes faculty with expertise and interests in linguistics, mathematics, philosophy, computer science, psychology, economics, sociology, and neuroscience. LILAC has a regular weekly research meeting and is developing a long range interdisciplinary research agenda and an associated (external) funding plan.

LILAC collaborates closely with the Institute for Logic, Language and Computation (ILLC) at the University of Amsterdam in the Netherlands.

8h. Computational Learning Laboratory

Directed by CSLI Researcher Dr. Pat Langley, the Computational Learning Laboratory is playing the lead role in a DARPA project on the transfer of learned knowledge in cognitive systems. The research focuses on developing new computational techniques that utilize knowledge acquired in one context to handle new situations that are related but superficially different from the original ones. The research team includes eight institutions and funding of almost \$9M for a period of three years. The CSLI subteam includes three senior research scientists, one postdoctoral researcher, and three graduate students.

9. Community outreach

The Summer Institute In Wallenberg Hall

In July of 2007 we held the third Summer Institute, a three-week program for researchers and practitioners to explore the important issues at the crossroads of learning, physical space and technology. The purpose of the Institute was public outreach and education, as well as the development of new contacts and collaborative relationships. The Institute consisted of four courses:

Aug 1-3	Building Effective Virtual Teams, directed by Chuck House (18 attendants)
Aug 6-10	Using VideoGames in Education, directed by Keith Devlin (17 attendants)
Aug 13-14	Learning Space Design, directed by Dan Gilbert (23 attendants)
Aug 16-17	Using e-Portfolios for Teaching, Learning and Assessment, directed by Helen Chen (28 attendants)

Research with local schools and teacher preparation

H-STAR faculty and students, particularly those affiliated with SCIL, are active in conducting their research on learning, teaching, and new technologies with partnerships that take them into public schools from elementary to high school, from Redwood City and East Palo Alto to San Francisco and beyond, to charter schools, as well as in after-school clubs and community centers. SCIL-affiliated faculty are also actively involved in contributing to SUSE's teacher preparation programs, the Teachers for a New Era initiative jointly funded by the Carnegie Corporation and the President's Office, and is engaged in planning and pursuing the campus-wide "K-12 Initiative."

10. Wallenberg Hall

H-STAR has principal responsibility for the research and research-related activities that take place in Wallenberg Hall, a facility funded (by the Swedish Wallenberg Foundation), designed and built explicitly to enable research into different forms of education, taking advantage of new technologies and flexible, novel architectural features, and paying particular attention to international educational initiatives and

collaborations. Wallenberg Hall has (thus) become a locus of activity for at least three distinct constituencies: faculty and students at Stanford University; researchers located at Stanford, in Sweden, and beyond (e.g., SCIL-affiliated faculty, Media X, LIFE Center collaborators, and WGLN projects); and a global array of industrial, commercial and academic enterprises with interest in the intersections between Silicon Valley and Stanford. ICT serves both as an H-STAR research medium, and to mediate teaching across states and international boundaries.

For **faculty and students at Stanford**, Wallenberg Hall is a place to explore and use advanced technologies for teaching and learning. For up to 12 hours most days, teachers and students take advantage of Wallenberg's state-of-the-art spaces to enhance learning in a multitude of ways. Video conferencing, in-class laptops, tablet PCs, Stanford-developed collaborative iRoom software and DIVER Video Tools, reconfigurable furnishings and multiple Webster "interactive" boards provide some of the tools and both physical and representational infrastructure in the rooms that helps make good teaching even better.

Since September 2002, Wallenberg Hall has played host to more than 400 regular Stanford courses in more than 30 academic disciplines as well as to the University's Program in Writing and Rhetoric. For many Stanford faculty and students, Wallenberg Hall has become an indispensable tool for doing the work of education better, faster, and in newly transformative ways than is possible elsewhere on campus. The additional benefit of these users from the perspective of the research and development community is that they demand that the technology work *now*, and that it work to support learning activities.

