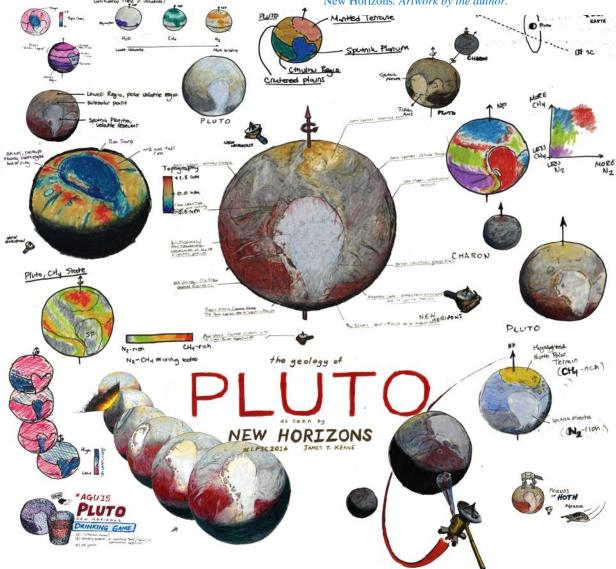
**PLUTO AND CERES—ILLUSTRATED.** J. T. Keane<sup>1</sup>; <sup>1</sup>Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA (jkeane@caltech.edu, @jtuttlekeane).

**Summary:** As scientists and engineers have explored the solar system, artists have remained in lockstep, illustrating both new discoveries and envisioning the yet unseen strange new worlds further out [1]. While hand-drawn illustrations used to be part of the scientific process, we now live in the age of PowerPoint, Paint, and Illustrator. Hand-drawn illustrations have generally fallen by the wayside in scientific works. In this work, I will present a collection of original sketches and illustrations detailing new results from the *Dawn* mission to Ceres, and the *New Horizons* mission to Pluto, Charon, and beyond. Figures 1-3 show examples of these sketches. I posit that hand-

drawn illustrations still have a place in scientific work, and are a powerful tool for public outreach, education, and engagement.

While I have illustrated a variety of different solar system objects, Ceres and Pluto are particularly interesting for a variety of reasons. Over the past three years (since *Dawn*'s orbital insertion at Ceres, and *New Horizon*'s flyby of Pluto), both Ceres and Pluto have transformed from distant pinpoints of light—only a few pixels across—into fully-fledged, dynamic worlds, replete with their own unique histories. These two dwarf planets are past (Ceres) and present (Pluto) ocean





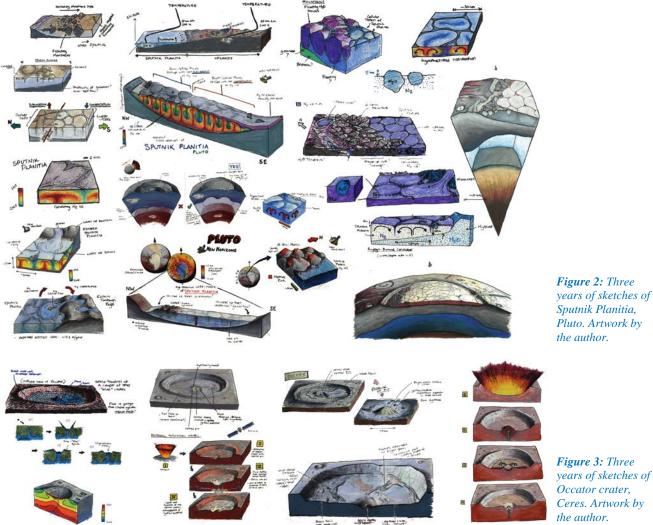


Figure 3: Three years of sketches of

worlds, and hold important clues about the formation, evolution, and habitability our solar system. Each world is host to a variety of unique processes that are not found elsewhere in the solar system, e.g., the bright spots on Ceres (Figure 3), or the giant Sputnik Planitia nitrogen ice glacier on Pluto (Figure 2).

Beyond recording a litany of new scientific discoveries, these illustrations also capture a second important aspect of planetary science-the human element. I sketch the majority of my illustrations in realtime during planetary science conferences (LPSC, DPS, AGU, etc.). As such, you can see the evolution of different, competing scientific hypotheses. Sometimes these sketches/hypotheses will converge into one generally accepted story (e.g. the nature of Pluto's Sputnik Planitia, Figure 2), or sometimes we will be left multiple competing hypotheses (e.g. the origin of Ceres's Locator crater, Figure 3). The color, detail, and style of these sketches capture the excitement of the crowd (or at least the artist).

Scientific illustration is a powerful tool for engaging with the public. While both the Dawn and New Horizons missions have provided stunning imagery of their target bodies, some processes or stories are not easily explained with spacecraft data. Hand drawn illustrations provide a more personal, human perspective for conveying these scientific ideas, and can complement more traditional digital illustrations. Both have a role in scientific communication.

References: [1] Miller, R (2014) The Art of Space, Elephant Book Company.