

Supporting Participation in Collaboratories by Scientists from Developing Countries

Airong Luo

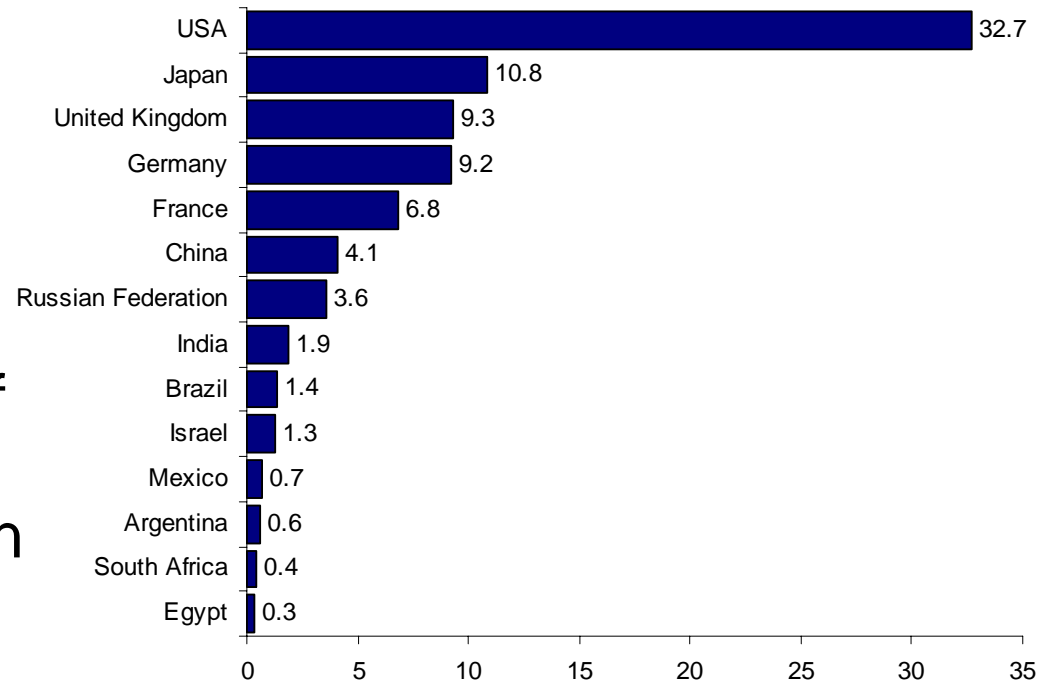
Shaping the Future of Collaboration

Dec. 11, 2006
Geneva, Switzerland



The Problem

- There is a gap in scientific output between developing and developed countries.
- Ninety-five percent of the new science in the world is created in the countries comprising only one-fifth of the world's population



