

**STANFORD BIO-X  
AND  
STANFORD  
HUMAN-  
CENTERED  
ARTIFICIAL  
INTELLIGENCE  
INSTITUTE (HAI)**

**CALIE PAPERS #4**

Stanford Bio-X and Stanford Human-Centered Artificial Intelligence Institute (HAI) are two bold initiatives at Stanford University. This paper details and examines the organisational models and mechanisms used to create and manage these large-scale initiatives and aims to highlight possible models for interdisciplinary collaboration at universities.

Author information

Name: Dr. Hans Pohl

Title: Programme Director

Organization: STINT, The Swedish Foundation for International Cooperation in Research and Higher Education

© CALIE Papers 2020

This publication is part of the CALIE Papers, a series by the CALIE Project. It aims to contribute to the development of knowledge within the CALIE focus areas. The scientific output expressed does not imply a position of the CALIE Project partners or collaborating universities. The CALIE Project partners, collaborators nor any person acting on behalf of the Project or collaborating universities is responsible for the use that might be made of this publication.

CALIE Project  
calieproject.com

## Contents

<b>Preface</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>3</b>
<b>Purpose and method</b> .....	<b>3</b>
<b>Stanford Bio-X</b> .....	<b>4</b>
Initiation and mission .....	4
Research .....	4
Education .....	4
Innovation .....	5
Collaboration .....	5
Management .....	6
<b>Stanford HAI</b> .....	<b>6</b>
Initiation and mission .....	6
Research .....	7
Education and training .....	7
Collaboration .....	8
Management and funding .....	8
<b>Concluding discussion</b> .....	<b>9</b>
Comparison of Bio-X and HAI .....	9
Relevance for Sweden .....	9

## Preface

The purpose of this study is to document and discuss two bold initiatives at Stanford: Stanford Bio-X and Stanford Human-Centered Artificial Intelligence Institute (HAI). The focus was on the initiation and management of these initiatives.

The project was carried out by Dr Hans Pohl in July–August 2019. Dr Pohl is Programme Director at the Swedish Foundation for International Cooperation in Research and Higher Education (STINT). He is also Senior Researcher at the Research Institutes of Sweden, Division ICT (RISE Viktoria).

The CALIE project and the Swedish Innovation Agency (Vinnova) organised and co-funded the study (dnr 2019-03431).

## Introduction

Stanford is a top-ranked university-based in Silicon Valley, USA. Sweden has many collaborations with Stanford; there is a Wallenberg Hall and even a Vinnova representative on campus. There is also an ongoing project involving four Swedish and three US universities (CALIE), which includes Stanford. CALIE focuses on leadership and education.

This report summarises the results of a study of two of Stanford's rather ambitious interdisciplinary initiatives: Stanford Bio-X and Stanford Human-Centered Artificial Intelligence Institute (HAI). The focus was on the initiation and management of these initiatives. The study serves as input to CALIE as well as to other actors interested in the topic.

## Purpose and method

The main purpose of this small study is to contribute to an improved understanding of how these types of initiatives are developed and managed. Given that the initiatives are thematically highly relevant also in Sweden, opportunities for collaboration were also of interest.

In both cases, the method was to study the website of each initiative and available documents. Thereafter, topics for discussion were listed and interviews scheduled. One meeting took place with representatives of each initiative, lasting approximately one hour:

- Dr Heideh Fattaey, Stanford Bio-X Executive Director of Operations and Programs
- Professor John Etchemendy, Co-Director Stanford HAI (with Professor Fei-Fei Lee) and Dr Michael Sellitto, Deputy Director Stanford HAI

The informants have been given an opportunity to read and comment on the draft final report. The project was carried out by Dr Hans Pohl in July–August 2019. Dr Pohl is Programme Director at the Swedish Foundation for International Cooperation in Research and Higher Education (STINT). He is also Senior Researcher at the Research Institutes of Sweden, Division ICT (RISE Viktoria).

The CALIE project and the Swedish Innovation Agency (Vinnova) organised and co-funded this study. CALIE is a Sweden–USA project for collaboration, academic leadership and innovation in higher education, which involves seven comprehensive universities: the universities in Gothenburg, Lund, Stockholm and Uppsala in Sweden, and Stanford University, the University of California at Berkeley and the University of Washington in the USA. Lund University heads the project, which is co-funded by Vinnova.

