

## From spectroscopy to science: what I owe to GEB

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Gordon E. Brown, Jr., is one of the main pioneers of spectroscopy applied to the earth sciences, not just in the field of synchrotron techniques. As a newcomer in that game in the mid 80's, after an enlightening PhD in Paris, a post-doctoral fellowship (1989-1991) in Gordon's laboratory and later as consulting professor at Stanford (1999-2014), I had an insider opportunity to closely observe the evolution in that accumulation of spectroscopy files into intriguingly new concepts: answering questions while raising others, including learning how-to-ask-pertinent-questions and how-to-build-a-vision. To me, his most powerful words are "I predict...". In spite of controversies from other prominent spectroscopists saying "XAS does not work" (equivalent to saying "physics is wrong"), Gordon pursued his goals with the help of his supporters. Another key-sentence was "Let's try!". For many of us, Gordon offered the great chance of their lives. For example, we built and optimized beamlines for the benefit of all, from APS to SSRL. We performed *in-situ*, high-temperature measurements (previously known as "not feasible") with a cannot-be-more efficient-design that worked to 2000K, which was a world record for then: 1994. We also added more mineralogy to "flasks of reagent-grade chemicals" that served too easily as poor surrogates of promising crystal structures. We looked at obscure but important details like anharmonicity and pre-edges features trying to develop "quantitative methods for dummies". We added unusual spectroscopies at this time like MCD and 3D-Mossbauer. Further, Pauling's bond-valence models were applied for the first time to a range of non-periodic structures, including those built from molecular dynamics and Monte-Carlo. This proved to be an efficient method to test computer-generated structures. We gained insights into elements exposed to magmatic processes now given the fancy name of "strategic" (like Zr, U, Mo etc.). But the work also involved: radiation damage in minerals, the fate of heavy metal during exogenous environmental processes, the expertise of some of the oldest pigments used by Humanity in the Lascaux caves and so on.

So, basically, Chuck made it happen: the geochemical cycle is about complete, not forgetting some glasses of wine, more well-roasted duck confit (cooked our way) all around family and surrounded by our hungry pets. Thanks Dad!