Molecules Drawn on a Cave Wall

Reflection on a trip to Germany

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1pm; left Hanover, New Hampshire on the Dartmouth Coach; 4pm; arrived in Boston; 7pm; flight departed; seven hours to London's Heathrow Airport without sleep, 5am London time; flight lands; 7am; flight to Berlin; arrives 10am at Berlin Tegel; we meet our amiable guide Elisabeth; three hour bus ride to Rostock.

1pm Rostock, Germany time; (6am Boston time, 20 hours without sleep so far); check in to Pentahotel for brief resting time (cheers); take tram to University of Rostock to check in for conference; greeted by conference organisers; walk to docks for boat trip to Warnemünde on the Baltic Sea; arrive at destination and walk along main street; surely we're still in Boston and my mind has only lost its interpretation of language due to lack of sleep; a fashion show is sighted(!), as is food; boat trip back to Rostock harbour; swaying stroll to University of Rostock; an opening conference social; antisocial in my case—-unable to speak proper sentences due to lack of sleep; long chilly walk back to hotel; sleep at 12am.

Total length of day: 31 hours.

Keep in mind this is just a journal entry for Day 1 of the 2012 NSYCC/JCF German Exchange Program. It was a journey through science and culture in Germany, at versions of light-speed where time somehow manages to impress memories into one's mind by the nanosecond. For the young chemist looking to find a library of experiences, emotions, and friendships in seven days, look no further.

Sitting here three months after the trip, I've reached a stage where some of these memories are resurfacing. One in particular, is the idea of speaking in a common language. The Frühjahrssymposium is attended by chemists from all over Europe— indeed, the airspace during social functions might as well be a language battleground! But so that science can be conducted amongst all attendees, the conference is formally run in English as it is a language that most scientists have in common.

English is not perfect, but it gets the job done for a scientist-to-scientist conversation. For a scientist speaking to a non-scientist: not so true. At best, a chemist can get an outwardly-enthusiastic inwardly-stupefied glance from a parent or friend when sharing a recent development at the lab. In most other cases, WE are at a loss for words when asked that simple question: "What do you do as a chemist?"

It is through a long-standing friendship with a grade-school friend of mine that I first encountered the challenge of communicating science. Bryant had his sights set on a career in politics, and soon after we both began our college studies, frequent lively debates became a staple of our friendship. Like all political science college students, Bryant had no difficulty

presenting a convincing argument. He was a sturdy wall, thick with ideas painted onto the surface in rich colour, and my viewpoints like feather duster assaults.

The fact that I couldn't make headway in proving an opposing point during our debates didn't feel too threatening; that is, until the day that *science* was our topic of discussion. The subject was global warming, and Bryant was telling me about his field studies on carbon dioxide levels in Antarctica since the last ice age—well, he was recounting sections from a book that he had read, but his eloquence nearly convinced me that he had sailed down to the ice cap and done the studies himself! He was a politician disguised as a scientist: he had discovered his results; he had formed his conclusions; and then that sense of having unearthed a new relic had urged him onto the podium to tell the world about it. He could spin an enthralling tale about global warming, regardless of whether there was underlying science or not.

That was threatening, and it caused me to reflect on my own obligations as a scientist just having begun graduate study. Perhaps the brainstorming, the research, the gathering of data, the putting it together into a theory, and the publishing of it into a journal, is all just Step 1? Perhaps science is also a subscription to *sharing* one's findings, so that they can contribute towards a collective objective? Scientists are diverse in their expertise, but one commonality that connects them is willingness to learn new things. Moreover, scientists all have stories to share: stories that are growing daily with each incremental or revolutionary discovery. Step 2, I came to believe, is the challenge of tying these two together. It is telling a truthful, objective, relevant *story* of one's scientific ideas to other scientists, as a means of contributing one's knowledge toward a central problem at hand.

In fact, it's the NSYCC/JCF Exchange and Frühjahrssymposium, where science, culture, and society are woven together so tightly that one wonders how they could ever be imagined as separate.

And that's because they're not separate. Reflecting on the trip across the Atlantic has convinced me that there is one more step for the scientist: contributing our discoveries to society via a common language. We live in a world that has needs, and seeks progress. The obligation of the scientist in this context is, I feel, to understand the nature of our current challenges and propose thoughtful solutions. Step 3 is convincing everybody else beyond science—the public, political, and commercial sectors—that science is worthwhile. It is seeding a sense that scientists can be *trusted*: to deliver on the funding they receive; to consider the possible solutions and outcomes of the problem at hand; and to give advice grounded in objective facts. But science is not going to gain trust by sending around its latest spreadsheets of results. Those beyond science don't speak this language. Rather, science needs to tell a compelling and relevant *story*—a language that has been intrinsic to the human experience since days of the cavemen.

American politicians figured out how to leverage the tools of Story long ago; however, science should be cautious not to follow the trajectory of that field. Bryant and I recently discussed what distinguishes a "policy" from a "theory". A theory begins when a scientist has an idea; so too a

policy begins when a politician has an idea. But if a scientist is a proper scientist, the theory must change as supporting or contrary facts arise. Scientists must be willing to admit they were in error, misled by an anomaly in their data, or so on. A scientist who does the reverse—alteration of facts to fit the theory in its preconception—is a mythologist.

On the other hand, a policy appears to be about defining a structure that is sturdy and *un*-changing, then working to nourish it by supporting evidence while relegating the unsupportive evidence to the proverbial paper shredder. In fact, it's almost the polar opposite of scientific method. I questioned Bryant: is this so that the politician can, in the long run, avoid saying that torturous self-deprecating phrase: "I'm sorry, but I was wrong"?

At least for wedge issues such as global climate change, it seems that the mythologists of the scientific community—those who are most willing to turn their theories into policies—occupy a dangerously large proportion of space in public media at present. This is a real shame, because that small fraction of the community carries such a raucous voice over the diligence of all the rest. It represents scientific story-telling gone astray from what science actually is.

Developing a common language between scientists and society will ensure that our discoveries are not lost in translation. We are human, and thus, we are capable of telling stories. What remains is a responsibility to use our minds and formulate NMR spectra, reaction mechanisms, protein folding pathways, into a tangible story that hits home to our target audience: the human race.

It is tempting for the creative mind to turn a story into a tall tale. Please: let's leave that genre to writers of fiction and ensure that stories of science are grounded by facts such as two hydrogens and an oxygen constitute water. Period.