

PARENTS LEAGUE OF NEW YORK

Review 2010

Essential Articles on Parenting and Education

A Life in Science

An Interview with Dr. Paul Nurse

Paul Nurse, Ph.D., is the President of The Rockefeller University. He is the recipient of, among other awards, the 2001 Nobel Prize in Physiology or Medicine. Dr. Nurse has been honored with knighthood in Great Britain for his services to cancer research and cell biology. Here he answers questions posed by the Parents League.

- ◆ Tell us about your childhood. How did you first become interested in science? Did your parents encourage this interest?

I grew up in London in a family that was neither wealthy nor academic. We lived simply but comfortably, and my family was always supportive of my academic efforts and aspirations, both at school and university.

As a primary school student, I had to walk a long distance to and from school. This walk took me through a park and some rough land where I could not fail to notice the animals, insects and plants and how they changed during the seasons. These walks awakened my powers of observation and aroused my curiosity. I recall wondering, for example, why leaves were larger on plants growing in the shade compared with the same plants growing in sunlight.

During the winter my attention was attracted to the stars and planets. I have a vivid memory of watching Sputnik 2, the second ever artificial satellite and the first with a living cargo (a dog called Laika), as it sped across the skies of London. A life-long interest in astronomy started then, and I still use a telescope for astronomical observations.

My passion for biology grew out of my early interest, as well as a profound interest in how living things work.

- ◆ Looking back, can you identify the roots of your success?

My driving force in pursuing science has always been curiosity along with a desire to come up with good explanations for scientific problems. I'm sufficiently competitive that I want to be doing interesting projects

successfully, but I'm not driven by wanting to get the results published a month or so before someone else. And I love experiments. Scientific inquiry can be very slow—experiments can and do fail and this can be demoralizing. It has also helped that I have chosen problems that not only interest me, but which could be addressed.

I also have had the good fortune to land in a number of supportive learning environments along the way. In primary school I had teachers who made the world seem a fascinating place and who encouraged my innate curiosity. Later, at secondary school, I had a biology teacher who encouraged me to do real experiments. I had a great time investigating the pigments of different fruit flies by following experimental protocols published in *Scientific American*. And all along the way I have found supportive and encouraging mentors and colleagues.

This is not to say that the path from school to the Nobel Prize was always easy. I faced a major obstacle when I was not able to get into a university. I had examination grades that should have gained me entrance, but I failed an elementary French language exam that was required for university—six times. I find learning languages impossible.

When I left school, I went to work as a technician in a microbiology lab run by Guinness. This turned out to be a great experience for me. I had a very sympathetic lab head who rapidly realized that I could do what was expected of me on the job in a couple of days each week. He encouraged me to carry out research experiments for the rest of my time. So I continued on my scientific path even while deflected from the conventional academic course of study in science.

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I was finally accepted by Birmingham University to study biology despite the fact I never passed that French exam. (The language requirement was waived for me thanks to the intervention of a genetics professor who took an interest in my application.) Subsequently, I moved on to the University of East Anglia to do a Ph.D. UEA was a new university with a new way of doing things; I liked this. But I was often working alone and my experiments often failed. At one point I actually contemplated alternate

careers, such as philosophy or the sociology of science. I became very self-motivated and very self-reliant—learned to trust my own judgment.

In choosing what I study, I am predisposed to try something new, something that has not been tried before that attracts me intellectually. That's what I did when I started asking questions about what governs cell division. There was not much enthusiasm in the research centers for those

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questions when I began—I had a hard time finding a job doing that research. My research showed that the genes controlling cell division in yeast—the model organism that I study—have the same control over the life and death of human cells. This led to new understanding—the ultimate reward for a scientist.

So to return to your question about success, I would say the difficulties I encountered developed certain qualities in me that have served me well—persistence, self-trust, a deep appreciation for the supportive colleagues and cooperation. I suspect that people who have it easy early in life can actually be at a disadvantage. They think life runs on rails—but it does not.

◆ It is striking how happy and animated you look. Were you a happy child or is it your work today that makes you happy?

I grew up in a loving home and was happy as a child. My work today—both in the laboratory and as head of a wonderful scientific institution—contributes to my happiness also. But there is more to say about this question of happiness. I have an idealistic view of science and what it can do for humanity. Better understanding of the natural world not only enhances all of us as human beings, but can also be harnessed for the better good, leading to improved health and quality of life. It is also a truly international activity which breaks down barriers between the peoples of the world, an objective that always has been necessary and never more so than now. Beyond all that, scientific understanding is often beautiful, a profoundly aesthetic experience which gives pleasure not unlike the reading of a great poem. So

it's not just that my work makes me happy; I feel privileged to be able to do the work that has come to me, work that is satisfying and has the potential to help others.

◆ What should schools include in their science curriculum?

We live in a society where increasingly complex scientific issues must be engaged by the public and addressed by the government for the well-being of all. I think the level of recent debate on such questions as global warming, stem cell research, and the origins of life (evolution vs. “creationism”) indicates the need for a far better public understanding of science, as well as a far better attunement to the complexity of the issues. The country's ability to harness science for the public good depends on developing these qualities in coming generations.

But the challenge here is great. The big issues that we need to take on often touch long established beliefs, both religious and cultural. Beyond that, the lay public tends to yearn for a level of certainty that science cannot often provide; it is also accustomed to receiving information in 15-second sound bites, whilst scientific complexity requires more in the way of explanation.

