

The Molecular Frontiers Foundation: Capturing the Interest of Young Minds

Bengt Nordén*



Bengt Nordén
Chair Professor of Physical Chemistry
Department of Chemistry and Bioscience
Chalmers University of Technology

Science fires our imagination about what might be possible. It helps us approach and possibly answer ancient enigmas: How did life begin? How does memory work? How do we use the energy around us to accomplish our tasks without harming the world we live in? Science also brings together people of all ages and backgrounds to share ideas, to carry out experiments that test hypotheses, and to catch inspiration.

The Molecular Frontiers Foundation (MFF), a nonprofit organization that is hosted by the Royal Swedish Academy of Sciences and claims on its homepage “Molecules Are Everything ...”,^[1] has two purposes: to identify, early on, breakthroughs at the frontiers of scientific research, and to make society, and particularly young people, interested in science. For this purpose, the vehicle is the molecule, central to everything around us, most notably to the things we need for living: the air we breathe, the water we drink, and the food we eat. The fuel is curiosity. The MFF seeks to increase the interest of young people in science by recognizing that creative inquisitiveness is a skill that can be honed and rewarded.^[2]

Asking thoughtful questions is an ultimately democratic activity: curiosity is abundant in all young people, regardless of geopolitics and socioeconomics. When the Inquiry Prize of the MFF was launched in 2007, it was the world’s first ever science competition that rewards questions rather than answers.^[3]

Since then, several other question-focused competitions have appeared all over the world and the ongoing, curiosity-fueled conversation with young people has even helped scientists identify the potential roles of chemistry and other molecular sciences in addressing global challenges.

Curiosity is abundant in all young people

Our idea of promoting the questions rather than the answers was that it would inspire to independent analytical thinking. It also contained some rebellious thinking that we thought might appeal to the young mind: you may forget your (boringly authoritative) textbooks once you yourself find a good “Why?”. I myself find it both refreshing and clarifying to go back to the original articles by great scientists to see what they really thought and what questions they focused on. For example, Albert Einstein asks questions about molecules in his PhD thesis, which was on the physical chemistry of diffusion and how many atoms there are in a mole. Of course, modern textbooks are often more pedagogical, but it can happen that in his endeavor to interpret the original theory, an author makes science more complicated than it needs to be. In the history of science, the minds of individuals are fascinating and could help young people not only understand the science but also inspire their curiosity. Our Inquiry Prize contest has shown ample samples of original thinking by young people: “Why are plants not black?” was one question that was awarded.

Historically, the MFF is the offspring of the interdisciplinary success of the Nobel Centennial Symposium on “Frontiers of Molecular Science”, which celebrated the 100th anniversary of the first Nobel Prize in 2001.^[4] And it is also inspired by a decision taken in 2006 by CERC-3 (Chairmen of the European Research Council Chemistry Committee) to try to address “chemophobia”, that is, the negative perception that chemistry is just pollution and dirty chemicals.

As Chair of the Nobel Committee for Chemistry and later of CERC-3, I was involved in the conception of the MFF. The 2001 symposium, which spanned an unusually broad range of problems, from physics to biology and medicine (with chemistry in the center), demonstrated the molecular paradigm as a unifying factor that enables very generic aspects to be phrased and discussed by scientists with very different backgrounds—even to the surprise of some of them.^[4] Many (both earlier as well as later) Nobel Laureates participated, some of whom today are members of the Scientific Advisory Board of the MFF, which consists of 30 scientists, of whom 13 are Nobel Laureates.^[1] Our chairman is Ahmed H. Zewail.

However, it is the outreach endeavors that have given the MFF its global character, the symposia where top scientists and high-school students gather together to discuss fundamental prob-

[*] B. Nordén
Department of Chemistry and Bioscience
Chalmers University of Technology
Gothenburg (Sweden)
E-mail: norden@chalmers.se

lems, and where the annual awards are announced to those five boys and five girls from all over the globe who ask (not answer!) the best questions.

