

Generation X-change

International meetings and exchanges are creating a universal, globe-spanning culture of science with widespread ramifications.

BY CHRISTOPHER MIMS

Not many high school students are so inspired by their first international meeting that they decide to leave behind their friends and family to get an undergraduate education overseas, but that's exactly what happened to Sophia Hsin-Jung Li from Taipei. She attended the inaugural Asian Science Camp (ASC) in her home town in 2007, and is now in her senior year at MIT.

ASC is one of only a handful of meetings held worldwide that, like the 2010 meeting of Nobel laureates and students in Lindau, Germany, are international, interdisciplinary, and focused on inspiring the next generation of leading scientists and fostering relations among young researchers. The ASC aims to promote interaction between promising science students from across Asia, both with each other and with the senior scientists who attend, including a dozen or so Nobel laureates. So far, it has been held in Taiwan, Japan, Bali and, in August 2010 India hosted the camp.

"At Asian Science Camp you speak English and talk about science with different people, and that was very exciting and inspiring for me at that point," says Li. "That kind of excitement, and being able to communicate with others, made me want to come to MIT."

Unlike most scientific meetings, gatherings

like Lindau, ASC and others are open-ended celebrations of ideas from a diverse array of research. According to some of those who have attended such meetings, while they include formal lectures, the part of a scientific meeting that is best remembered and potentially most valuable are the countless contacts made outside lecture halls. These connections, conducted in, and made possible by, the common language of science, lead to both scientific

Cultural exchanges can have surprising effects on the practice of science.

collaboration and the kind of cultural exchange that can have surprising effects on the practice of science in labs all over the world.

Like other scientific meetings, these gatherings are, in a sense, gateways to deeper cross-cultural exchanges. For some young scientists they have been the inspiration to broaden their research, the birthplace of international research partnerships, or the impetus to embark on a research career abroad.

INSPIRED COLLABORATION

For many fields, collaborations between scientists of different nationalities and across countries are so important that research breakthroughs could hardly be made without

them. For example, in physics, 'big science' like CERN's Large Hadron Collider is far too expensive and complex for any one nation to accomplish on its own. Yet whether the field is inherently interdisciplinary, like systems biology, or highly specialized, such as theoretical physics, the opportunity to work together promotes not only technical exchange, but a cross-cultural fertilization of ways of conducting research.

"Wherever Italians go they are well accepted for their scientific skills and for other kind of skills," says CarloAlberto Ratti, a PhD student in theoretical physics at the University of Milan-Bicocca. "People abroad say we are funny — I don't know why," he adds with a grin.

Immediately after the Nobel Laureate Meeting at Lindau, Ratti had an opportunity to show off some of what makes Italy and its scientists unique to a group of new friends he met at Lindau. Ratti's new friends were attending a small science conference in Turin, and they took a detour to visit him in Milan.

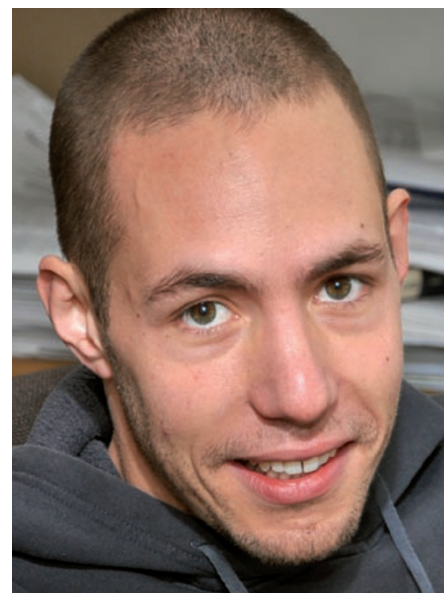
"I don't like Milan because I think it is a very gray city," admits Ratti, "But they fell in love with it — they were astonished by the town!" There was a return visit: Ratti went to see his new friends at the John Hopkins Hospital. For a theoretical physicist, Ratti found his tour of a biology laboratory very revealing.



CarloAlberto Ratti, Jose Ramirez and Grace Wang in front of the Washington Monument.



Roy Ziblat (Israel).



Emmanuel Unuabonah (Nigeria), Wang Likun (China) and Baybars Kuelebi (Germany).

Despite what Ratti describes as a dearth of funding for basic research relative to other countries in Europe, Italian scientists are in demand for international collaborations not only because of their skill at research and a history of innovation and learning stretching back to the Renaissance, but also simply because scientists from other countries fall in love with Italy itself.

Scientists like Ratti have leveraged the unexpected — the physical beauty of their home and the reputation of its people for warmth and an enjoyable lifestyle — to forge connections with scientists in countries with more resources.

