

EDITORIAL

Deconstructing the Translational Tower of Babel

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A principal stumbling block in translation is the compartmentalized nature of data—from biomedical research, disease classifications, health records, clinical trials, and adverse event reports—across diseases and disciplines. These silos impede discovery of commonalities across diseases, and the distinct languages that each discipline uses impede the cross-discipline understanding that is required for efficient translation from basic to clinical to public health science.

By contrast, imagine a world in which researchers had a way to easily access and interrelate these data and languages. Such a tool would accelerate hypotheses about, e.g., which drugs have the potential to treat diseases, the impact of environmental exposures on the onset or worsening of disease; what might be causing illness in patients for whom existing approaches have failed to identify the origin of their symptoms; and better understand the relationships between rare and common diseases. This is the vision of the Biomedical Data Translator: to bridge the current symptom-based diagnosis of disease with research-based molecular and cellular characterizations through an informatics platform that enables interrogation of relationships across the full spectrum of data types, from disease names, clinical signs and symptoms, to organ and cell pathology, genomics, and drug effects.

When we committed to this vision in 2016, we were well aware of its ambitious scope. We, therefore, designed the program to be different in virtually every way from how National Institutes of Health (NIH) research projects are typically competed, supported, and managed, and have taken an explicitly flexible and staged approach to its construction. For the last 24 months, the National Center for Advancing Translational Sciences (NCATS) has been funding a feasibility assessment phase of the Translator, focused on identifying data integration and inclusion barriers and exploring inferential or predictive models that would provide new insights into biology, health, and disease. It was assumed that we did not understand all requirements or needed capabilities when we started, and the platform is being built in an agile way with frequent modifications driven by data from pressure testing using research questions that have been difficult to address by other means. Operationally, the NCATS supports the Translator through a flexible research authority called

Other Transactions within the Center's Cures Acceleration Network. The flexibility of Other Transactions to expand, contract, add, discontinue, or modify activities based on data as the program is built has changed the usual ways that we, as funders, interact with research teams and they interact with each other. This too was an experiment: could we entice over a dozen high-performing research teams from diverse backgrounds to become fully miscible with each other and with us to make the Translator vision possible? At the end of the feasibility phase, the NCATS will assess whether the scientific, operational, and cultural experiments have been successful enough to warrant ramping up to build a fully functional Translator that finds and connects existing data, provides previously unknown insights into diseases and possible treatments, and is able to make inferences and predictions even when data are missing. The early results are in, and they are encouraging, as you will read in the articles from the investigators.^{1,2}

Two hundred years ago, chemists created a comprehensive enumeration of the elements and systematic relationships among them. This Periodic Table transformed chemistry by placing it on firm scientific footing. We envision the Translator doing the same for translational science.

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1. The Biomedical Data Translator Consortium. Toward a universal biomedical data translator. *Clin. Transl. Sci.* 12, 86–90 (2018).
2. The Biomedical Data Translator Consortium. The Biomedical Data Translator program: conception, culture, and community. *Clin. Transl. Sci.* 12, 91–94 (2018).

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