

Graduation Ceremony for LAMSS Fellows  
May 16, 2009  
Remarks by Bob Rosenbaum, Chairman of PIMMS

A story in a recent issue of the N.Y. *Times* attributes to the poet, Coleridge, the observation that opposites exist in order to be reconciled.

Let me quote two opposites about mathematics and science:

Lancelot Hogben, a British 20<sup>th</sup> century geneticist, wrote “Mathematics for the Millions,” in which he proclaimed, “No mathematics of any significance has ever been developed except in response to an immediate, practical need.”

The polar view was expressed by the 19<sup>th</sup> century mathematician, H.J.S. Smith, who in his presidential address to the British Mathematical Society, proposed the toast,

“Here’s to mathematics—may she never be of use to anybody.”

Although some mathematicians and scientists subscribe to one or the other of these extreme, dichotomous views, I think that both of them are wrong-headed, and they call for Coleridge’s reconciliation. (To leave our subjects in opposing positions—the practical or applicable versus the theoretical or pure, as they are sometimes called—does an injustice to mathematics and the sciences. We should avoid such a vicious versus!)

Let us look at a historical example:

c. 1600 B.C. Necessary surveying in Egypt to restore land boundaries after the annual Nile floods

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led to practical geometry

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followed by the Greek development of geometrical notions “for their own sake”

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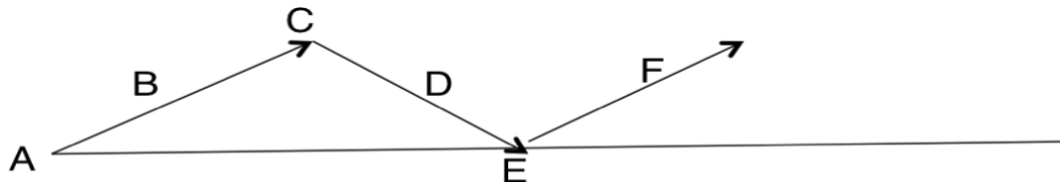
such as the study of conic sections—plane sections of a cone—the ellipse, the parabola, and the hyperbola.

Then, a while later—a whole lot later!—about 1600 A.D., Kepler, trying to improve the Egyptian and Greek description of planetary motion in terms of circles upon circles, found the ellipses of the ancients just what he needed for an accurate description of planetary motion.

In many situations, we begin with a concrete, practical problem, grounded in the perceived world. After we have solved that problem, we may pursue generalizations and abstractions—“flights

of fancy”, if you will, that grow out of the practical problem. We may pile abstractions upon abstractions, but eventually we return to the world in which we live, thus drawing refreshment from the insights that our abstractions provide us about our perceived world.

A sketch of this process perhaps looks like this:



- A. Begin with a (concrete) problem in the perceived world
- B. Conjecture (guess) a solution
- C. Make an (abstract) model of the situation, using sketches, drawings, letters, numbers and other symbols
- D. Use rational argument (reasoning) to find a solution in the model
- E. Translate the abstract solution into the language of the original concrete problem
- F. Pursue implications of the original problem – generalize!

Far from being opposites, the applicable and the theoretical are close partners in science, technology, engineering, and mathematics. The great mathematical-physicist, John von Neumann said, “Mathematics, too long divorced from reality, tends to become baroque and decadent.”

Antaeus, a giant wrestler of ancient mythology, defeated all his rivals because, each time he was slammed down by an adversary, he found new strength from contact with the Earth. (Hercules finally defeated Antaeus by lifting him over his head, keeping him from the Earth until he weakened.)

I trust that you avoid the vicious versus by **uniting** the theoretical with the applicable, furnishing your students with the *tools* and *attitudes* needed to cope with the problems of our technological society.

You, yourselves, have taken advantage of your opportunities to

- *strengthen* your command of what you teach;
- *broaden* your perspectives of our culture and how it can be communicated; and
- *pass along* to colleagues the fruits of your enhanced understandings, in the spirit of our Leadership Academy.

Through these activities you are fulfilling the goals described by President Obama in his recent University of Arizona graduation ceremony.

As Chairman of PIMMS, I salute you for your dedication, I welcome each of you warmly as a PIMMS Fellow, and I look forward to sharing with you the friendship and collegueship that characterizes the PIMMS Fellowship.