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Interest in moonshine was reignited in 2009 by the Mathieu moonshine observation of Eguchi–Ooguri–Tachikawa. In 2015, a new kind of moonshine for the Thompson sporadic group was announced by Harvey and the speaker. In this talk we explain how this new moonshine for the Thompson group serves as the counterpart to Mathieu moonshine in a family of new examples, called penumbral moonshine, which operates in parallel to the umbral moonshine of Cheng–Duncan–Harvey. In particular, we explain a genus zero property which governs penumbral moonshine, and justifies the comparison to umbral moonshine. This new topic features many open problems, and promising connections to other areas of mathematics and physics. (Received August 13, 2019)