about energy and climate change, and Richard Ernst (Chemistry, 1991) about his love for Himalayan art.

As informative and thought provoking as these lectures were, the real high points of the meeting, to me, were the discussions with the students. During the afternoon sessions, the Laureates who had already given their talks that morning were installed individually in rooms where students could ask them questions. No one else was admitted. My session lasted for two hours. I had spoken with students before my presentation, but usually the interactions were general (pictures, autographs, finding out superficially about them and their interests). After my talk, the students knew what my current interests were and the discussions went in all sorts of interesting directions.

Some asked about my career path (checkered) and others wondered if I had any advice (not really). Most of the questions, however, were about the science. From their reading or from simply listening to my talk, the students generated a large number of fascinating questions. They wanted to know details of the experiments and they wanted to discuss potential future experiments. Conclusions about my research that had taken me years to realize (and which I have not written about or described in my talk) were instantly suggested by several of the students at the session. Seeing their excitement and quickness was humbling, but also invigorating. These conversations about the work continued through to the end of the meeting (including on the trip to Mainau), and I was impressed by how intelligent and interested the students were. I wanted all of them to come to my lab.

As informative and thought provoking as these lectures were, the real high points of the meeting, to me, were the discussions with the students.

I had a wonderful time at the meeting, but what about the students — what did the meeting offer them? First, the meeting allowed the students (as well as the Laureates) to broaden their horizons, to have a chance to meet, exchange ideas, and learn about new areas of research from investigators from all over the world (the conference participants came from 67 different countries). The word 'exchange' is important here, because I don't believe that the real benefits were associated with hearing advice from a bunch of older scientists who had been fortunate enough to get some recognition for their work. After all, the students had probably gotten as good, if not better, advice from their own mentors and other investigators at their home institutions.

The second benefit of being chosen to attend these meetings, I think, is the acknowledgement it gives to young scientists, especially at a time when they do not get much recognition, that they are on their way to succeeding in science, and that we think that they are important. Although they really do not need any seal of approval, everyone likes to get the occasional pat on the back. The Lindau Nobel Laureate meetings do a terrific job of giving that pat on the back.

I have been invited to the multi-disciplinary meeting next year. I will definitely attend, and I have already requested that my talk be early in the session, so I can have even more time with the students. I feel fortunate to be part of the discussions. ❐

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Looking back on Lindau

Jeffrey R. Lancaster

The Nobel Laureate Meetings held on the German island of Lindau bring together some of the world's brightest young minds with those individuals who have reached a pinnacle of scientific achievement. The impact of this unique event on all the delegates — especially the young researchers — is far-reaching.

When I stepped off the bus in Lindau, I fully expected to be part of a unique conference boasting an extraordinary proportion of attendees who have been awarded the Nobel Prize, and I was not disappointed. The list of Nobel Laureates scheduled to attend was posted well in advance of the conference, and even the topics on which the Laureates would speak was already known[1]. In this sense, there were few surprises to be had. What did catch me off guard, however, was that my experiences in Lindau were most strongly shaped by my peers — young researchers — followed closely by my interaction with members of the media and the conference support staff.

For a summer in which I attended four important conferences, the Lindau meeting doesn't, surprisingly, stand out as overtly special at first glance. Compared with these other events, the application process for the Lindau event was merely lengthier, but the fundamental principles behind the Lindau meeting were the same as for any other disciplinary seminar, namely to encourage conversation among scientists and to showcase relevant scientific research. However, two subtle points have ultimately distinguished the Lindau meeting for me as a unique event of which I was honoured to have been a part.

First, conversation and the sharing of ideas were fostered not solely between scientists with comparable levels of experience, but also across scientific generations and geographies. I had worthwhile discussions with my peers from Australia, China, India, the Netherlands, Poland and Spain (to name but a few), and was able to speak to scientists at various stages of their careers, from undergraduate to graduate students, postdocs, professors, governmental scientists and, of course, Nobel Laureates. Second, the activities pursued by scientists outside of publishable, academic research also featured prominently at the meeting. That scientists might have a life apart from, and in addition to, their research is most often a topic best reserved for conference

happy hours, not keynote addresses. In Lindau, these activities were granted an equal 'footing' with scientific endeavours, as Richard Ernst (Chemistry, 1991) discussed in his lecture on 'Passions and Activities Beyond Science'[2]. His wonderful account of how his love of Tibetan Buddhist art led him to install a Raman spectrometer near his bedroom for those 'sleepless' nights is truly memorable!

The past

In retrospect, I approached the conference from a perhaps somewhat unique viewpoint, a duality that I am still trying to fully understand. As a scientist, I was drawn to Lindau for the chance to mingle with scientific celebrities, to bask in the glow of their wisdom and knowledge, and to commune with my fellow fans of these heroic personalities. This may all sound somewhat naive, but how often do you get to meet those honoured for discovering the causes of the hole in the ozone layer and climate change? We hold some small hope that the magnitude of the Laureates' contributions, their work ethic and their recognized genius will rub off on us in the early stages of our professional scientific lives. More than anything, I wanted to pick the Laureates' brains about 'how' they approach and go about doing science.

