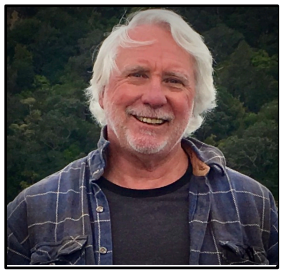
The Fleischmann-Pons heat and ancillary effects. What do we know, and why? How might we proceed?



#Michael C.H McKubre[1]
[1] SRI (Retired), New Zealand
Email: mmckubre@gmail.com

After almost 30 years of studying seemingly anomalous nuclear effects in metal hydride systems what can we say that we have learned with high-level confidence? For some of us it has been a nearly full-time journey; for a rare few nearly fully-funded. After this time and effort what is it that we can assert and defend about our new knowledge of nuclear reactions in condensed matter? These questions are subjective and I will focus my answers on what I have learned by direct experiment and analysis, and from the experience of a few close colleagues – mostly ENEA (Italy), Energetics (Israel), MIT and various Navy Labs around the US.

One must seek scientific truth *via* correlation. Isolated "facts" are rightly called "anomalies". These are useful in alerting the world to the presence of potential novelty but are not particularly useful in themselves and I have resisted characterizing our field as "anomalous". Anomalies exist to be explained or rejected – in either case forsaken as anomalies. At one point I recommended not accepting papers for presentation at one of our conferences unless more than one variable was measured and a correlation shown between them. In our work at SRI, initially the correlation sought was excess heat and loading. Under EPRI sponsorship (and gentle duress) we searched diligently for correlation between excess heat and any plausible nuclear product: neutrons, gammas, X-rays or low energy gammas, betas, photo-radiographic evidence of any photons, tritium (indirectly) and (finally) helium-4 and helium-3.

This exercise of seeking multi-correlation is, however, exquisitely painstaking and, therefore expensive, requiring the physical presence of experts covering a wide range of specialized knowledge and specialized hardware. In FPHE experiments more subtle difficulties are added by the challenge (or impossibility) of optimizing experiments to satisfy the constraints of: electrochemistry, without which there is insufficient loading and apparently no effect; calorimetry, without which there is no believable effect to correlate; and whichever of the pantheon of potential nuclear products (not ash) that one strives to correlate. Obviously everyone except the experimenter would prefer the search for products in all plausible output channels, in real time, and *in situ*. But this is experimentally not possible at our present level of investment – and perhaps not at all unless the effect is made larger and triggerable. Gozzi *et al* [1] have reported a nuclear multi-correlation (X-ray, heat excess and helium-4 in the D/Pd system) but they were cautious in their interpretation and this work was not continued.

How might we proceed rationally? Nearly 30 year old anomalies should have grown to adult maturity and self-sustainability or been buried and forgotten. By various factors we have been heavily constrained from pursuing and accomplishing the one thing that would make anomalies go away: correlation, preferably multi-correlation. Correlation is one thing that can rapidly advance our research and cause. Practical reality is another – a working device even if only a toy, but with net gain and easily observed utility. The search for correlation would be vastly simplified by an ability to trigger the effect on demand thus permitting phased analysis. A working device demands even more - the capability to control the effect; the ability to turn it on/off, up/down. What indications do we have to encourage us and guide us to tread either of these paths?

[1] D. Gozzi, P. L. Cignini, M. Tomellini, S. Frullani, F. Garibaldi, F. Ghio, M. Jodice and G. M. Urciuoli, Proc. ICCF2, p. 21 (1991).