For **researchers at Stanford, Sweden, and elsewhere**, Wallenberg Hall is a workplace and a laboratory for explorations in the application of technology to learning. On the fourth floor of Wallenberg Hall, H-STAR provides support to faculty-led research projects funded by the NSF, WGLN and other funding agencies such as the Mellon Foundation, National Endowment for the Humanities, and other private foundations and corporate sponsors.

For **industrial, commercial, and academic enterprises** with interests in education and technology, Wallenberg Hall provides a gateway to Stanford's remarkable resources as a world-class university located in the world's most fruitful incubator of technological innovation. We continue to attract globally distributed visitors to learn about our ideas, methods, findings, technologies and teaching. These visits are consequential in many ways: (1) as an efficient method for communicating to colleagues and decision-makers results from the research and the teaching that we support; (2) as providing potential collaborators for multi-institutional and international projects; and (3) in providing Stanford researchers with opportunities for scholarly exchanges about current thinking about technology and education in a concrete context of demonstrations. We continue to find Wallenberg Hall to be a vibrant hub for

attracting and sustaining a far-flung network of researchers and practitioners in the U.S., Sweden, and elsewhere.

For the **campus community** as a whole, Wallenberg Hall provides ideal facilities and support for special events. Among the many varied activities that took place in Wallenberg Hall during FY07 (often with support from Wallenberg Hall staff) are:

21-Sep-06	Business Leadership Summit
Repeating	CleanTech Innovation Meetings
2-Oct-06	Lehman Bros Speaker Event
6-Oct-06	Ethics in Society Speaker Event
11-Oct-06	Design Institute - Maverick of the Minds event
12-Oct-06	An Inconvenient Truth - Office of Religious Life
Mid Oct	Reunion Homecoming - tours and lecture space
17-Oct-06	Jewish Studies - Mitchell Wagner speaker event
18-Oct-06	Swedish Financial Delegation
19-Oct-06	BASES Info Session
20-Oct-06	Lively Arts, Pre-performance Gallo Winetasting event
30-Oct-06	BASES Google Speaker Event
13-Nov-06	History - Koyro Saram Documentary Film showing
14-Nov-06	PWR Open House
15-Nov-06	IHUM Open House
27-Nov-06	Swedish Consulate speaker event
28-Nov-06	BASES E-Challenge event
30-Nov-06	Microsoft TechFest
1-Dec-06	World Aids Day event
10-Dec-06	Santa Lucia event - Scandinavians at Stanford
11-Dec-06	IHUM Final Presentation event
12,13-Dec-06	A Chanticleer Christmas - Lively Arts Pre Performance event
23-Jan-07	BASES E-Challenge event
3-Feb-07	Mobile Persuasion Bar-Camp 07
6-Feb-07	AEC Round Table event
21-Feb-07	PWR Open House
23,24-Feb-07	Parents Weekend - tours/open house
24-Feb-07	Entrepreneurship Week - The Role of the University Roundtable
25-Feb-07	Entrepreneurship Week - Social Entrepreneurship Panel Discussion
28-Feb-07	China Week Dinner
2-Mar-07	Apple Computers - Aperture Seminar
2-Mar-07	Entrepreneurship Week - Venture Capital Speed Dating (ASES)
9-Mar-07	Sociology Open House
Repeating	Stanford Webmasters Meetings
7-Apr-07	Social Networking Workshop
13-Apr-07	IHUM Fellows Colloquium
14-Apr-07	PACE Program (visit by high school/prospective Stanford students)
19-Apr-07	US Ambassadors to Scandinavia - meeting and reception
21-Apr-07	Linkoping Day - celebrating Palo Alto's twin sister city
28-Apr-07	BASES E-Challenge and Social E-Challenge events
8-May-07	Microsoft X-Box Tournament
10-May-07	Innovationsbrun Meeting
18-May-07	Lively Arts - Major University Presenters Meeting
30-May-07	Deloitte Consulting
7-Jun-07	Psychology Senior Honors Presentations

