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**Human Sciences and Technologies
Advanced Research Institute**
Wallenberg Hall

December 8, 2006

To: Ann Arvin
Vice Provost and Dean of Research and Graduate Policy

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

Subject: Annual Report for H-STAR for FY 2005–2006¹
(Response to memo of November 16, 2006)

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CONTENTS

- 1. Overview**
- 2. H-STAR mission**
- 3. H-STAR mission and the Stanford Challenge**
- 4. How H-STAR works**
- 5. Major units within H-STAR**
- 6. Faculty and researchers in H-STAR**
- 7. International activity**
- 8. Research Programs within H-STAR**
- 9. Community outreach**
- 10. Wallenberg Hall**
- 11. Media X Industry Partners Program**
- 12. Symbolic Systems Program (SSP)**
- 13. Affiliated degree programs: LSTD and LTD**
- 14. CSLI Publications**

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

1. Overview

H-STAR is a new Stanford interdisciplinary research institute, with independent lab status, approved by Dean of Research Artie Bienenstock in December 2005. The initial formation of the new institute was achieved by the merger of two centers, CSLI and SCIL, both of which retain the status of centers (but not independent labs) within the larger institute structure.

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 40 (non-faculty) researchers who are working on projects led by faculty PIs.

H-STAR researchers produced (over)² 352 research papers, received 1 patent, and published 7 books. A complete list is provided as an appendix to this report.

H-STAR employs 44 staff (academic and non-academic), of which 9.3 FTE 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 FY06, under academic staff, we supported 40 graduate students, working mostly for SCIL projects. Not shown in the headcount figures below are temporary employees that average about 15 people each year working mainly for research projects in SCIL and CSLI.

H-STAR FY06 Headcount			
Academic Year:	FY06	Estimate FY07	Estimate FY08
Category			
Academic Staff			
Engineering Research Associate	8	7	9
Sr Research Scholar	6	6	6
Physic Science Research Associate	1	1	1
Social Science Research Associate	1	1	1
Visiting Associate Professor	1	2	
Post docs	2	3	2
Graduate Students	40	40	40
Total Academic Staff	59	60	59
Staff	25	24	23
TOTAL Headcount (w/o faculty)	84	84	82

² The actual totals will be higher, since a number of H-STAR faculty/researchers did not submit their lists by the deadline for preparing this report.

The total volume for federal and non-federal sponsored research in H-STAR in FY06 was \$4.3M, of which \$1.2M was F&A (indirect cost charges). Close to 50% of the \$2M in gifts we received in FY06 was transferred out as university research to H-STAR affiliated faculty.

H-STAR has an industry partners program, Media X, that supports, through annual membership fees charged to industry partners, faculty and student research as well as contributing a small amount to the administrative costs of H-STAR.

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 third 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, and we are in the fifth year of a five-year project funded by Scottish Enterprise for a total amount of \$7.6M, split evenly with the University of Edinburgh's Human Communication Research Center (HCRC).

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 allocated to Media X for housing 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 funds campus-wide research. The program currently has 24 industry partners, 5 at the Strategic Partner level (\$300,000 a year) and 19 at the Affiliate Partner level (\$50,000 a year). The program does not have a defined faculty membership structure on campus; it supports and funds research based on topics involved people and technology, not by discipline. Since the program began in 2001, Media X has supported more than \$2.5M of Stanford research, spread across 76 Stanford faculty PIs, receiving 183 proposals, representing faculty from all seven schools, and involving 95 graduate students. This funding was 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), and 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, Guadulape (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 40 Stanford and Stanford associated researchers have a significant affiliation with H-STAR (an asterisk indicates that the researcher has received funding from H-STAR):

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. Dev, Parvati (SUMMIT)*
8. Devlin, Keith (CSLI and Consulting Prof. in Mathematics)
9. Ehlen, Patrick (CSLI)
10. Esmonde, Indigo (School of Education)
11. Flickinger, Daniel (CSLI)*
12. Fogg, B.J. (CSLI and Consulting Prof. in Computer Science)
13. Fong, Vivienne (Department of Linguistics)
14. Fruchter, Renate (Engineering)*
15. Go, Janet (SCIL)*
16. Grossman, David (Center for Design Research)*
17. Guimaraes, Marc Perreau (CSLI)
18. Harbott, Lene (EPGY)
19. Hayes-Roth, Barbara (Consulting Prof. in Computer Science)
20. Huang, Camillan (SCIL)
21. Israel, David (SRI and Consulting Prof. in Philosophy)
22. Kaplan, Ron (PARC and Consulting Prof. in Linguistics)
23. Kunz, John (Civil and Environmental Engineering)*
24. Langley, Pat (CSLI and Consulting Prof. in Symbolic Systems)*
25. Levitt, Raymond (Civil and Environmental Engineering)*
26. Macken, Betsy (EPGY)
27. Martin, Caitlin (SCIL)*

