WHY STUDY MINERALOGY?

In recent decades, mineralogy has evolved considerably. This is due in part to the development of new instrumentation of enormous precision and to the vastly greater powers of computation now available. It is also due to the expansion of the subject: mineralogy now spills over into the realm of societal issues, in particular, environmental studies. Here mineralogists have let down their guard, allowing their expertise to become undervalued and too often overshadowed by the pronouncements of lawyers, politicians, and administrators.

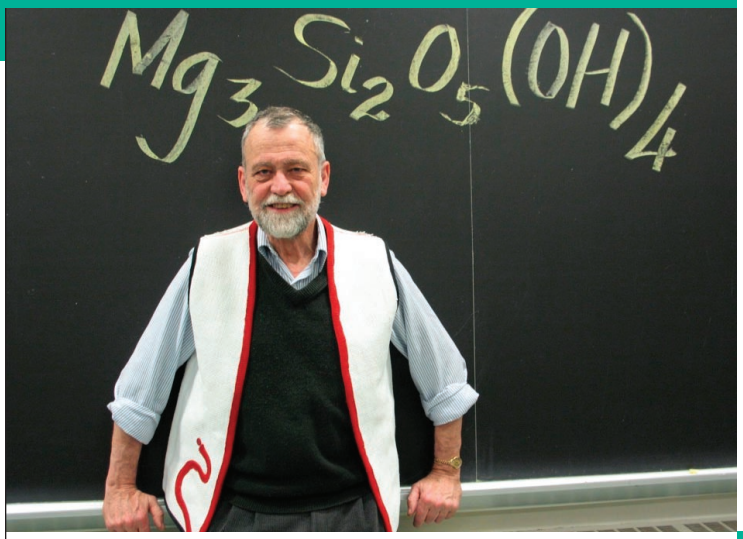
I open the undergraduate mineralogy course that I now teach wearing an elegant white vest with red and black trim (see photo). I'll return to the significance of this garment shortly. My two-hour lecture commences with the usual introductory topics: What is mineralogy? How does it relate to the other Earth sciences? And so on. Next I pass directly to the core of my lecture: Why study mineralogy? To let the cat out of the bag right off, in my view a central purpose is to offer guidance to lawyers, politicians, and administrators who widely display remarkable ignorance of matters mineralogical. This advice allows me to launch into the asbestos controversy, a topic as bizarre and irrational as the Y2K catastrophe that threatened civilization a decade ago. Remember that one?

For openers, I point out that asbestos does not exist, at least not to a mineralogist. Asbestos is not a mineral; it is a commercial term for a variety of unrelated minerals with an *asbestiform* habit (i.e. in fibers with a certain degree of flexibility). This allows me to introduce the nature of polymorphism (e.g. antigorite, chrysotile) to my students. Next comes white versus blue or brown asbestos: the amphiboles. This presents the opportunity to bring up the concept of mineral groups and to discuss the distinctiveness of individual members. Then I dive into the bio-geo-medical literature (a wonderful occasion to demonstrate to my students the importance of journal articles). Here one can read about the stark contrast in toxicity between asbestiform minerals of the serpentine group (chiefly chrysotile) and the amphibole group (chiefly riebeckite and amosite). Further along, the student can learn that chrysotile is rather harmless. It is resorbed quickly by human tissue, leading to no buildup of lung burden. Dust from brake shoes and pads contains no chrysotile; the intense and concentrated heat due to friction upon braking reduces the mineral to a brown amorphous substance.

My introductory lecture next moves on to talc. To set the scene, I disperse a small cloud of the mineral at the front of the classroom from a can of "baby powder." It is an opportunity to point out that talc is indeed a mineral—an unusual mineral in that it allows little ionic substitution and thus deviates little from its ideal formula. This is a handy point to elaborate on the definition of a mineral. Also, I here mention that talc is a phyllosilicate and is thus related to mineral groups (a concept brought up just a bit earlier) such as the micas, clays, serpentines, chlorites, and so on. This past year, my students were told to keep the following short article in mind. It appeared in August, 2008, in *Le Devoir,* one of Québec's most prestigious newspapers.

"Beware of talc. A group of doctors, scientists and consumer-defense organizations yesterday demanded that American health authorities immediately ban cosmetic products with talc because of the carcinogenic nature of the mineral as revealed by several scientific studies. According to the Cancer Prevention Coalition (an arm of the American Association of Public Health), 'talc poses a deadly risk of ovarian cancer in women,' the incidence of which has risen 30% since 1975. With more than 15,000 deaths each year attributed to it, talc must be removed from drugstore shelves, according to the coalition which, in passing, deplores that for years the Food and Drug Administration has refused to require that warning labels be affixed to the packaging of these cosmetics."

On their midterm exam, the article reappeared, and I asked them to analyze it (1) from the viewpoint of its logic, and (2) as a mineralogist. Quite frankly, if by the end of their undergraduate years our students are unable to assess such mineralogical nonsense and explain clearly to lawyers, politicians, administrators, and the public at large why such pronouncements in the media are claptrap, we have failed as teachers of mineralogy.



Tomas Feininger in his white vest

At the age of 19, I worked in the asbestos industry, in a shop shaping and fitting blocks of asbestos to friction bands and clutches for bulldozers, locomotives, and steam shovels. It was really dirty work. The dust from my job—grinding the edges of the asbestos blocks flush after riveting them to their bands and discs—was so dense that one could not see from one side of the shop to the other, a distance of about 10 or 15 meters. We wore no masks. It was, in fact, the suffocating dust (and not the mere presence of chrysotile) throughout the asbestos industry in the 1950s and 1960s, in mines, mills, and product shops, that was the cause of widespread lung disease. The same held for flour mills, cotton-carding shops, coal mines, and other dusty industrial venues, where lung disease was no less rampant than in the asbestos industry.

My interest in these issues began some 20 years ago when my (then) ten-year-old daughter came to my office and was intrigued by and picked up a sample of chrysotile with 4 cm long fibers. She asked: "Daddy, this is beautiful, what is it?" When I told her that it was chrysotile "asbestos," she reacted as if faced by a deadly snake. Recoiling, she said something like "Daddy, how can you keep something so dangerous in your office?" Then and there I realized that we, as mineralogists, had a battle on our hands.

Toward the conclusion of my lecture, I point out that much of the media-driven assault against mineralogy is fueled by the notion of the no-risk society. This is absurd. No such utopia is attainable. Frankly stated, life is a fatal condition contracted at birth and transmitted sexually. Bon voyage!

Let me now return to my white vest. Excluding the thin coloured trim, this garment is made entirely of chrysotile. At the close of my lecture, I ask the students what they think of my vest. The opinions are invariably favourable. I then request that one of them come forward to feel the cloth. When I ask what is the nature of the cloth, no one in the room has an answer. When I reveal that it is chrysotile asbestos, I am met by disbelieving stares of amazement. I go on to recount how this material has saved many lives and that it promotes our security by protecting firemen in their work, that New York's World Trade Center towers might still be standing if the steel structure had been insulated with asbestos (as had been recommended by engineers before construction began), and that the Swissair plane that went down in Nova Scotia in 1998 with terrible loss of life would not have crashed had its wiring been insulated with chrysotile rather than with the artifical product used in its place because of the asbestos ban. In short, I refer to chrysotile as a "Don de Dieu."

Now, at 73, I have probably taught my last mineralogy class. Enough is enough. Nevertheless, I take this occasion to ask earnestly that those who follow take proactive positions on legal, political, and administrative issues where mineralogy has a role. There are many, and we share a common responsibility.

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