## Stanford Bio-X

### Initiation and mission

A grassroots movement among Stanford faculty – inspired and led by many people, including James Spudich, Bill Mobley, Channing Robertson, Steven Chu, Dick Zare, and Lucy Shapiro – resulted in a bold enterprise known as Bio-X, created to facilitate interdisciplinary research and teaching in the areas of bioengineering, biomedicine, and bioscience.<sup>1</sup>

The initiators shared graduate students in their laboratories and noted the potential of interdisciplinary collaboration. They talked to the president of Stanford (Professor John Hennessy), who supported the idea. In September 1998, a Planning Committee was formed, consisting of faculty from the schools of Engineering, Medicine, and the Humanities and Sciences

The Mission of Bio-X is to catalyse discovery by crossing the boundaries between disciplines, present interdisciplinary solutions and create new knowledge of biological systems to benefit human health.

One of the initial activities was the launch of a seed grants programme, supporting selected proposals, which were required to be interdisciplinary, create new knowledge, and unlikely to receive support from traditional funding bodies such as the National Institutes of Health (NIH).

Jim Clark, a retired professor from Stanford, offered to fund a building, and the Norman Foster-designed Clark Center that houses Bio-X opened in 2003.

### Research

Currently, approximately 970 Stanford faculty are involved in Bio-X, of which 48 are based in the Clark Center. Faculty have secondary affiliations at Bio-X, and the policy is to be inclusive: if someone at Stanford wants to be involved, (s)he is welcome.

Seed grants are still offered by Bio-X. Every second year 20–25 proposals are selected, each amounting to USD 200,000 and intended for a 2-year project. Until 2017, the seed grant funding came from the President of the university. Now, the seed grants are paid for by gift funds. The seed grants have led to follow-up projects with external funding ten times that of the seed grants.

### Education

Education at Bio-X has a clear focus on research. A 10-week Undergraduate Summer Research Program has been offered by Bio-X since 2006. In 2019, 150 Stanford students applied and 65 were accepted. Students apply with their mentor. Students do hands-on laboratory research

---

<sup>1</sup> <https://biox.stanford.edu/about/biox-history>

with faculty mentors, they attend weekly faculty talks<sup>2</sup> and the final part of the programme is a scientific poster session.

Stanford Bio-X PhD Fellowship Program supports 20-25 new students each year and continues their support for three years. Students stay a part of their home department.

### Innovation

Research activities initiated by Bio-X seed grants and fellowships have led to over 100 patents. New firms have also been established. Faculty cannot head a firm in parallel, however, being a board member is permitted.

Corporates are invited to fund seed grants or other projects. The corporates involved include Novo Nordisk, Sanofi and Novartis. Sanofi has for example funded 17 seed grant projects. The benefits for the corporates are:

- Opportunities to talk to faculty
- Shared IPR
- Exclusive timed license rights
- Approval of articles before publication (within a short period of time)

Within the seed grants programme, bi-annual symposia are organised when corporate visitors are invited.

One bioengineering project, which is rather an academic innovation, has now been housed in its own building and can be regarded as a kind of spin-off from Bio-X.

### Collaboration

Even though Bio-X was and still is focusing on collaboration, the emphasis is very much on collaboration within Stanford. Collaborations with other universities are not managed by Bio-X, but by the different schools at Stanford.

One exception is Aarhus University in Denmark, which has established an activity mirroring that of Bio-X, funded by the Danish government. Bio-X has supported this development and a connection between the centres still exists.

Stanford Bio-X has partnered with Novo Nordisk Foundation since 2014 in establishing a joint visiting scholar or visiting postdoc fellowship programme. The fellowship supports visiting scholars or visiting postdocs with a significant association to Denmark's academic or research environment to conduct postdoctoral-level research at Stanford for 3 years at a time before returning to their hosting Danish institution for their 4th and final year.

---

<sup>2</sup> The author was invited to attend one such talk with three presentations, among them one by Professor Brian Kobilka, who was awarded the Nobel Prize in Chemistry in 2012.

