Editorial

Scattering of disciplines towards new "composites" and "personalized education"

The New Year is here and issue 7 has arrived. Seven is a special number for mathematical reasons and more:

- Seven is the fourth prime number and not only a Mersenne prime, but also a double Mersenne prime. It is also a Newman-Shanks-Williams prime, a Woodall prime, a factorial prime, a lucky prime, a happy number (happy prime), and much more.
- Seven is the only dimension, besides the familiar third dimension, in which a vector cross product can be defined.
- Seven is the lowest dimension of a known exotic sphere.
- There are seven fundamental types of catastrophes.
- The Millennium Prize Problems are seven problems in mathematics that were given by the Clay Mathematics Institute in 2000.

Concerning the latter two statements, let us hope to face challenges, rather than problems and catastrophes. Let us believe in the luckiness and happiness for which this number stands. It is up to us how we interpret the number seven and life in general.

From the same sense of interpretative confusion, here is another point that strikes me: what background do we need to judge the greenness of developments and research and who is teaching sustainability? In our scientific field, we definitively need a synthetic-chemical education combined with some safety expertise and special knowledge on reaction mechanisms. This may add up to what is called "green chemistry". Its counterpart, "green engineering", demands a solid engineering background, yet with a focus on the process engineering side. Still, much more is needed. Energy is almost a science in its own right, with its own scientific journals, yet energy is just one of many categories within the life-cycle assessment cluster we use and, at a higher-level, we may even need to include supply-chain management models up to product design. With the latter, some knowledge about business management is required. The large range of disciplines and expertise needed is a given for many modern scientific fields that cross various boarders. Nanotechnology is just one of the most prominent examples.

This reminds me of the Bibical story of the Tower of Babel and its consequent scattering of languages. Starting from one nation and one language, (too) high ambitions (the building of the Tower of Babel) are believed by some to have led finally to a scattering and even confusion of languages, which led to a diversification of nations and cultures.

Looking at the portfolio of teaching courses offered at universities, I often wonder how researchers manage to get such complex and intertwining know-how. The courses I know are often stuck on a discipline level. Yet, education has reacted and opened in the past decade. At TU Eindhoven, for example, within chemical engineering we offer courses on hydrogen technology and business education, and have good process and product design specialization. Despite this, I feel the more traditionally rooted education and educational systems (including teaching materials, lecturers, training programs, and whole educational centers) can no longer match the enormous speed at which the classical disciplines are melting towards new composites. It is often wise to be cautious in following such composites, however, as many of these are a flash in the pan or their fate and relevance, simply, is unclear. The only solution here is self-learning and training, giving flexibility in learning and shifting responsibility from the learning system to those to be trained. In an equivalent to "personalized medicine", such learning may be termed "personalized education". We in academia and as teachers have to work on preventing the gap from becoming larger – otherwise new educational and training models will arise that even better fit the needs of trainees, society, the market and the world. We have to grow with the discipline and those who grow. *Green Processing and Synthesis* tries to follow this "growth" as well.

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