This year, a hub of the MFF for Asia has opened in Singapore, hosted by the Nanyang Technology University and its President Bertil Andersson. In April, some 400 high-school students gathered with top scientists in their fields at a Symposium of the MFF on “Emerging Technologies in Bio-Medicine” in Singapore.^[5] At the subsequent Symposium in Stockholm in May, top researchers in the world are addressing “How Chemical Cycles Shape Our Planet: The Global Challenge”.^[5] The moderator is the President of the MFF, Richard N. Zare.

The Symposia of the MFF address timely topics from very wide angles: from nano- and biotechnology^[6] to the origin of life, alternative energy, finance, and medicine.^[7] The MFF also invites young people to bring their curiosity about the world and the future to further fuel this enterprise. The answer to one question often leads to a set of new and, perhaps better, questions and moves our imagination another step ahead. As put so well by Francis Crick in a BBC interview in 1987: “Big questions get big answers.”

One reason why top scientists and many others contribute enthusiastically on a voluntary basis to the MFF is their deep concerns about our future. Science has played, and will continue to play, an indispensable role in how we deal with natural resources, environment, diversity of life on earth, and human health, problems that lie close to our hearts and directly affect us. Many examples from the history of science show that we are usually hopelessly inept at predicting future consequences of serendipitous fundamental findings: their general im-

portance and practical applications (and occasional harmful effects) are often initially obscure.

2012 Symposia of the MFF in Singapore and Stockholm

To further develop our society, and to understand the importance of advances in science, we need not only a new generation of talented scientists—we also need those who are *not* scientists to partake in the ongoing global scientific discussion. Politicians sometimes appear disconnected from science and one could envisage the fatal consequences if the knowledge gap in scientific understanding between the leading scientists and the public (and politicians) becomes so large that communication is lost.

So what are the goals of the MFF and what will happen in the future? The current interest in the symposia of the MFF and internet activities shown globally is promising from a number of perspectives. Firstly, symposia where curious young people meet across the borders of nations to address scientific questions also have another important dimension: catalyzing communication between different cultures—in a longer perspective that supports mutual understanding, stability, and peace. Secondly, the remarkably higher interest often found among young people from the developing world could facilitate a more general interest and focus on questions important to us all. My hope is that this curiosity could be infectious!

Finally, although probably obvious to all readers of this journal, it could not be emphasized enough that science is useful! The economic success of Singapore

and other East Asian countries a couple of decades ago and of China (and even India) today is partly based on the fact that these countries offered good opportunities for university studies in engineering and science *and* convinced many young people to use these opportunities. In China, about half of all university students today study science and technology, and 35% in Finland, compared with 17% in Denmark and 12% in Africa. I am convinced that the economic development of nations depends to a large extent on their ability to motivate young people for careers in science and technology, the quality of secondary school science and mathematics being a key issue in this context—here the MFF may have an important role also by connecting with science teachers.

The requirement of speakers at the symposia of the MFF to address a broad audience has, I believe, also greatly stimulated making the lectures understandable (to non-expert academics too) and to advance how we think about the problems: what we know and what we do not know and, not least, what we do not understand at all. The latter challenges seem to be universal in their ability to turn on young minds.

[1] <http://www.MolecularFrontiers.org>.

[2] <http://www.MoleClues.org>.

[3] J. Kotz, *Nat. Chem. Biol.* **2007**, 3, 79.

[4] http://www.nobelprize.org/nobel_organizations/nobelfoundation/symposia/chemistry/ncs-2001-2/about.html.

[5] <http://www.molecularfrontiers.org/pages/programs/molecularfrontierssymposium.php>; <http://www.kvase/sv/Kalendariumlista/Event/?eventId=391>.

[6] <http://www.molecularfrontiers2008.com/>.

[7] <http://www.molecularfrontiers.org/pages/events/pastevents.php>.