Standing in contrast to my life as a chemist — and like many scientists before me — I am also hopelessly interested in the history and sociology of our profession, its development and its missteps. After reading for an MSc in the History of Science, Medicine and Technology at the University of Oxford, I became plagued by a question that still goes unanswered for me: is there a duty for a practicing chemist to be aware of the sociological development of his or her profession, and to make their peers aware of the problems associated with that profession? The Lindau meeting is one of a special set of hagiographic celebrations that recognizes and reinforces our collective scientific history. The weight of the importance of the Laureates in this history is manifested in the heavy — roughly 7 kg — book *Nobels: Nobel Laureates Photographed by Peter Badge*, which each researcher was generously given[3]. This sizable book contains photographs of all living Laureates, and is imposing on any bookshelf or coffee table, not to mention in hand luggage on a flight home. We gathered in Lindau to honour the heroes in our field, to try and gain something from interacting with them, and to hear from the scientists themselves how history 'actually' developed.

Each delegate was given a stylish conference bag large enough to accommodate the book containing photographs of all the living Laureates.

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As much as the conference is centred on the Laureates, I believe that the true focus was on the young researchers. Through shared experiences such as this we are able to distil what it is to be a scientist, and in that we recognize our identity as scientists. Although not at the forefront of many attendees' minds, I approached the event keenly aware that our inculcation into the professions of chemistry, biochemistry and medicine would be a direct result of the meeting. This is one of only a handful of events that shapes our understanding of what it means to be a scientist, what our place in society can be, and how it feels to be part of a global community of researchers sharing a passion for science. Furthermore, we have now become a part of the history of the meetings themselves, and it is this shared narrative that we will now retell to our peers and to future students.

This penchant for historicity also came out in a wonderful conversation with numerous Laureates (and especially with their spouses!). Helen and Bob Grubbs (Chemistry, 2005) generously shared with me stories about their lives in New York City and at Columbia University, about departmental football and basketball games against the faculty, and about my own boss's celebrated athleticism! Such stories are not just a part of how Science-with-a-capital-S is done, but about what it means to part of a scientific community. From a historical perspective, I saw the wide spectrum of this scientific community on display in Lindau — from the most honoured to the future of the discipline — and as a scientist I was incredibly grateful to be a part of it.

The present

The point was made often, but I think it's worthwhile repeating — the Nobel Prize is a recognition; it is not something that can be sought. During the event, I found the vast majority of Laureates to be modest, warm, and often overwhelmed by the sheer number and enthusiasm of interested students. Some Laureates seemed comfortable in this makeshift spotlight, whereas others shied away from it. I often reminded myself that each Laureate was some graduate student's advisor, that their signature appears on many graduate school forms, and that they — like me — were in the middle of juggling not only the conference, but research responsibilities back home.

I must admit that I was not scientifically interested in each and every Laureate's address — I can't imagine that any attendee could have been! I was, however, fascinated by the opportunity to hear scientists speak about their research and their lives in a forum that recognized their role as progenitors of scientific fields. To hear Rudy Marcus (Chemistry, 1992) discuss problems of 'on-water catalysis' that he is currently researching, juxtaposed with a narrative about the development and use of green fluorescent protein from Martin Chalfie (Chemistry, 2008) was truly extraordinary. As an observer, the gathering at Lindau seemed to me to be an opportunity for many of the Laureates to reflect on their careers while simultaneously looking forward with a still-active sense of scientific curiosity.

That position, however, also seems to be problematic for the Laureates. Throughout the meeting — in panels about renewable energy and climate change (principle themes of the meeting) and in 'young researcher only' breakout sessions — some Laureates were asked to speak about issues beyond the fields for which they were recognized with the Nobel Prize. Some Laureates, such as Sir Harold Kroto (Chemistry, 1996), welcomed the opportunity to discuss opinions on issues ranging from the relationship between science and religion to renewable energies. The resulting debates were lively and had the effect of placing the Laureates on the same level as the graduate students, as educated — though non-expert — 'everymen'. Other Laureates avoided speaking outside their fields of expertise and were unable to contribute to

discussions except as technical experts. By no means am I arguing that one approach is better than the other. However, I believe it is important to at least recognize — especially in such an international forum — that Nobel Laureates are educated individuals, but not experts in all fields. I was glad to hear that many had intelligent thoughts on the important political and scientific issues of our day, but I would be wrong to take those views as any sort of gospel. Instead, their opinions spurred me to think more critically about topics that particularly appeal to me.

Of all the fascinating components of the conference, the 'young researcher only' breakout sessions were where much of the magic happened. Touted as a one-on-one opportunity for dialogue between Laureates and students outside the purview of the media, organizers and chaperones, the group discussions allowed the Laureates' personalities to shine. Some Laureates prepared secondary lectures, whereas others came willing to discuss anything and everything on the young researchers' minds. I think equally important to the Laureate responses, however, were the questions and issues raised by the graduate students; this opportunity showcased what we wanted to learn from the Laureates. Students asked questions ranging from specific scientific ones, to the role of scientists in society, from thoughts on education, to proposed collaborations. Students at the sessions I attended were most interested in the Laureates' personal narratives and in the broader ways that scientists interact and — more importantly — can advocate in sociopolitical environments. As young researchers we know that our voices will be important in future scientific discussions, but many of us were unsure whether we have the tools necessary to make them heard.

