The highlights of my career lie in having some very successful students. They're like your own children.
- Dr. Neal R. Amundson

An Unsolved Problem in Chemical Engineering
Graduate Student Workshop.

Imagine a network of chemical reactions in which various reactants interact in perhaps complicated ways to form products, some of which are desirable and some of which are undesirable. Imagine also the availability of fixed streams of the reactants that can be freely mixed in a variety of ways. One of the major problems of chemical engineering is to determine just how these streams should be mixed in order to encourage the production of desired products, while discouraging the production of undesired ones. A general theory for how this should be done remains elusive.

The more one thinks about the problem, however, the more it becomes clear how many different mathematical threads (e.g., dynamical systems theory, differential geometry, convexity theory, optimization theory) must be woven together in its solution. We'll describe the problem more precisely, and we'll try to show why so many seemingly distinct parts of mathematics inexorably come together in consideration of it. Moreover, we'll review what's known and what remains unknown.

The problem is important in its own right, but the workshop is primarily intended as a case-study in support of a much broader lesson: Very rarely are problems in applied mathematics like those at the end of a textbook chapter. Almost always, there's a need to draw on what's known from a great variety of sources and a need to invent what's not known.

In Recognition of Professor Neal R. Amundson

Neal R. Amundson, Cullen Professor of Chemical Engineering and Mathematics at the University of Houston, is widely regarded as the most prominent Chemical Engineering educator in the United States. His honors and awards are legion. He is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences. He received the NAE's Founders Award, honorary doctorates from the Universities of Minnesota, Notre Dame, Pennsylvania, Guadalajara, and Northwestern University. He received the Farfel Award, the highest faculty honor given by the University of Houston. The building that houses the Department of Chemical Engineering and Materials Science at the University of Minnesota was named "Amundson Hall" in 1979.