28. Mittagunta, Girija (SCIL)*
29. Perrault, Ray (SRI and Consulting Prof. in Philosophy)
30. Pugh, Carla (SUMMIT)*
31. Purver, Matthew (CSLI)
32. Rosen, Joseph (SCIL)*
33. Rosenberg, Duska (CSLI and Royal Holloway University, London)
26. Tversky, Barbara (Dept of Psychology, no longer at Stanford but still affiliated with CSLI)
34. Van der Loos, H.F. Machiel (CDR)*
35. Varges, Sebastian (CSLI)
36. Varma, Sashank (SCIL)*
37. Verplank, William (Computer Science and CCRMA)*
38. Wellings, Paula (SCIL)*
39. Wong, Dik Kin (EPGY)
40. 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 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 2006, a total of \$2,143,361 in grant funds was awarded, split roughly equally between Stanford and Sweden. This amount comprised 7 grants in Medicine, 3 in Engineering, 2 in Humanities, and 3 in Pre-college Education.

The WGLN II Board of Directors includes Professor of Biological Sciences H. Craig Heller as Chair, Provost John Etchemendy; former Dean of Research, Arthur Bienenstock; and President and Professor Emeritus Donald Kennedy.

7b. The Wallenberg Research Link

Led by Professor Emeritus Stig Hagstrom, 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. Digital Vision Fellowship Program

Initiated and originally funded by the Reuters Foundation, this one-year program on social/technological innovation enables mid-career professionals to spend a year at Stanford working on a project that makes use of technology to help solve a pressing “digital divide problem.” Since 2001, the DVP has hosted 53 Fellows, who have worked on 49 projects in 15 countries. More than half of the DVP projects were sustained after the Fellowship period, at least 20% of the projects received significant funding (three have received over \$1M), and several have received international recognition and awards.

DVP projects currently focus on three Initiative Areas: Advancing Financial Services; Knowledge and Empowerment; and Networked Health and Welfare.

In FY06, the DVP kicked-off its fifth program cycle with 15 Fellows, working on 13 projects. Two Fellows worked on a joint project, one Fellow acted as a resource for the other Fellows. These Fellows represented nine countries, spoke 17 languages, and had an average of 10 years professional experience. Several were accomplished entrepreneurs.

7d. Scotland: The Stanford–Edinburgh Link

The Stanford–Edinburgh Link is a five-year program of research collaboration between CSLI and the University of Edinburgh that commenced in 2002, funded by Scottish Enterprise at \$7.6M. The collaboration focuses on research into natural language processing and speech recognition systems and the development of graduate education in these areas. All projects involve researchers at both CSLI and Edinburgh’s Human Communication Research Center (HCRC). The typical project length is 3 years. The lead CSLI researchers involved in this program are listed below, along with the size of the (total) research budgets for each project.

Altman	\$168,871
Beaver, Flemming	\$37,654
Jurafsky	\$192,403
Jurafsky, H Clark	\$329,295
Jurafsky	\$181,998
Jurafsky	\$4,359
Manning, Flickinger, Oepen	\$377,168
Manning	\$123,107
Manning, Langley	\$267,890
Nass, Reeves, H Clark	\$115,897
Peters	\$3,148
Peters, Lemon, Shapiro	\$260,440
Reeves, Nass	\$206,069
Reeves, Cavedon, Lemon	\$41,223

Schwartz	\$20,000
Tversky	\$115,721
Wasow, Zaenen, Bresnan	\$73,970
Total	\$2,519,213

As part of the Link program, H-STAR hosted a visit to Stanford by the First Minister of Scotland and a subsequent visit by the CEO of Scottish Enterprise, to investigate the possibility of a second phase link collaboration when the current project ends in 2007.

7e. 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.

7f. Finland

For the past two 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 an initial maximum of 24 person-months for 2006-07, 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 have had a number of conference events and planning meetings in Finland and at Stanford during 2006, with the view to developing joint research projects.
- *Nokia Research Center*: Nokia was a Strategic Partner in Media X for several years, with a Nokia researcher based full time at CSLI. Nokia withdrew their Media X membership in 2004 to concentrate their Silicon Valley research activities in their new Nokia Research Center, an 80-person facility on Page Mill Road. NRC has already formed a collaborative research and teaching

relationship with Stanford's Engineering School, and discussions have also taken place with a view to developing collaborations with H-STAR faculty.

7g. 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.

7h. 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 we are currently exploring Norwegian funding opportunities for work to be carried out at CSLI.

7i. 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. One researcher from the Amsterdam HCS Lab spent most of 2005-06 at Stanford, and was joined by two graduate students for shorter periods. All funding is provided by the University of Amsterdam.

7j. 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.

7k. 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.

7l. 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. As a bridge of collaboration between SCIL and the center in Taiwan, postdoctoral fellow Ben Chang spent 2005-2006 at SCIL working with Stanford faculty and students on learning technology projects for Taipei City.

