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# Synchrotron Mössbauer Spectroscopy: Implications in high pressure and mineral physics

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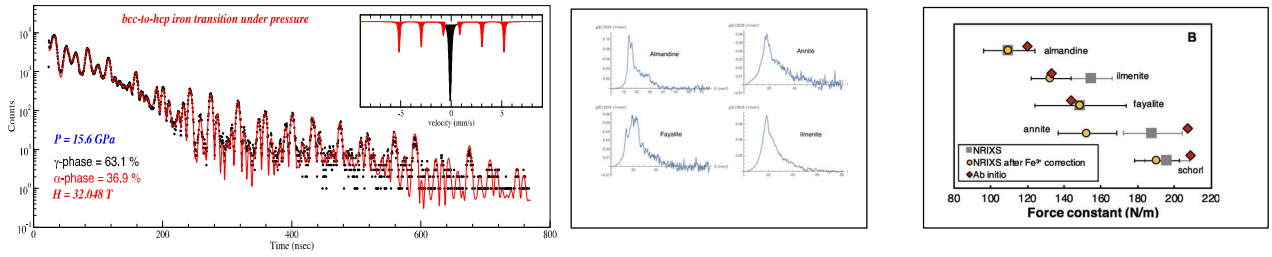
It's been 60 years since the Nobel Prize was given to Rudolf Mössbauer for the discovery of the eponymous effect, almost 50 years since the idea of using a synchrotron source to excite a Mossbauer transition, 40 years since the first successful experiment, and 30 years since the phonon-assisted nuclear resonance inelastic scattering experiments. I happened to witness, participate, and sometimes lead some of these discoveries and developments for the last 45 years.

In this presentation, the basic principles of Mössbauer effect and spectroscopy will be discussed, advantages of synchrotron-based methods will be listed, and some recent examples will be given. I will review the key scientific issues addressed by nuclear resonant scattering methods in geophysics and geochemistry. Measurements of velocity of sound of earth-bound minerals, iron valence and isotope fractionation in core-mantle boundary under high pressure exceeding 1 Mbar will be used as examples.




*Left: Nuclear decay of mixed a-Fe (magnetic) and ε-iron (non magnetic) under pressure, middle: phonon density of states of several rock forming minerals showing psrtial phonon density of states of $^{57}Fe$ atoms in common rock forming monerals, and right: average force constants corresponding to those minerals.*

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