



DARPA's N3: The Future of Non-Surgical Brain Interfaces

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The Defense Advanced Research Projects Agency (DARPA)'s Next-Generation Nonsurgical Neurotechnology (N3) project is an ambitious initiative aiming to develop vast array of nanoscale sensing and transmitting brain-computational interfaces (BCIs). An axiomatic attribute of such a system is obviating the burden and risks of neurosurgical implantation by instead introducing the nanomaterials via intranasally, intravenously and/or intraorally, and using electromagnetic fields to migrate the units to their distribution within the brain. It's said that location is everything, and so too here. Arrays would require precise placement in order to engage specific nodes and networks, and it's unknown if -and to what extent any "drift" might incur in system fidelity.

The system works much like WiFi in that it's all about parsing signal from the "noise floor" of the brain; but "can you hear me now?" takes on deeper implications when the sensing and transmitting dynamics involve "reading from" and "writing into" brain processes of cognition, emotions and behavior. I'd be the first one to argue for an "always faithful" paradigm of sensing

and transmitting integrity; yet, even if the system and its workings are true to design, there's still a possibility of components (and functions) being "hacked". As work with Dr Diane DiEuliis has advocated, the need for "biocybersecurity-by-design" is paramount (not just for N3, but for all neurotech, given its essential reliance upon data).

By intent, N3 holds promise in medicine; but the tech is also provocative for communications (of all sorts), and its dual-use is obvious. Yes, Pandora, this jar's been opened. If we consider the sum-totaled operations of the embodied brain to be "mind", and N3-type tech is aimed at remotely sensing and modulating these operations, then it doesn't require much of a stretch to recognize that this is fundamentally "mind reading" and "mind control", at least at a basic level. And that's contentious. In full transparency, I served as a consulting ethicist on initial stages of N3, and the issues spawned by this project were evident, and deeply discussed. But discussion is not resolution, and the "goods" as well as the gremlins and goblins of N3 tech have been loosed into the real world. The real world is multinational, and DARPA – and the US – are not alone in pursuing these projects. Nations' and peoples' values, needs, desires, economics, allegiances, and ethics differ, and any genuine ethical discourses – and policy governances – must account for that. The need for a reality check is now; the question is whether there is enough rational capital in regulatory institutions' accounts to cash the check without bouncing bankable benefits into the realms of burdens, risks and harms.

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