Magic also happened among the young researchers outside of the lecture halls, at planned lunches, during coffee breaks, and at informal gatherings. Although conversations often first turned to 'what you're working on', discussions seemed to move smoothly beyond research to differences among national education systems, the shared plight of graduate students, and what to do when not doing research. Networking among graduate students was further encouraged with the issue of free cellular phones equipped with unlimited text-messaging for the duration of the conference, custom-printed business cards, and a tome of attendee biographies and résumés. Now and in my future professional career, I believe the resources I received and the connections I made at Lindau will be invaluable assets for collaborations, postdoctoral opportunities and professional connections. For me, this time with my peers was the most rewarding and validating thing I took away from the conference.

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Martin Freeth (left), one of the UK's most experienced science-film producers, and 'Glidecam' operator Lucas Franz (right) hard at work capturing footage for nature.com's 'Nobel Reactions' series of films from Lindau.

The future

For a meeting with the themes of renewable energy, sustainability and climate change, the outlook for my generation of scientists is both rife with opportunity and fraught with peril. At times, it seemed that many of the Laureates' discussions placed the onus of solving these great dilemmas directly on our shoulders, suggesting that we must take up these challenges and use our ingenuity to overcome them. But every generation is faced with great problems that must be solved, whether that particular dilemma is a global environmental issue, the dawn of atomic weaponry, or the changing of fundamental paradigms about matter. Although my generation of scientists will undoubtedly be burdened by the mistakes of previous generations, we also have the chance to confront and ameliorate them for the greater good.

And although these problems will continue to be pressing, we cannot shelve, forget, or neglect the many other open scientific questions. As graduate students with dissertations to write, it would be easy to return from Lindau and just refocus on our chosen problems by taking a tunnel-vision view of science.

In some small way, however, we must remember to keep open the opportunities for collaboration stimulated in Lindau. Whether through Facebook, MySpace, Twitter, Epernicus, LinkedIn, instant messaging or good-old-fashioned e-mail, the social aspects of science are crucial for solving each and every one of the problems we face as scientists. I smile whenever I see an article published by a friend I made in Lindau, both to honour their hard work and in thinking back to our time there. I hope we find ways to use the connections made during the conference to their fullest potential.

I went to Lindau knowing that my time there would be short, that it would be precious, and that I wanted to share it with a number of people who could not make it there themselves. Foremost, as a National Science Foundation Graduate STEM Fellow in K-12 Education[4] working with teachers and students at Peter Rouget Middle School in Sunset Park, Brooklyn, New York, I had a unique opportunity to expose urban middle-school students to the idea of the Nobel Prize and hopefully to some of the Laureates themselves. Students were asked to randomly select a Nobel Laureate from a set composed of Laureates both historically famous and those who would be in Lindau. After researching their biographies, students then developed interview questions appropriate for the Laureates, ranging from enquiries about their inspiration for scientific discovery to what kinds of student

they were in school, from what it was like to actually win a Nobel Prize, to how hard they had to work to get there. Although my initial plan to record the students asking questions on videotape and Laureates responding to juxtapose them in conversation went unrealized, students were able to see that the

> This is one of only a handful of events that shapes our understanding of what it means to be a scientist, what our place in society can be.

Nobel Prize is one example of a very public recognition for academic success. Exposing students — especially those from minority and low-income backgrounds — to this type of recognition of scientific achievement may be integral in them becoming interested in pursuing science in school and, eventually, as a career. My time in Lindau will therefore not only inspire me in my studies, but it has a far-reaching potential to inspire these students in theirs.

At the time I did not realize that this exercise with my middle-school students was preparing me to produce a recorded conversation of my own for a film series produced by *Nature*[5]. After a lengthy application process I was selected to 'chat' with Richard Schrock (Chemistry, 2005) along with Christer Øpstad, a fellow graduate student from Norway. The most fruitful aspect of our discussion — aside from engaging Schrock about my own research — was gaining his insight into how to go about selecting and pursuing research questions, and I found his approach to the questions he has chosen to be truly fascinating. We also discussed a wide range of topics, such as metathesis, polymers, catalysis and open problems in each of these areas. Our conversation is available to view online as well as other videos of graduate students in conversation with Laureates who attended the meeting.

There is an irony to the Nobel Laureate Meetings in Lindau that as young researchers we are allowed to attend only one meeting. And although common wisdom says that we must earn a Nobel Prize in order to attend any future gatherings, my hope is that what we were able to take away from the conference transcends geography and scientific generation. I hope I have been able to capture for the reader a glimpse of my experience in Lindau. I don't claim this to be universal, but more importantly I hope that my fellow young researchers gained a similar perspective in Lindau, and will apply it to their own experiences in future conferences, meetings and collaborations. ❐

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