World Shares of Scientific Publications,
2001

Source: UNESCO Science Report

2005

2

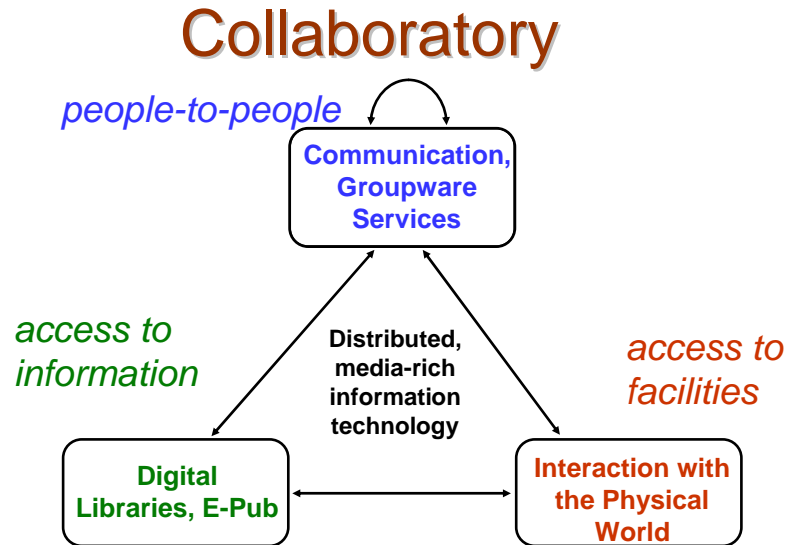


An alliance to advance understanding of collaborative research

SCHOOL OF INFORMATION
UNIVERSITY OF MICHIGAN



Collaboratory as a Possible Solution



- an organizational entity
- spans distance
- provides access to data sources, artifacts and tools required to accomplish research tasks
- supports rich and recurring human interaction oriented to a common research area. (Olson *et al.*, 2004)

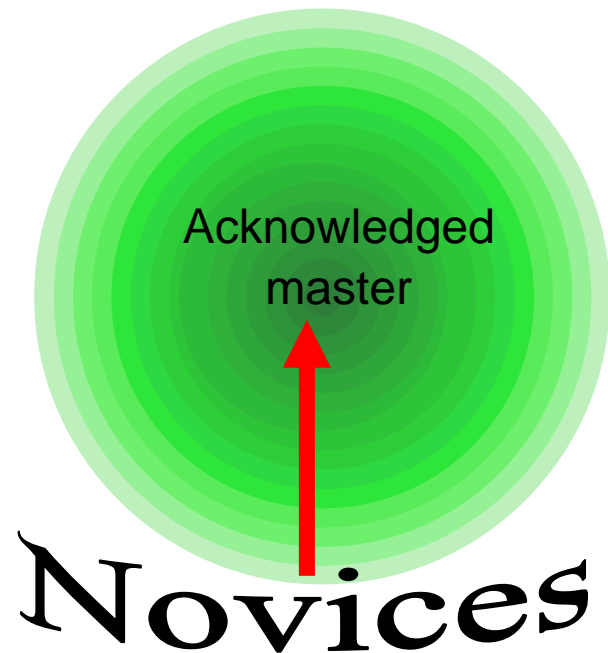


Need for Research

- Unclear whether collaboratories meet the needs of scientists from developing countries
- In order to design collaboratories that meet the needs of scientists from developing countries, we need to
 - Understand the process of their participation in collaboratories
 - Understand what leads to successful participation



A Theoretical Framework to Understand Scientists' Participation in Collaboratories— *Communities of Practice*



- Participation is a form of learning
- learning is social, more a learning **to do** than a learning of things
- Novices start as peripheral participants, and move into center through interacting with both novices and masters



Factors Affecting Scientists' Participation in Community of Practice

- Building and sustaining relationships
 - Building trust
 - Sustaining interactions among members
- Helping novices access experts' knowledge (tacit vs. explicit)
- Helping novices access practices



Multi-levels of Peripherality in a Collaboratory

- Defining Peripherality
 - Being inexperienced in the current work task
 - Being distant from the US and Europe, where most of the leading scientists reside
 - The publication impact of the country of the field studied is below world average
- Multi-levels of Peripherality
 - The labs from developing countries studied are peripheral communities in collaboratories
 - In each lab, postdocs and graduate students are peripheral participants



Research Questions

- How is engagement in communities of practice by scientists from developing countries supported in collaboratories?
- What are the social and technical barriers to their engagement in communities of practice?



