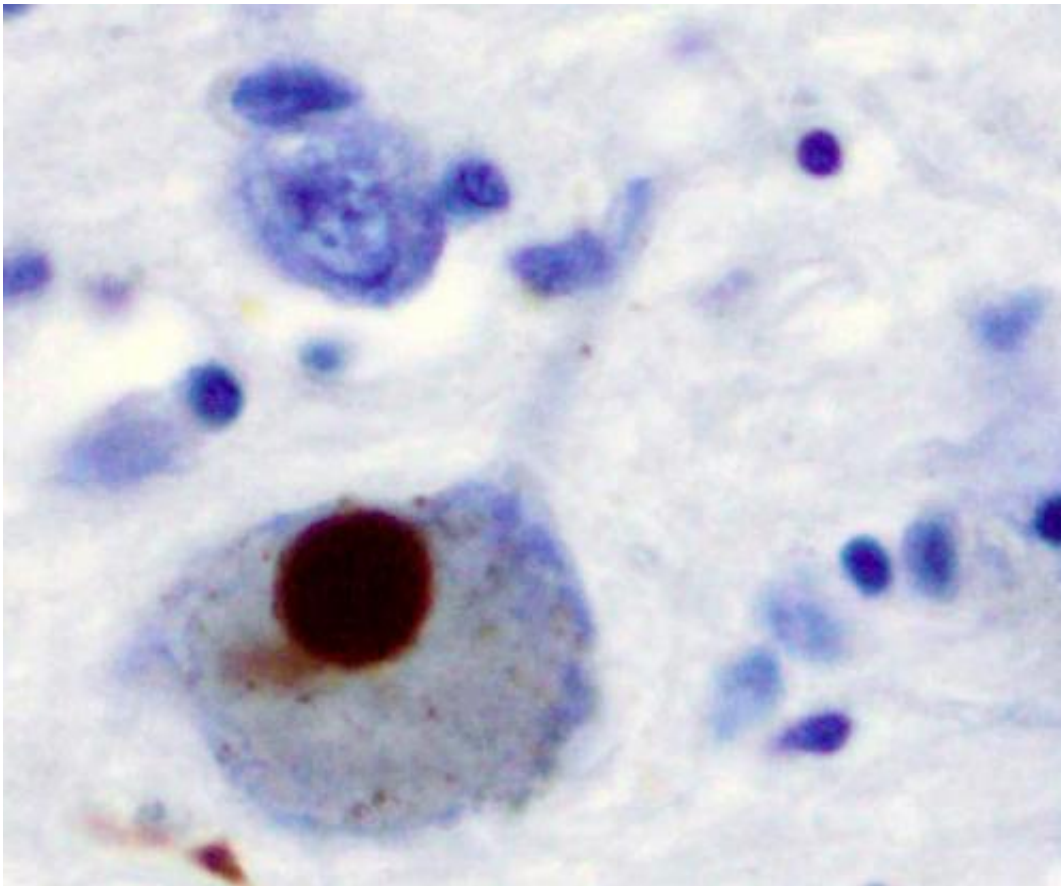# Systems approaches to optimizing deep brain stimulation therapies in Parkinson's disease

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Immunohistochemistry for alpha-synuclein showing positive staining (brown) of an intraneural Lewy-body in the Substantia nigra in Parkinson's disease. Credit: Wikipedia

Systems biologists, physicists, and engineers have intensively worked at

computational tools to analyze, predict, and optimize the effects of Deep Brain Stimulation (DBS) to treat chronic neurological diseases. These efforts often have overlapping objectives and closely-related methods, but they are rarely compared, combined, or jointly discussed, perhaps because they often target different research communities.

A new *WIREs Systems Biology and Medicine* review systematically brings this information together to identify the major milestones in the development of systems approaches to the modeling and study of Parkinson's disease and DBS. These approaches acknowledge the interactive nature and interdependence of various factors to optimize the therapeutic effects of DBS in individual patients.

"Although effective and generally safe, DBS remains a fascinating puzzle to scientists, physicians, and engineers. The therapeutic mechanisms of DBS, in fact, are still elusive and the current, semi-permanent stimulation protocols have often motivated the investigation of ways to make DBS less invasive and more efficient," said lead author Dr. Sabato Santaniello, of the University of Connecticut. "In this review article, we show how different strides in medical imaging, computer modeling, and control strategies have paved the way towards a truly patient-specific optimization of DBS therapy.

  More information: Sabato Santaniello et al, Systems approaches to optimizing deep brain stimulation therapies in Parkinson's disease, *Wiley Interdisciplinary Reviews: Systems Biology and Medicine* (2018). DOI: 10.1002/wsbm.1421

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