Please recall with me five incandescent lines from Act Three, Scene Two, of *Romeo and Juliet*, in which Juliet speaks of death and fame and beauty and nature and love:

> Give me my Romeo; and, when he shall die,
> Take him and cut him out in little stars,
> And he will make the face of heaven so fine
> That all the world will be in love with night
> And pay no worship to the garish sun.

The imagination behind these lines is without peer in the English language.

Now, consider the metaphors describing the big ideas and major scientific mysteries of our age: black holes; anti-matter; quarks; string theory and now, instead of *the* universe, “quantum multiverses.” Some of the metaphors of science are Shakespearean in imaginative scope—because, while scientists do assemble vast amounts of data, science is no more about data than Shakespeare is about the alphabet. As the great physicist and mathematician Freeman Dyson put it:

> The public has a distorted view of science, because children are taught in school that science is a collection of firmly established truths. In fact, science is not a collection of truths. It is a continuing exploration of mysteries. Wherever we go exploring in the world around us, we find mysteries. Our planet is covered by continents and oceans whose origin we cannot explain. Our atmosphere is constantly stirred by poorly understood disturbances that we call weather and climate. The visible matter in the universe is outweighed by a much larger quantity of dark invisible matter that we do not understand at all. The origin of life is a total mystery, and so is the existence of human consciousness . . . . Science is the sum total of a great multitude of mysteries. It is an unending argument between a great multitude of voices. It resembles Wikipedia much more than it resembles the *Encyclopaedia Britannica* (*New York Review of Books*, March 10, 2011).
So, what does it take to educate scientists, those explorers of the mysteries of “quantum multiverses”? With what tools should we equip them for their work in the darkness of Plato’s cave, as they seek to parse the meaning of the shadows on the wall?

Well, certainly they should learn the habits of mind and technique necessary to collect data. They must master the academic disciplines on which science relies: mathematics, computing, biology-chemistry-physics. And they must discover the current dimensions and directions of their scientific fields—so that they can both contribute to the ongoing work and head off in new ways when the time comes.

And when will that be? How will the student be educated to know when it is time for what Thomas Kuhn called a “revisionary revolution”? How did Watson and Crick know when to veer off the mainstream and into the mysterious waters that produced the double helix? What vital educational dimension enabled them to discover or devise the structure of DNA? What educates scientists to become Shakespearean when the time comes?

Why, of course—reading Shakespeare!

The ideal scientific education must prepare students for imaginative breakthroughs by exposure to poetry, theater, art and music. These are the disciplines by which the educated imagination is formed.

This kind of education is, of course, the special province of the liberal arts college and a major reason such a high percentage of graduate students in the sciences come from liberal arts colleges. Eckerd College has developed an extraordinary track record in just five decades of graduating imaginative scientists. Our alumni include:

**Harvey Jeffries,** ’64, a prominent faculty member and research scientist at the University of North Carolina in Environmental Sciences and Engineering;

**George Atkinson,** ’67, former Science and Technology Adviser to the Secretary of State, Professor of Chemistry and Optical Sciences at the University of Arizona, and founder and executive director of the Institute on Science for Global Policy;

**Marion Marshall White,** ’74, senior scientist at Argonne National Laboratory and former Senior Scientific Adviser for construction of the linear accelerator system of the Spallation Neutron Source at Oak Ridge National Laboratory;

**Carlos F. Barbas III,** ’85, recipient of the Arthur C. Cope Award for excellence in organic chemistry from the American Chemical Society and the Janet & W. Keith Kellogg II Professor and Chair in the chemistry and molecular biology departments at the Scripps Research Institute in La Jolla, California;

**Sue Slaugenhaupt,** ’85, Associate Professor of Neurology at Harvard Partners Center for Genetics and Genomics; and

**Aaron O’Connell,** ’05, who built a “quantum machine” that was selected as the 2010 Breakthrough of the Year by *Science Magazine* and the American Association for the Advancement of Science.
The James Center for Molecular and Life Sciences builds on the extraordinary reputation our science graduates have established in just a few decades and on the work of faculty of this College—in both the sciences and the arts—who have contributed to graduating scientists with an educated imagination. Great faculties deserve great support, and the generous donors who supported the extraordinary effort to create this facility have made that possible.

Winston Churchill’s observation about architecture—“We shape our buildings; thereafter they shape us”—is dramatically illustrated by this new facility, which reflects the intellectual fusion of biology and chemistry by inseparably connecting the faculty and labs and classrooms and apparatus for both disciplines: These are not biology wings and chemistry wings—these are science wings . . . and there are spaces everywhere for informal conversation and study and computer docking, places to hang out and talk with fellow students and faculty, places for research and discussion and academic play.

The center of the building is designed to be the academic gateway to the campus, a thoroughfare inviting every student to intersect with these exciting disciplines. This thoroughfare is not simply emblematic of hospitality. It is a physical symbol of an educational necessity. It is not enough to suggest that the arts and humanities simply illuminate and energize the scientific imagination. To the contrary, much of the “commanding energy” of contemporary intellectual life issues from the mathematical and natural sciences. Indeed, it is increasingly clear that the boundaries between the arts and the sciences exist only in the minds of the professoriate and the structures of the academy, as enterprises as various as the mapping of the genome and the creation of the latest Ferrari make clear.

It is, in fact, no exaggeration to suggest that mathematical and scientific pursuits now constitute an alternative poetics, and that more than a passing familiarity with these disciplines is now required for educated citizenship. As George Steiner put it forty years ago:

> The notion that one can exercise a rational literacy in the latter part of the twentieth century without a knowledge of calculus, without some preliminary access to topology or algebraic analysis, will soon seem a bizarre archaism. These styles and speech-forms from the grammar of number are already indispensable to many branches of modern logic, philosophy, linguistics, and psychology. They are the language of feeling where it is today most adventurous. As electronic data-processing and coding pervade more and more of the economics and social order of our lives, the mathematical illiterate will find himself cut off. A new hierarchy of menial service and stunted opportunity may develop among those whose resources continue to be purely verbal (In Bluebeard’s Castle—Some Notes Towards the Redefinition of Culture, 131-132).

Steiner’s assertions are increasingly true in the 21st century, and it is incumbent upon those of us who are committed to providing a comprehensive education for the future leaders of our culture to ensure that we provide a curriculum equal to the task. A 21st century liberal arts education worthy of the name requires the arts and the humanities and the sciences for every student, regardless of the student’s major.

This new facility has raised the bar, not simply for the faculty and students of biology and chemistry, but for all of us, in every discipline and every office. As in all grand enterprises, having reached this new and unprecedented level of accomplishment, we must begin again to
reach even higher, push ourselves and our students to achieve even more—not simply because we cannot help ourselves, cannot resist the all-too-human impulse, our defining trait since Adam ate the apple, to reach for the knowledge of the gods. But also because life on our planet depends on it—depends on scientists educated in places just like Eckerd College to imagine and to help create a future in which the civilizing and war-waging machines of the 20th century do not make life on this planet impossible for the 22nd.

Thank you, each of you in this room, and those beyond, who have made the impossible dream of this facility possible. In thanks to you, let Shakespeare have the final word.

        O, wonder!
        How many goodly creatures are there here!
        How beauteous mankind is! O brave new world,
        That has such people in it!
        (The Tempest, Act 5, Scene 1, 182-185)