LINDAU WRIT SMALL

The value of Lindau-like international meetings is well recognized. Today countless universities, government agencies and private, not-for-profit foundations sponsor smaller, focused versions of these meetings: they are often deliberately restricted to researchers from a less expansive geographic area, and may even be on a single subject.

Even such focused meetings can involve scientists representing a broad array of disciplines and countries, as Roy Ziblat, a Ph.D. student in structural biology at the Weizmann Institute of Science in Rehovot, Israel, found out. In March 2010, Ziblat organized the first ever International Student Workshop on Lipid Domains, which attracted 70 scientists, two-thirds of whom were from outside Israel.

The study of cell membranes requires expertise in biology, chemistry and physics. “There are researchers from all these backgrounds [working on lipid membranes], but there aren’t conferences involving researchers from all these areas of study,” says Ziblat.

Bringing together scientists from such diverse backgrounds — even those who are working on what is essentially the same problem — meant that Ziblat and his co-organizers

must conquer a linguistic barrier that arises even when scientists are all ostensibly speaking English: jargon.

In the first two hours on the first day of the conference, attendees were split into two groups: one, mostly physicists and physical chemists, were given a lecture on lipid-membrane biology for non-biologists; the second group, mostly biologists, learned about the physics of lipid barriers. Thanks in part

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to Ziblat’s tactics, the meeting was such a success that the Weizmann Institute will sponsor other international meetings on a variety of subjects — the next one will cover scientific archaeology.

KNOWLEDGE TRANSFER OR BRAIN DRAIN?

Scientific exchanges, particularly when they are between countries with different levels of economic development, can involve more than just knowledge transfer — for better or for worse.

The Fundación Ciencia para la Vida, in Chile, has a joint programme, Science and Friendship, with the University of California, San Francisco. The explicit goal is to establish scientific partnerships, and the mechanism is an annual meeting in Santiago, Chile. This brings scientists in Chile, such as Alejandro Montenegro-Montero, a graduate student in molecular genetics at Pontificia Universidad Católica de Chile, together with US scientists on an equal footing.

These connections are worthwhile. “There are things that can be done in the US that cannot be done here in Chile,” says Montenegro-Montero, because they require resources that simply are not available. But rather than

being a cause for envy, these interactions are inspirational.

“When people in the lab come back from abroad, it inevitably helps the quality of the science here. We get the feeling that you can actually do great science here, even though you have a limited budget or other limitations,” says Montenegro-Montero. “You have to be crafty.” This, he contends, is an advantage later on, because it makes Chilean scientists more effective when they do research in labs that have ample resources.

Resources are also limited in Nigeria. Emmanuel Unuabonah is a surface chemist, a member of The Academy of Sciences for the Developing World, and a faculty member at Redeemer’s University in Redemption City, near Lagos. He has attended three international meetings including Lindau, and completed the final year of his PhD in China — yet unlike many of his fellow internationally mobile Nigerian scientists, he has returned to his home country.

“[Nigeria] is an exporter of PhD potentials,” says Unuabonah, “They get their PhDs abroad, and ninety-five percent don’t return.”

Part of the attraction in working abroad is access to modern facilities. “[The situation in Nigeria] is simply a drag on my productivity,” says Unuabonah, whose current work revolves around modifying clay with inorganic salts in order to develop a simple and cheap system for wastewater treatment. “There are reactions I need to run for 72 hours at a stretch, but I have never gotten power for such a long time without it going out. It can be frustrating.”

Halting such a brain drain is one of the reasons that Unuabonah helped establish the Nigerian Young Academy with the Nigerian Academy of Sciences. The Young Academy was inaugurated in August 2010, and is a first step, he says, to hosting international meetings like Lindau.

Scientists who have at least a masters degree will be eligible for funding for interdisciplinary research. But even with the added support, convincing young people to go into science will be an uphill struggle: in Nigeria, the younger generation is more interested in going into lucrative professions, such as politics, banking and finance. In Nigerian colleges, the business students outnumber science students 40 to 1. “[With this academy] we will try to reinvigorate science in the minds of young ones, as it is almost forgotten here in Nigeria,” says Unuabonah.

CULTURAL MIX

In China, the Sino-German Center for Research Promotion focuses almost exclusively on international meetings. The foundation’s mission, to promote collaboration between scientists in China and Germany, especially those at the beginning of their careers, is accomplished through workshops lasting 3 to 5 days to bring together up to 40 students at once, from both countries.

