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The Original Michaelis Constant: Translation of the 1913 Michaelis–Menten Paper

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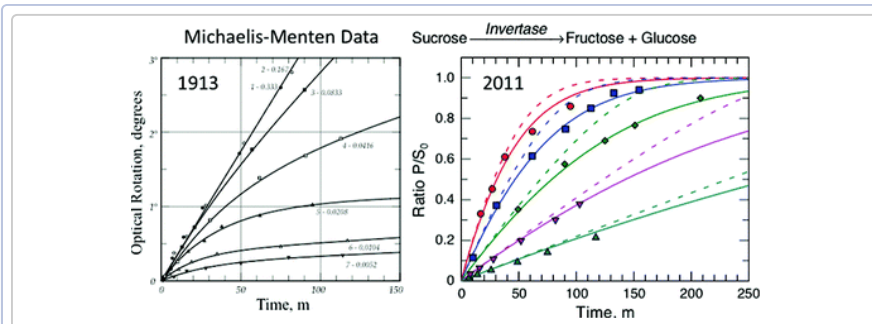
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Abstract



Nearly 100 years ago Michaelis and Menten published their now classic paper [Michaelis, L., and Menten, M. L. (1913) Die Kinetik der Invertinwirkung. *Biochem. Z.* 49, 333–369] in which they showed that the rate of an enzyme-catalyzed reaction is proportional to the concentration of the enzyme–substrate complex predicted by the Michaelis–Menten equation. Because the original text was written in German yet is often quoted by English-speaking authors, we undertook a complete translation of the 1913 publication, which we provide as [Supporting Information](#). Here we introduce the translation, describe the historical context of the work, and show a new analysis of the original data. In doing so, we uncovered several surprises that reveal an interesting glimpse into the early history of enzymology. In particular, our reanalysis of Michaelis and Menten's data using modern computational methods revealed an unanticipated rigor and precision in the original publication and uncovered a sophisticated, comprehensive analysis that has been overlooked in the century since their work was published. Michaelis and Menten not only analyzed initial velocity

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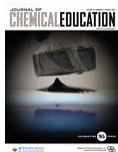
measurements but also fit their full time course data to the integrated form of the rate equations, including product inhibition, and derived a single global constant to represent all of their data. That constant was not the Michaelis constant, but rather V_{\max}/K_m , the specificity constant times the enzyme concentration ($k_{\text{cat}}/K_m \times E_0$).

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