Mid June	SUSE Summer Institute sessions
23-Jun-07	Masters of Liberal Arts weekend classes
25-Jun-07	Keio University Workshops
2-Jul-07	Speaker event for GSB
All July	Philosophical Stages Workshop Course
23-Jul-07	L'Oreal Offsite Event
27-Jul-07	Learning Design and Technology Expo event
August	Summer Institute at Wallenberg Hall 2007
1-3	Building Effective Virtual Teams
6-10	Using VideoGames in Education
13-14	Learning Space Design
16-17	Using e-Portfolios for Teaching, Learning and Assessment
21-Aug-07	High Performing Computers Conference

In addition we have been pleased to host, on multiple dates:

- Videoconference connections for PAC10 Meetings, Bill Perry, Margot Gerritsen, Jon Krosnik, Doug Osheroff, Sharon Long, various PhD Oral Defenses
- Job searches for Classics, Drama, Art
- Auditions and rehearsals for Stanford Shakespeare Society
- Meetings for Stanford Student Groups, including: Forum for American-Chinese Entrepreneurs (FACES), Stanford Consulting, ISIS, Green Dorm Project, Brainstorming India, Scandinavians at Stanford
- President and Provost Faculty Workshops/meetings

11. Media X Industry Partners Program

The Media X program is staffed by Executive Director, Charles (Chuck) House (a well known leading Silicon Valley executive and entrepreneur) and Office Manager, Amy Atkinson, with contract support by Dr. Martha Russell. During the past six years 90 Stanford professors have submitted research proposals for Media X funding. During 2007, the submission of research proposals in response to an RFP on “The Fusion of Virtual and Real Worlds” added ten new faculty researchers to the Media X community.

The 5th Media X Annual Meeting, held on April 16-17, 2007, attracted 275 representatives from companies and other research organizations. An exclusive half-day session was held for Media X partners. The day and a half annual meeting, “Research, Collaboration, Innovation,” held at Arrillaga Alumni Center featured presentations by Stanford faculty members and industry affiliates, as well as poster sessions by Stanford graduate students sponsored by Media X.

A Media X Seminar Series was launched in 2007, with 9 seminars given by industry researchers during the autumn quarter; two were co-sponsored with the Stanford Humanities Lab. Focus Days (in-depth brainstorming sessions with Stanford faculty and industry researchers from a member company) were held in 2007 on themes of creating and measuring emotion, new media and processes for distributed team collaboration, visualization processes for work teams, and tools and processes for collaboration in virtual environments.

Follow-up activities between Affiliates and the faculty members who attended the intimate, in-depth discussions about issues of common concern during the Focus Days have led to faculty speaking engagements, hiring graduating students, expanded Media X member relationships, and discussions about collaboration, resulting in two proposal submissions (Knight Foundation and NSF) for collaborations between Stanford and member organizations.

A two and a half day workshop was held by Media X in August 2007, in conjunction with the Wallenberg Summer Institute. The focus of this workshop, attended by 40 industry researchers, was “Building Effective Virtual Teams.” The program featured Stanford faculty members, industry researchers and several demonstrations of tools and applications and resulted in three new Media X memberships.

Media X co-hosted three meetings with industry partners in 2007. In February 2007, a half day meeting was co-sponsored with Cisco, Seriosity and Santa Fe Institute. In May, Media X co-sponsored a day-long program on “The Future of Advertising in Digital Media” with Accel Partners, to which over 400 faculty members and industry leaders attended. In November, Media X collaborated with the Bay area’s CTO Forum on an evening meeting focused on Innovation. In 2007 Media X welcomed six Distinguished Visiting Scholars to its community.