8. Research Programs within H-STAR

8a. The LIFE Center

After its second 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, and Anthony Wagner.

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 FY06 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 2005-06 was \$325,000.

8d. *Brain Research Group*

This project is led by Professor Patrick Suppes, the budget for this project in FY06 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. In FY06, the lab received a \$5K VPUE award for undergraduate research assistance, and it has just 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 is in the second and final year of a \$150,000 NEH grant, and in the second and final year of 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 2006 we held the second Summer Institute, a one-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 two sessions, titled Smart Spaces for Learning, which were taught by SCIL Academic Technology Specialist Dan Gilbert. Each session filled its 20 spots with educators, researchers, and practitioners from across the country and around the world. The sessions were crafted to offer hands-on experiences as well as lecture, discussion, and in-depth field trips to the Exploratorium and the DeYoung Museum, both in San Francisco. Follow-up evaluations demonstrated a high level of participant satisfaction and a desire for future opportunities to study and collaborate with Stanford.

Planning is underway to tailor a similar but greatly expanded Summer Institute for a broader audience in the coming summer of 2007.

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 in planning the new 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 350 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 FY06 (often with support from Wallenberg Hall staff) are:

IHUM Symposium	HipHop Conference
Psychology Senior Honors Convention	VA Training Sessions
Diagrams 2006	Philosophical Stages presentations
Dalai Lama Webcast	Sophomore College
Revolutionary Tides Symposium	Residential Computing Training
IHUM Open House	Nobel Day
PWR Open House	OGC Retreat and Party
Silicon Vikings events	SUMMIT Gaming/Comp Workshops
BASES E-Challenge (speakers and finals)	Alpha Kappa Psi speaker events
Futures of Learning Speaker series	Cameron Diaz & filming by MTVU
FACES speaker events	Lively Arts Post Performance events
Communications Holiday Party	Continuing Studies classes
Various Final Presentations events	PPO/HR meetings
World Economic Forum meeting	ICER Conference
World Aids Day speaker event	IRWG Forums/speaker events
Rose Bowl and World Cup events	Budget Meetings/Provosts Office
Stanford Shakespeare Rehearsals	H&S Deans Office Meetings
Asian American Film Festival	CS Software Faire
SCIL Summer Institute 2006	Microsoft TechFest event
CSB 2006 - workshops and speakers	Trovix Training (H&S Hiring Mgrs)
High Performance Computing Conference	ITSS Networking Training Sessions
Take Your Daughters and Sons to Work Day	Course Mgmt Systems Meetings
Scandinavians @ Stanford events	Aids Leadership Initiative
Stanford Video & Multimedia Group	Project Testing for non WH projects
Green Dorm Project	Job Searches: Multiple Video
Reunion Homecoming	Conferences for the following
Community Day	Departments - Drama, Asian Film
Doug Engelbart's Birthday Party	Studies, Sculpture, CCRMA, VP
Darwin Day	Student Affairs, & DLC
Parent's Weekend	

11. Media X Industry Partners Program

The Media X program, which has its own fulltime Executive Director, Charles (Chuck) House (a well known leading Silicon Valley executive and entrepreneur), has been very attractive to Stanford faculty, as 76 professors have submitted

research proposals for Media X funding during the past six years. We continue to broaden the intellectual exchanges these new funding and collaboration opportunities have provided for the campus, and are aggressively pursuing new partner development activities.

The last annual Media X Partners Conference, held on March 16-17, 2006, attracted 400 representatives from 100 companies, 20 VC firms and other research organizations. Twenty-eight Stanford researchers gave presentations, and a further 24 faculty and 88 students attended the conference.

The current industrial and government membership of Media X is:

Strategic Partners (\$300,000 a year for a committed three years membership)

- Cisco Systems (CA)
- Dai Nippon Printing (Japan)
- Omron (Japan)
- Scottish Enterprise/University of Edinburgh (Scotland)
- Time Warner (USA)

Affiliate Partners (\$50K per year)

- AARP (Washington, D.C.)
- Boeing (Seattle, WA)
- BP (United Kingdom)
- British Telecom (United Kingdom)
- Cox Communications (Atlanta, GA)
- Dai Nippon Printing (Japan)
- France Telecom (France)
- Fuji Xerox (Japan)
- Intuit (Mountain View, CA)
- Microsoft (Redmond, WA)
- Philips (Eindhoven, Netherlands)
- Reuters (London, England)
- Rio Tinto (Australia)
- SAP Labs (Palo Alto, CA and Germany)
- Sesame Workshop (New York, NY)
- Steelcase (Grand Rapids, MI)
- SRI International (Menlo Park, CA)
- Tekes (Finland)
- Visa (Foster City, CA)

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 35 students in 2005-06 (27 BS/BSH, 4 SSP minors, and 4 MS). The program currently has 111 active students. The SSP Summer Internship program had 15 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 FY06, 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 14 titles in FY06, plus 5 reprints. The unit had a FY sales income of \$393,534.