## Management

Bio-X is managed and run by a staff of four full-time equivalents. It has a committee charged with making all top-level decisions concerning Bio-X, composed of the Vice Provost for Research, the Dean of the School of Medicine, the Dean of the School of Engineering, the Dean of the School of Humanities and Sciences, the Dean of the School of Earth Sciences, the Bio-X Director (Dr. Carla Shatz), and the Bio-X Executive Director.

The recommendations from the Bio-X Executive Director to other universities planning to create something similar are to:

- Get faculty committed
- Ensure own funding
- Nurture the passion for collaboration

The central location of the Clark Center is also an important contributing factor in its success. Bio-X now has an endowment allowing it to operate on the interest.

Does this mean that Bio-X will continue to grow indefinitely? Dr Heideh has been involved almost since the start of Bio-X and she admits that the development has been very positive and that there still is much energy and dynamism in the organisation. Still, she thinks that even though Bio-X is financially independent, anything might happen.

## Stanford HAI

### Initiation and mission

Preparations for the Stanford Human-Centered Artificial Intelligence Institute (HAI) started in the fall 2017 or early 2018. Professor Fei-Fei Lee (Computer Science) had the idea to bring in the humanities a few years before. When the then President of Stanford asked everybody at Stanford for proposals as a part of the strategic planning process, HAI was proposed.

Professor Etchemendy, Provost of the School of Humanities and Sciences, was asked to look at all proposals relating to AI and found two that stood out. One of them was HAI. Later, he was asked to be a Co-Director of HAI together with Professor Lee. Professor Etchemendy's research interests are language and logic.

Dr Michael Sellitto was hired as the Deputy Director for HAI in mid-2018. HAI was officially launched with a symposium on March 18, 2019.<sup>3</sup> The symposium involved 33 speakers, among them the President of Stanford and Bill Gates. It was held at Stanford and as the capacity was only 400 participants, several people could not be granted physical access.

The mission of HAI is to advance AI research, education, policy, and practice to improve the human condition:

---

<sup>3</sup> See <https://hai.stanford.edu/events/2019-hai-symposium/overview>

Stanford HAI leverages the university's strength across all disciplines, including business, economics, education, genomics, law, literature, medicine, neuroscience, philosophy and more. These complement Stanford's tradition of leadership in AI, computer science, engineering and robotics. Our goal is for Stanford HAI to become an interdisciplinary, global hub for AI thinkers, learners, researchers, developers, builders and users from academia, government and industry, as well as leaders and policymakers who want to understand and leverage AI's impact and potential.<sup>4</sup>

Stanford HAI has three focus areas:

- Human impact – studying and forecasting the human and societal impact of AI
- Augmenting human capabilities
- Intelligence – developing AI technologies inspired by the versatility and depth of human intelligence

### Research

Two calls for proposals have been carried out offering 25 and 29 grants, respectively, of USD 75,000 each for one year.<sup>5</sup> The HAI seed grant calls ask for new, innovative and interdisciplinary research in human-centred artificial intelligence. Proposals involving collaborations of faculty and students across different fields are encouraged, with a preference for supporting AI-related research bridging two or more departments and/or schools and for the advancement of a human-centred focus.

One part of the review involved assessing how the proposal might lead to mid-level and high-level funding from external sources. According to Professor Etchemendy, seed grant programmes are an efficient method to shape things as desired. All levels at Stanford apply for funding. Another programme is being planned. Funding has already been secured and the projects will be much larger than the seed grants.

### Education and training

Courses relating to HAI are listed on the website. The ambition is to develop an interdisciplinary education programme for bachelor, master and potentially also PhD students. Currently, all PhD students are based at their schools.

A partnership has been developed with the Symbolic Systems programme. The Computer Sciences program will be broadened to include human aspects. For example, Harvard has included a one-week ethics component in all its computer science courses.

A training course for journalists is offered and a Cyber and Artificial Intelligence Boot Camp for congressional staff will take place in August 2019.<sup>6</sup> Although 25 spaces were on offer, demand

---

<sup>4</sup> <https://hai.stanford.edu/>

<sup>5</sup> Short introductions of the granted projects are available at <https://hai.stanford.edu/news/hais-2019-seed-grant-awards> and <https://hai.stanford.edu/news/hais-2018-seed-grant-awards>

<sup>6</sup> <https://www.hoover.org/events/cyber-and-artificial-intelligence-boot-camp-2019>

has been much higher and people who are not part of the congress have also asked if they may participate.