Research Methods

- Qualitative approach
 - Interviews
 - Analyzing public documents
 - Field of observation
- Sampling
 - Definition of peripheral scientists
 - Identifying collaboratories: identify eight collaboratories from www.scienceofcollaboratories.org
 - Identifying interviewees: convenience sampling followed by snowball sampling



Collaboratories Studied
































Collaboratory	Field	Distribution of participants	Countries of Participants Being Interviewed
A	Biomedical	1 lab in US, 3 labs in China	2 China, 1 US
B	Biomedical	30 labs in 6 countries	2 China
C	Molecular Biology	55 labs in 12 countries	2 Korea, 1 US, 1 China
D	Molecular Biology	about 246 participants	1 US, 1 Korea, 1 South Africa, 1 Taiwan
E	Biomedical	134 labs in 15 countries	1 US, 1 Korea, 1 South Africa, 1 Taiwan
F	High Energy Physics	86 institutes in 29 countries	3 US, 1 China
G	High Energy Physics	160 institutes in 36 nations	1 Germany, 1 Korea
H	High Energy Physics	47institutions in 15 countries	1 US, 1 Chinese



Results – Supporting Participation (1)

- How is engagement in communities of practice by scientists from developing countries supported?
 - Virtually concentrating people sharing similar research interests from all over the world
 - IT helps to provide various forums for scientists to interact with each other
 - Web forums
 - Meeting minutes posted online
 - Repositories (databases, wiki, documents etc.)



Investigator	MicroArray Experiment	Samples Analyzed	Data Files	Gene-chip version	Data Analysis	
					Low Level	High Level (if performed by Core E)
● filter	● filter					
Steven Rosen	Gene expression in experimentally injured and control mouse spinal cords	MicroArray Samples	   Dec 25, 05	GLYCO_v2	 	
Martin Lotz	ML 6: Impact of mediator nitric oxide on gene expression in human chondrocytes. Expanded Study	MicroArray Samples	   Dec 06, 05	GLYCO_v2	 	 
Susan Fisher	Susan Fisher 1: Effects of estrogen and progesterone on glycosyltransferase expression in mice	MicroArray Samples	   Nov 19, 05	GLYCO_v2	 	 
Minoru Fukuda	Changes in gene expression during the transition from inflammation to cancer following Helicobacter felis infection	MicroArray Samples	   Oct 10, 05	GLYCO_v2	 	
Celso A. Reis	Celso Reis 1: Gene expression changes in the gastric epithelial cells introduced by Helicobacter pylori infection	MicroArray Samples	   Sep 26, 05	GLYCO_v2	 	 



Micro Array Experiment : MAEXP_281_100505

General Information

Experiment ID:	MAEXP_281_100505
Experiment Title:	Susan Fisher 1: Effects of estrogen and progesterone on glycosyltransferase expression in mice
Experiment Date:	10/05/2005
Status:	Public
Protocol ID:	

Experiment Description

The Fisher lab is testing the hypothesis that the mucin-coated oral and uterine cavities present similar carbohydrate receptors that specify the bacterial ecology of both regions and the repertoire of these oligosaccharide species is hormonally regulated. This theory also suggests that certain individuals express carbohydrate receptors that make them susceptible to both periodontal disease and preterm labor. Experimental procedure: 40 mature female mice were ovariectomized. The mice were allowed to rest for two weeks to eliminate any remaining endogenous estrogen (E2) and progesterone (P4). Then the mice were separated into four groups (10 each) that received the treatment indicated. Group 1: ovariectomized mice with no supplement, only sesame oil vehicle. Group 2: ovariectomized mice with only P4 supplement (2 mg/day/mouse). Group 3: ovariectomized mice with E2 supplement (100 ng/day/mouse). Group 4: ovariectomized mice with both P4 (2 mg/day/mouse) and E2 (100 ng/day/mouse) supplement. The treatment lasted for 4 days; the steroids were dissolved in sesame oil and injected subcutaneously. After treatment, salivary glands (parotid, submandibular, and sublingual gland) and uterine horns with cervix were collected. Total RNA was extracted from these samples according to the Core E recommended protocol. Three independent sets of total RNA samples from each tissue were hybridized to the GLYCOv2 array and analyzed.