Wang Likun is a member of the centre and a PhD student at the Chinese Academy of Sciences. As China’s economy — and consequently its scientific enterprise — grows at a breakneck pace, Likun is witnessing the changes wrought by exchanges like these.

Twenty years ago, says Likun, his advisor worked in an environment in which scientists mostly published in Chinese-language journals. “Now, as many scientists return to China from other countries, we are more willing to share our research with scientists in those countries. Many more papers are published in international journals, and some are in top journals like *Nature* and *Science*,” says Likun.

Coincident with this increased openness is a growth in the number of research collaborations with scientists and groups outside China. This has led to subtle changes in the culture of science in China and across Asia, where traditional Confucian values mean that authority is accorded a great deal of respect. “In Taiwan, if you do research with a professor, it’s like a boss and a worker. There is a hierarchy,” says Sophia Li.

However, as Likun observes, even in mainland China there is a gradual adoption of more Western research practices. “We now have a happy hour which is held on Friday afternoon every week,” says Likun. “Students and PIs [principal investigators] get together and share their experiments and talk about everything. This activity is just beginning — it started in recent years as some PIs have come back from abroad.”

SCIENTIFIC ACCULTURATION

Some scientists see international exchanges as having a profound effect on their local culture of science. In China and Taiwan, scientists like Li and Likun have witnessed a change in lab hierarchies. In Turkey, where Baybars Kuelebi



Inna Pertsovskaya (Spain).

pursued his undergraduate degree, research has changed from being supported entirely by a university to something more “entrepreneurial,” as it is in the US and his current home, Germany.

“The research institute is becoming really strong in Germany, which is also partly parallel to the US,” says Kuelebi, who is a student at the Heidelberg Graduate School of Fundamental Physics. “The university idea of research is decreasing... This old German

“In Taiwan, if you do research for a professor, it’s like a boss and a worker.”

concept is completely going away.” There is a risk that international exchange will lead to a homogenization of science. Yet, Inna Pertsovskaya, born and educated in Russia but now studying for a PhD at the University of Barcelona as a Marie Curie fellow, has found in her experience that the diverse regional cultures of science to be stubbornly resistant to being overwhelmed by outside influences.

“Wherever you are, whether in Spain or Germany, their ways of doing research are different,” says Pertsovskaya. “It’s kind of a good thing — [the Marie Curie foundation] likes you to move because you get more experience from several different labs.”

In countries like Germany, home to the Lindau meetings, many universities have redoubled efforts to attract international students, whose growing diversity contrasts with the profile of professors, who are almost exclusively German.

“Historically, Europe is different from the American type of scientific system. You can see that by the greater number of foreign students with respect to German students,” says Kuelebi.

Kuelebi is in the first wave of international students in Heidelberg. By day, he studies stellar astrophysics, but his other passion is communicating about science on the web. For him,

international exchanges are an opportunity to connect with other scientists who have a similar interest in communicating with the broader public. The web provides a way for him to stay connected with the people he meets, and to collaborate on science communication via the same medium that binds them together.

“These kinds of web things will be very important for the future, to encourage public interest and get people to start participating in science,” he says. “I think it can lead to qualitative changes in science and the perception of science.”

FUTURE LINDAUS

Participants in the Lindau Meetings have found them so rewarding that some have already succeeded in setting in motion meetings that are unabashed copies of it.

Raj K. Sharma, senior scientific officer for the Indian government, describes the meeting his colleagues are working on as a “reverse-Lindau programme”. The name alludes to the fact that, from the perspective of scientists in India, the meeting will be just like Lindau except it will bring the world to India — rather than require that scientists from India travel to Lindau.

A part of the government’s INSPIRE programme, intended to excite India’s youth about science, this reverse-Lindau would invite students and researchers from all over the world and focus on building collaborations between these scientists and the rapidly expanding pool of researchers in India. Details have yet to be finalized, but the simple act of describing it in relation to the Lindau meeting is a measure of its influence on the thinking of governmental scientific bodies in the developing world.

A GLOBAL COMMONS

“When students leave India and come back, I think it actually enhances the level of the research that’s done in India,” says Moupiya Maji, a masters student at the Indian Institute of Science in Bangalore. The transformation is as much cultural as it is scientific, says Maji: by broadening their horizons, scientists in India become better educators of the next generation.

Yet science is also a culture unto itself, and in its protected enclave, conventions and ideas travel far and fast. Increasingly, one could consider cultural exchange as a requisite for success in science — maybe with a dose of a wanderlust.

“I think I could explore the world by doing science. I can go to seminars around the world and talk about science and see their culture and I think that’s very exciting,” says Li. “We have a shared language called science.”

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