### Collaboration

The goal is to become a global hub. Nevertheless, the emphasis is on Stanford and activities on campus. Potentially, an office might be opened in Washington D.C., but otherwise HAI will be based on campus in Palo Alto.

Governments from all around the world have already contacted HAI. They ask for advice and are also interested in developing different types of collaboration. Universities have been a bit slower to approach HAI and the process of establishing academic collaborations has not yet started.

### Management and funding

Professor Etchemendy mentions seed funding as one of the mechanisms for growing the network and creating closer ties. Another method to foster collaboration within Stanford is to invite proposals for half-day workshops or rather brainstorming sessions, preparing for major research projects. All faculty were invited, and the purpose of the workshops was to list the ten most important questions. The response has been very good and the only contribution from HAI has been to provide a venue and some coffee.

HAI also organises community-building receptions, but there is potential for improvement in communication within the community. Externally, additional symposia or conferences are planned, the next one in October 2019. Two or three such events will be organised every year.

One big issue for the management is raising funding. Individuals have already committed 250 MUSD. Corporates were expected to provide gifts, but the process has been slower and the amounts of funding lower than expected. They hoped for MUSD 10 per firm. Foundations might be quicker to grant funding, but the amounts are lower. Depending on how the funding situation develops, a new building dedicated to HAI might be built.

Professors Etchemendy and Lee are expected to work 50% as co-directors and the other 50% in their roles at their home schools. This is the typical model used at Stanford. Dr Sellitto and another eight people are employed by HAI. All other staff have (at least) double affiliations, with HAI being the second. About 150 faculty at Stanford are listed on the HAI website plus an Advisory Council and Distinguished Fellows.<sup>7</sup>

In his role as provost, Professor Etchemendy has followed the evolution of other initiatives like HAI. He lists two crucial steps in the development:

- The relevant faculty need to be talking to each other. One way to achieve this is to offer funding.

---

<sup>7</sup> See <https://hai.stanford.edu/people/faculty>

- The next step is to find the leadership. It is very important that the leadership is prepared to make this its number one project for the next five years. Recruitment within Stanford is preferred as a strong network is needed. For the Neuroscience institute, it took two years to get the right leader.

When the interviewer mentioned that HAI is very ambitious and could almost become larger than Stanford itself, Professor Etchemendy confirmed that it is ambitious and that it has an orientation in line with the overall Stanford principle of working interdisciplinary and integrating research and education.

## Concluding discussion

### Comparison of Bio-X and HAI

The initiatives described above are clearly in different phases but otherwise, there are many similarities. Both address broad, long-lasting, and clearly interdisciplinary themes. They have a strong focus on the combination of Stanford-internal resources. The initiative came from faculty, but top-level support had been given early in the process. Whereas Bio-X is the result of a group of influential professors pointing out a need, the instead HAI originates from an individual. HAI was realised through the university's long-term planning process.

International collaboration is not emphasised. Obviously, Stanford faculty participating in the initiatives collaborate internationally, but collaboration appears mainly to be linked to their home schools and not to Bio-X or HAI. However, HAI has the ambition to become a global hub and it is too early to tell how the international network will develop.

Both initiatives use seed funding as an important mechanism to foster collaboration within Stanford. HAI also mentions some other mechanisms.

External funding, mainly donations from individuals, dominates. HAI appears to move very quickly towards being completely funded by external sources. The second round of seed grants was for example already entirely externally funded.

Corporates are involved in advisory roles and as sponsors. However, the impression is that Stanford to a very large extent decides the direction and scope of the activities. Collaborative research with corporations appears uncommon within the initiatives.

### Relevance for Sweden

Thematically, both initiatives are very relevant. Collaboration with Bio-X is possible, for example in the postdoc format used by Novo Nordisk Foundation. It remains to be seen which opportunities HAI will offer.

The organisational model and the mechanisms used to create and manage the initiatives might be of interest. Obviously, there is a need to foster interdisciplinary collaboration also at Swedish

universities. One question is whether a similar initiative in Sweden would be based at one single university or rather take the form of a broader collaboration using the expertise from different universities.

Stanford's funding situation clearly differs from that of most other universities. The availability of external funding with few constraints is probably more limited for Swedish universities.