The total income from membership fees for FY07 was \$1.0M. The bulk of this money was used to run the program and support faculty research. Previous Media X members continue to be involved in seminars and meetings. Services were delivered in 2007 to the following Media X members:

Strategic Partners (\$300,000 a year)

- Dai Nippon Printing (Japan)
- Time Warner (USA)

Affiliate Partners (\$50K per year)

- BP (United Kingdom)
- Intel (Santa Clara, CA)
- Intuit (Mountain View, CA)
- Konica Minolta (USA)
- Mitsubishi (Japan)
- Motorola (USA)
- NBC Universal (New York, NY)
- Philips (Eindhoven, Netherlands)
- Scottish Enterprise/University of Edinburgh (Scotland)
- StatOil (Norway)
- Sun Microsystems (Palo Alto, CA)
- Tekes (Finland)
- Visa (Foster City, CA)

Associate Partners (<\$25,000 or in kind support)

- Accel Partners (Palo Alto, CA)
- fxPAL (Palo Alto, CA)
- Learning.com (Portland, OR)
- NCast (Mountain View, CA)
- Qwaw Forums (Palo Alto, CA)
- SAP Labs (Palo Alto, CA and Germany)
- Sesame Workshop (New York, NY)
- Swivel Media (San Francisco, CA)

Media X continues to broaden the intellectual exchanges provided for the campus by funding and collaboration opportunities, as well as through seminars and Focus Days. Media X is aggressively pursuing both new partner development activities and related faculty interests.

Plans for outreach and cultivation in 2008 include the Media X Annual Meeting on March 3-4, continuation of the Media X Seminar Series, a fall meeting co-sponsored with Accel Partners, a half-day workshop on using geospatial information for journalists (in conjunction with the Knight Fellows Program,) and one or more workshops in conjunction with the Wallenberg Summer Institute.

12. Symbolic Systems Program

Unusually for research centers, CSLI has an associated education program offering an undergraduate major and a masters degree, the Stanford Symbolic Systems Program (SSP), an interdisciplinary degree program administered in the School of Humanities and Sciences. The goal of SSP is to provide students with the vocabulary, theoretical background, and technical skills needed to understand and participate in contemporary interdisciplinary research about language, information, and intelligence — both human and machine. The curriculum combines traditional humanistic approaches to these questions with contemporary developments in the science and technology of computation. SSP has consistently attracted some of the brightest students at Stanford, many of whom have gone on to pursue successful careers in technology.

The SSP program graduated 47 students in 2006-07 (44 BS and 3 MS). The program currently has 80 active students. The SSP Summer Internship program had 11 interns last summer. Several of the SSP interns did their summer work at CSLI. Many H-STAR faculty are active in SSP instruction and advising.

13. Affiliated Masters and Doctoral Programs: LSTD and LDT

Soon after its creation in late 2001, SCIL Director Roy Pea collaborated with colleagues in the School of Education (SUSE) and elsewhere on the campus to establish an interdisciplinary doctoral program in the Learning Sciences and Technology Design (LSTD), which now has a cohort of 28 full-time students. These students are active in H-STAR Institute research activities, commonly found on the 4th floor of Wallenberg Hall, and are typically funded by H-STAR and Media-X faculty

research grants. A related program, established by SUSE in 1997, is the Learning Design and Technology (LDT) program, with an engaging project-focused curriculum that attracts 12-20 masters' students for its full-year duration. Together, the LSTD (PhD) and LDT (MA) programs provide a vital "people" contribution to the interdisciplinary research, teaching, and apprenticing activities of the H-STAR Institute.

14. CSLI Publications

CSLI Publications promotes scholarship in linguistics, logic, philosophy, psychology, computer science, and other fields that contribute to the development of theories of language and information, with attention to including different schools of thought.

CSLI Publications has a full-time director, Dikran Karagueuzian, assisted by a full-time staff member. Student help is used to supplement the work of the two full-time employees. During FY07, the Publications group occupied two offices in Cordura Hall and had use of some storage space in Pine Hall.

The Publications Director develops original ideas for books with established, as well as emerging and promising scholars. The director also scouts out new manuscripts at professional conferences and during visits to authors at various academic institutions.

CSLI Publications brought out 12 new titles in FY07, plus 6 reprints. The unit sold 17,917 copies and had a FY sales income of \$384,258.