An interview with Harold Varmus

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After reaches the pinnacle of the Nobel Prize, what is your interest in working with teachers?

There are two answers to that question. One is that winning the Nobel prize doesn't change my perspective on life that much because I'm not in this game to win prizes. When you came into my office a minute ago we were discussing how we were going to present his results in a paper. Something we've been worrying about. We do experiments, we get results and then try to write the best paper we can. That part of the process doesn't change and we don't change all that much from having these prizes lavished on us. On the other hand, winning a Nobel prize does do one thing to you, and that is you are more conscious of your own personal history, how you got into science in the first place, and why science is a worthwhile endeavor. I was walking up the hill this morning. The year I entered high school was the same year that Watson and Crick published their data, in 1953 and it was at least ten years before I had any inkling of what was going on. I went through high school and college thinking biology was cutting up worms. I went to college thinking that biology was something that you studied to learn about forms of organisms and metabolic pathways so that you could go to medical school. In fact, as a matter of fact, I ended up not studying science as a result of that and studied literature, then went to medical school thinking that I could practice medicine, not so I could become acquainted with the mysteries of the human forms. So at medical school, more or less by serendipity and talking with classmates and through a seminar by a famous man named Saul Spiegelman, I learned about the excitement of Molecular Biology.

And I wondered how my whole attitude toward science would have been changed if, as a high school student, somebody had come over from Cold Spring Harbor Labs - I grew up on Long Island - and said there is a revolution going on in biology right now. We know what genes are made of. It's one of the things that have galvanized not only those of us that do science and those of us that are interested in dealing with school teachers is that biology is in an amazing phase of growth and it is much more important to transmit some of the excitement about this and where the frontiers are, than simply teach students about a hundred organisms and the different phyla, etc. Its interesting in impressing upon them that there are a lot of interesting questions out there that still need to be answered in dealing with the understanding of life at a level that would have seemed impossible 25 or 30 years ago.

What are your experiences with the San Francisco schools?

I have two kids that have grown up in the San Francisco public school system. One is now a junior at Lowell and the other is a sixth grader at Aptos middle school I have to say that I haven't spent that much of my time trying to impress my views upon his teachers, but I have paid some attention to the kind of science education they have gotten. And in my opinion, it has been variable. I have gone to my younger son's school just after the prize, because they were anxious to have me come and sign autographs, but I took the occasion to also talk to them about what a scientist does in a day. I found it very encouraging, despite a couple of students that fell asleep on me. But there were several students that got so wound up about it that they got me to talk about things that I hadn't expected to talk about. For instance about the coding problem, how genes tell cells what to do. So it was clear that even at that age kids are able to take in some of the aspects of molecular biology without knowing any of the chemistry, just because it is now possible to abstract the problems because we can view it as an information transfer. You can use computer systems. How you can put a signal into something and get something back. So you can get across some of the basic principles of molecular biology.

General impressions about direction of science education in this nations.

I'm not an expert on primary or secondary education. I've only seen what I went through and what my kids have gone through. But what I'd like to believe can happen in the schools, particularly in the high schools, is that first of all students can have some exposure to the excitement of biology and secondly that they can learn how a scientist thinks. I think that in some ways that is a much more important gift than learning some of the tools, which they inevitably will learn anyway. They will learn enough math to get along in life, and chemistry is important too, but there is a process of learning how to formulate a question, learning how to answer it experimentally, learning how to evaluate the data you get in a critical fashion that is so essential to science, an probably many forms of life. But many people don't appreciate rational thought that is based on observation, evaluation, and imagination. These have an influence on the aspects of our culture that we tend to value the most. Obviously I'm one who believes that a high school should be a place that one learns literature and philosophy and other things, but most of our culture is based on a rational scientific way of thinking and I find it .... one of my children, in fact has a tendency to feel antagonistic toward that general approach to life,

despite the fact that every moment of the day he takes advantage of its fruits. I'm certainly a great believer in the imagination, because the imagination is crucial to everything that is wonderful in science. But its harnessed to another kind of engine. One that prizes careful observation, critical instincts, reevaluation, testing of ideas, without simple acceptance. So it is that combination that has been powerful in our society. That is one thing that I think a good education is meant to teach people to do.

If you had to pick one thing for a teacher to get across to a student.

I think this depends on the student. I would be content if my older son, who is probably not going to have scientific career, understood some of the joys of scientific method without being able to do it himself. That would be fine. One thing that disappoints me in our society is the fairly low level of information that people have about our bodies work, how cells function. It amazes me that simple things like the coding properties of DNA are not accepted by everybody. Because these are not difficult concepts. They are a hell of a lot easier than understanding the intricacies of 19th century American legislation and that everyone takes away with them; everybody knows the Dred Scott case. I can tell you, having just looked into it, that is much more complicated than knowing how DNA codes for protein. Yet you say that to someone and they think you are crazy. There just ought to be more pathways in ..... for what I've seen happen at Lowell in physics, called conceptual science. It isn't necessary to know all of the chemistry or properties of how DNA works. Obviously, you can't practice science the way we do at UCSF if you don't know the chemistry of the DNA chain, but it is possible to understand the principles and how they affect our society. The simplest example is knowing enough about how DNA codes this information so that we can understand what is going on in criminal courts with regard to identifying culprits through DNA fingerprinting. To make science less intimidating is absolutely now, especially now that we have a clearer understanding of some of the rules. Not just learning the anatomy of 500 different organisms, but really understanding some of the central principles.