Large individual differences in the ability to acquire a second language in adulthood have captured the interests of scientists and laypersons alike for centuries. One limitation of this research, common to all aptitude work, is that a theoretical understanding of the construct of aptitude progresses iteratively with the development and assessment of tests for measuring it. In this talk I will describe some of my work using resting-state brain measures to circumvent this limitation. I will first describe a series of studies using resting-state EEG alone to predict up to 50% of the variance in rate of L2 learning. I will then describe some very recent work leveraging what we have learned about L2 aptitude to predict individual differences in learning computer programming languages.