

## A CHILDHOOD DREAM

**Pierre Laszlo** – I was about 10. My friend Denise and I were staying in a village, named Colombe, in the Terres Froides part of the Isère. We had noticed a path in which some clay was apparent. We used it to mold figurines that you can readily imagine. That is Scene number 1. Now to number 2. I am in my early twenties. I am staying in Ratilly, in the Yonne. I am serving an internship with potters named Jeanne and Norbert Pierlot, stoneware potters. Norbert Pierlot was a born teacher. He never stopped telling me, "Pierre, you are a chemist; you ought to interest yourself in clays". It did not register. It took me 20 or 30 years before I realized the wisdom of his advice.

Now, we have reached the mid-Seventies. At long last, I am interesting myself in clays — because of the Drunkard Theorem. This is from maths, based on an idea of the Pole George Polya. He meant to calculate the probability of return to its origin of a particle undergoing a random walk, as in brownian motion. What is the probability for a drunkard, after he has downed a dozen martinis, to make it back to his bed? In normal three-dimensional space, the probability is 0.34. Thus, there are two out of three chances that the drunkard, even after an infinite time, won't make it back to his departure point. However, if you restrict to 2 the dimensionality of the problem, the probability becomes unity. The relationship to chemistry? In order for a chemical transformation to occur, there needs to be an encounter between random-walk particles. Hence, if you force these particles to move in a plane, the frequency of their encounters greatly increases. Thus, from constraining a chemical reaction to occur in two rather than in three dimensions, one can reap large accelerations.

This is the factor we took advantage of with clays, primarily with clays known as smectites. Smectites are the usual types of clays, such as the playdough Denise and I were using. They are swelling clays. A clay, when dry, is just a white powder, resembling salt or flour. However, as soon as you add a little water to it, as soon as you humidify it, then it expands. Water molecules come in-between the clay platelets. This swelling allows you to insert molecules of the chemicals you make react. These planar platelets slide with the greatest ease past one another. To use the formal language of Mandelbrot's fractal theory, the effective dimensionality is closer to 2 than to 3, which would be the case with other finely divided powders, such as alumina, silicagel, and many others. The first such modified clay, we made with ferric nitrate and we named it "clayfen." Afterwards, we went from ferric nitrate to cupric nitrate, named that "claycop." And so on, we ended up with "clayzic," from zinc chloride, which enabled us to catalyze the Friedel-Crafts reaction.

Benefiting from clays and modified clays, I was able to achieve a childhood dream and to experience entrancing years, in leading the group of young scientists I had gathered.

**4min 15sec**