I do not pretend to know a great deal about science curricula or instructional methods in U.S. schools, but I do believe that these institutions can help address the challenges we face through science instruction that promotes a true understanding of what science is about—how it is conducted, what its limits and possibilities are—in addition to the mastery of scientific and technological knowledge.

◆ You have won many awards, including the Nobel in 2001. Do you believe in prizes and awards at the elementary and secondary levels? And may we ask, were you always a good student?

To me, it is not so much a question of whether prizes in the schools are a good or bad thing; it is more a question of the context or total learning environment in which they are awarded.

Rewarding extraordinary achievements can be a very good thing. The benefits extend well beyond the recipients of awards. For many people, it is inspiring to see others honored and recognized for outstanding achievements. We don't know what kind of efforts toward excellence these prizes may elicit in others.

As for your other question, I was always a good student with the exception of French!

- ◆ Rockefeller University is organized around laboratory groups, many of which operate in open plan labs. Do you think there are parallels that could be applied to elementary and secondary education?

Rockefeller is unique in that we are not organized by departments. The unit of organization is the laboratory. There are 70 lab heads on campus, all of whom report directly to the president. Harvard Business School would

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call this a recipe for disaster. I prefer to think of it as organized anarchy. But the most important thing about this organization is that it dispenses with barriers that keep scientists and ideas from different disciplines from coming into contact. It is an environment that fosters interdisciplinary approaches to problem-solving and in which science seems to flourish.

I do think that many high schools and colleges are adopting interdisciplinary approaches to science and other fields, and this is a good thing. Breaking down “silos” of knowledge or learning—and putting an emphasis on integration—can foster innovative approaches to problems and creative thought.

- ◆ Rockefeller selects a handful of students from around the world for its graduate program. Are there characteristics that the graduate students have in common?

Rockefeller grants its students an unparalleled degree of freedom to explore scientific questions and a rare degree of financial as well as personal support. It is not surprising that it attracts students who gravitate toward an environment where their full creativity and varied interests have a chance of flourishing.

The small size of Rockefeller’s program allows faculty to come to know their students very well, and when it comes time for each student to graduate, the thesis director makes a small speech about the graduate at the convocation ceremony where we award the Ph.D. degrees. I am always struck

by how personal these tributes are and how much they reveal about the immensely varied gifts of the students as well as their depth of character. We learn of scientific insights pursued with tenacity and of the willingness to take on breathtaking scientific challenges. We also learn of unsuspected talents—in areas ranging from musical performance to athletic prowess. And we learn of more homely virtues, such as uncommon devotion to family and friends or some cause aimed at bettering human society. It is astonishing, how capable, creative, and active these students are in many areas, not simply science.

- ◆ The University is one of the few institutions in the city to run an on-site, full-day preschool for its staff. Can you tell us about your experience with the preschool?

I see providing childcare and pre-school education on campus as vital to the University's mission. Our Child and Family Center, which offers these services, is a major reason we are able to attract some of the best young scientists from around the world to New York City. It is important for young mothers and fathers to know that their small children are safe and flourishing. This resource for parents and children has been especially important to our ability to retain and promote outstanding young women scientists, as it really helps them to be good scientists and good parents at the same time.

- ◆ What lies ahead in the field of science and how should schools or parents prepare their children for this future?

Whether or not your children want to be scientists, they will be citizens. As I mentioned earlier, it is increasingly important for citizens to engage science, quite simply, because science impacts so many matters of public policy. If the public does not understand the science behind these issues, we may not be able to exploit scientific knowledge for the benefit of society,

It follows that a minimal level of scientific literacy can be enormously helpful to parents in raising their children. It will help them talk more knowledgeably with their children about scientific questions and to play a more active role in their children's education. Furthermore, parents who take an interest in science may encourage their children to take an interest in science. Such are also more likely to stay abreast of new discoveries that may impact their children's health or development.

At The Rockefeller University, we sponsor an initiative—Parents &

Science—which is a resource in these areas. P&S sponsors events that feature distinguished Rockefeller scientists along with eminent speakers from such fields as psychology, medicine, education and the social sciences. The programs, which focus on recent discoveries relevant to the care and nurturing of children from infancy to adolescence, are a good way for parents to increase their own scientific literacy—and to meet other parents with an interest in science.

- ◆ What can a parent who knows nothing about science do to foster such an interest in his or her child?

New York City has many resources that a parent might turn to in order to foster a curiosity in nature, which is one route to encouraging an interest in science—the American Museum of Natural History and its planetarium, the parks, the annual World Science Festival. Another route might involve exploiting a fascination with electronics and technology. The Internet is a major source of amazing information. Unfortunately, not all of it is true. Still, the Web certainly has the potential to stimulate curiosity and lead kids from one question to the next. Then, too, if you and your family are more politically than scientifically attuned, some of the current debates might prove a pathway into an interest in science. An interest in sports and health could possibly do the same.

As an amateur astronomer, I want to put in a good word for investing a couple of hundred dollars in a telescope for your child if he or she shows any slight inclination toward or fascination with the stars. What can be seen with a modest telescope is quite simply a revelation. Children can look at Saturn and see its rings and look at Jupiter and see four moons going around it—that is, they can see exactly what Galileo saw which led him to argue that the sun, not the earth, is the center of the solar system.

Finally, I think it is vital to support kids in whatever intellectual pursuit or passion they seem to be developing.