Links

[List of MicroArraySamples for this Experiment](#)



Micro Array Experiment : MAEXP_281_100505

General Information

Experiment ID:	MAEXP_281_100505
Experiment Title:	Susan Fisher 1: Effects of estrogen and progesterone on glycosyltransferase expression in mice
Experiment Date:	10/05/2005
Status:	Public
Protocol ID:	

Experiment Description

The Fisher lab is testing the hypothesis that the mucin-coated oral and uterine cavities present similar carbohydrate receptors that specify the bacterial ecology of both regions and the repertoire of these oligosaccharide species is hormonally regulated. This theory also suggests that certain individuals express carbohydrate receptors that make them susceptible to both periodontal disease and preterm labor. Experimental procedure: 40 mature female mice were ovariectomized. The mice were allowed to rest for two weeks to eliminate any remaining endogenous estrogen (E2) and progesterone (P4). Then the mice were separated into four groups (10 each) that received the treatment indicated. Group 1: ovariectomized mice with no supplement, only sesame oil vehicle. Group 2: ovariectomized mice with only P4 supplement (2 mg/day/mouse). Group 3: ovariectomized mice with E2 supplement (100 ng/day/mouse). Group 4: ovariectomized mice with both P4 (2 mg/day/mouse) and E2 (100 ng/day/mouse) supplement. The treatment lasted for 4 days; the steroids were dissolved in sesame oil and injected subcutaneously. After treatment, salivary glands (parotid, submandibular, and sublingual gland) and uterine horns with cervix were collected. Total RNA was extracted from these samples according to the Core E recommended protocol. Three independent sets of total RNA samples from each tissue were hybridized to the GLYCOv2 array and analyzed.

Links

[List of MicroArraySamples for this Experiment](#)



- *From the publications, you can only get the success stories. But in this kind of databases, people also reported their failure experiences, and I learned a lot from people's failure. If I know that method did not work, I will not use that method in my research."*

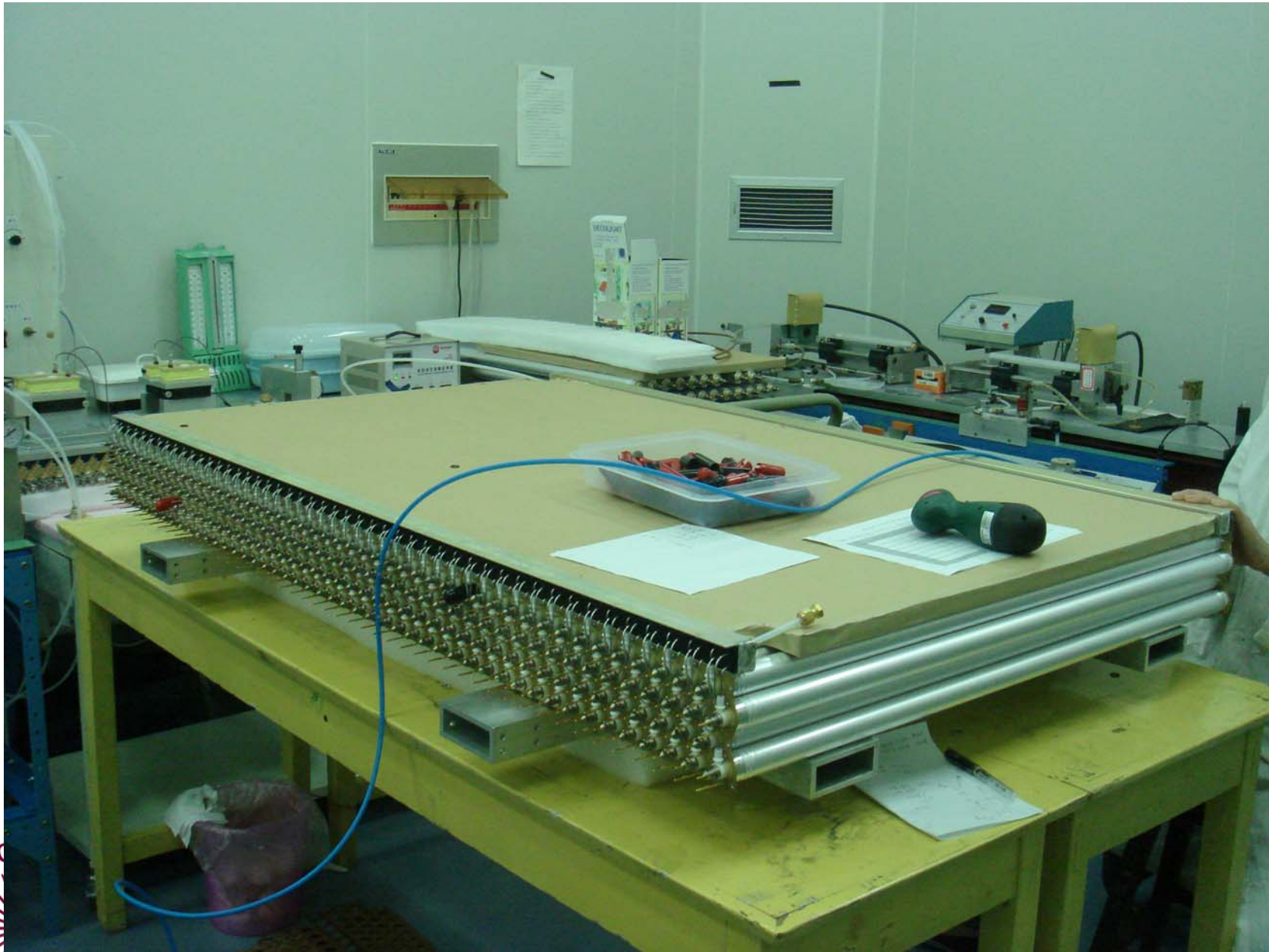
Dr. S (Biomedicine, Korea)



