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Classical array models and the location of the field emission tunnelling barrier

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Increasing interest in using DFT methods to model charged surfaces is illustrated by the MeVARC 2017 programme. However, the need to understand charged surfaces at the atomic level has long existed, most notably since Bahadur and Müller first "saw atoms" in 1956, using their new field ion microscope technique [1], and needed to explain how it worked. This didn't happen for another 20 years, until after the development of classical array models that replaced each atom by a superimposed point charge and dipole (e.g., [2]). These models were unexpectedly successful, especially for locating a field ion emitter's "electrical surface". Only relatively recently have they been made increasingly obsolescent by good DFT techniques. This talk will remind colleagues of these models, and then make connections between the physics and predictions of these models and those of quantum-mechanical techniques, including DFT. The talk will then apply old and new theory to discuss "Where is the field electron emission tunneling barrier, relative to surface atoms?" This may be relevant to a future re-examination of "What really is the nature of the tunnelling barrier experienced by a field emitted electron?", and "Can we resolve this question by experiment, rather than using "longstanding widespread theoretical belief?"
[1] E.W. Müller & K. Bahadur, Phys. Rev. 102, 624 (1956).
[2] R.G. Forbes, J. Phys .D: Appl. Phys. 18 (1985) 973-1018

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