

# Uncle and Nephew

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No one influenced my scientific life more than the uncle I knew best. He was a noted mathematician who reached the top of French academia, the Collège de France, when he was thirty-eight and I was thirteen. So I always knew that science is not just recorded in dusty tomes, but is a flourishing enterprise, and the option of becoming a scientist was familiar to me for as long as I can remember. I might now, following the usual pattern, continue with fond reminiscences of teachers and postdoctoral mentors. But, in fact, I seem to have fled from teachers and mentors, and even existing disciplines. No wonder that my scientific life ran against every pattern. The wonder is that it developed at all.

While still an adolescent, my uncle had fallen in love with a certain branch of mathematics, and he remained utterly faithful to it throughout his life. He left Poland for France at age twenty, not for political or economic reasons, but as an “ideological” refugee. He was motivated, first, by repulsion for the excessively abstract “Polish mathematics,” then in the process of being invented by a man named Waclaw Sierpiński, and second, by attraction to the Poincaré school that ruled in Paris in 1920s. As a postdoc (the position was just being invented), he was close to Jacques Hadamard and Vito Volterra, that day’s most influential mathematicians in Paris and Rome, respectively. My father later joined him in France, as an economic refugee from the depression in Poland. The clash between Sierpiński and my uncle concerning ideals in mathematics (and other matters!) had therefore the unanticipated eventual merit of saving our lives. Before the Paris fashion in mathematics came under the rule of the so-called Bourbaki school, with its own version of abstraction, my uncle had become thoroughly accepted. A dry spell for him could come and go, but he never wavered in his faith: harmonic analysis as defined in a very classical way was for him the embodiment of truth, beauty and poetry. At age 74, he was elected to the Académie des Sciences, succeeding to the seat (“fauteuil”) that had been Poincaré’s before it went to Hadamard.

While I was fond of my uncle, many aspects of his story somehow repelled me intensely. My uncle, in turn, always felt that I had squandered my intellectual gifts. Lately, however, it is becoming clear to me that in some essential ways we are alike.

One obvious difference is that my uncle’s life story was as straight as an arrow, while the externals of mine appear continually broken. One similarity is that I also became an “ideological” refugee from an Utopian movement towards abstraction. Bourbaki made me, first, leave Ecole Normale in 1945, then leave France in 1958. And, by a profound irony, which man’s works were to become one of my most fertile hunting grounds for tools? This man was no other than Waclaw Sierpiński! While my uncle’s peers, teachers, students and other companions at work were few, they were a close club. But I eventually managed to thrive as a scientist without either joining an existing club, or feeling I must create my own for my few formal students. This made me “always dependent on the kindness of strangers.” To my uncle, opinion outside his club did not matter, and the idea that he should do anything to draw new members into the club was anathema. Even in his formal closing lecture at the Collège de France, he did not follow the custom of commenting on his own life, but gave a very technical talk addressed to the specialists. But to me the opinion of “kind strangers” never ceases to matter. I met this challenge, in due time, and my books appear to be widely popular and influential. Yet, I must confess that the continual feedback I receive from my many readers and listeners is somehow disconnected, and my uncle would have found it insufferably tenuous.

Now to the ways in which my story should have enchanted my uncle, and the stark scholars and judges among our ancestors. I, too, have followed a single star with unwavering intensity. Also, while several active and well-known individuals have led society to expect that I would like them, on welcome occasions, to comment about every topic, I am not a dilettante and will not do so. My domain of competence is broad and oddly-shaped, but it has clear-cut limits that I refuse to cross.

For many long years, the star I followed was barely distinct. I was hardly able to describe to myself, much less to friend or foe, why it deserved to be followed. All I could say is that certain problems that others seemed to consider as totally unrelated, had the same “taste” to me. I never minded being led to cross yet another boundary between fields, but never did it for the pleasure of crossing, or because the problem was in fashion. I always moved in hot pursuit of a technical problem that was congenial because its “taste” was the same as that of a problem I had met elsewhere and had liked. In due time, of course, the space of topics I like has expanded and eventually it jelled. It is a significant part of a cluster of related investigations that include the “search for order in chaos” and “the study of scaling in nature,” two subjects pursued by many scientists today. During a long earlier period after my 1952 Ph.D., however, no other individual with skills and energy to spare was giving more than a passing nod to what I was calling the “study of erratic natural phenomena.” This old Latin-based term

“erratic” was far weaker than its Greek-based synonym “chaotic,” and it would not have travelled as well and as far, but it may have been less unacceptable at the time.

There was no competition to fend off, which is perhaps why (if there is truth in what I am told) I handle today’s competition with a notable lack of skill. Being “peerless” was a great frustration. As in sports (and science has taken on altogether too many features of a spectator sport), there is no first without a second, no glory in the sole entrant’s winning a race.

I also gave wide use to “self-similar”; it turns out that this term has been used before, on one single occasion. And, of course, I coined “fractal”. This notion used to be implicit – in other words, it did not exist – until I made it into a topic of wide interest. Around it, I conceived and developed a new geometry of nature, and implemented its use in diverse fields. Not only does it give fresh meaning to the “unreasonable effectiveness of mathematics in the natural sciences (Wigner),” but it twins it with the new theme of the “unreasonable visual beauty of the shapes of mathematics.” Thus, conceptual beauty, practical usefulness, and the pleasure of the eye are brought together most unexpectedly. If the German language were not so reluctant to use *kunst* freely, this opera-lover would describe his life effort as a *Gesamtkunstwerk*.