Results – Supporting Participation (2)

- Site visits
 - Learning tacit knowledge
 - Learning management practices
 - Learning how to communicate and collaborate with other people
 - Learning how to do the work





Results– Supporting Participation (3)

- Site visits
 - Building trust
 - Enabling scientists to make impact





An alliance to advance understanding of collaborative research

- *“Only after you meet people, you can have a feeling about what kind of people they are. You can know whether you want to collaborate with them and how to collaborate with them.”*

Dr. L. (Korea, biomedical science)

- *“[Video conference or teleconference] is useless if you don’t know the people and you haven’t worked with them in person....”*



Dr. Y. (High energy physics, US)



Results -- Barriers (1)



- Much fewer teleconferences and video conferences
 - Low bandwidth
 - Time zone difference
 - Missing the opportunities to learn
 - Missing all the informal communication in various meetings
- Much fewer opportunities for site visits



- *In meetings and conferences, scientists can learn from other scientists' discussion.... When a scientist makes presentation, other scientists raise questions and make suggestions. The presentations are usually posted online, but the questions and suggestions raised are not posted. Scientists who are not present at the meetings miss the questions and suggestions.*

Dr. O (High energy physicist, China)



Results – Barriers (2)

More barriers

- Cultural differences
 - Fewer opportunities for students to participate due to hierarchical structures
 - Limited funding exacerbates the problem



Implications – Principles of Technical Design and Social Practices

- Facilitate participants' use of knowledge repositories
 - Motive users to contribute
 - Facilitate information searching from these knowledge repositories
- Adopt technologies that can capture informal communication in meetings and conferences
- Create more opportunities for scientists from developing countries to have interpersonal contacts with their collaborators



Use low bandwidth technologies when collaborating with scientists from developing countries



Acknowledgement

- Thanks for my dissertation committee members
- Thanks for Dr. Homer Neal and Dr. Steven Goldfarb
- Thanks for all the scientists who took their time talking to me



Questions?



An alliance to advance understanding of collaborative research

