

1000 km in diameter, he used his simulations, supplemented with a lookup table from Johnson's jetting results, to estimate the locations, frequency, sizes, and velocities of potential chondrule-forming impacts.² Those impacts began occurring a few thousand years into the simulation and continued for millions of years, a time span consistent with the life span of the nebula and the spread of ages found among real chondrules dated isotopically.

The simulation's conservative estimate of 10^{23} kg for the accumulated melt made by jetting is several times greater than the mass thought to reside in the asteroid belt, says Johnson. And his separate calculation of likely droplet sizes—determined by the balance of surface tension and inertial forces acting on the accelerated plume of gas and melt—reproduced a millimeter-scale distribution over a wide range of impactor sizes. Together, the results explain the chondrules' abundance in meteorites.

A reinterpretation

According to the impact-jetting theory, chondrules emerge from much larger bodies and preferentially accrete onto smaller ones, which have a larger collective surface area. That logic led the MIT–Purdue collaboration to a succinct conclusion stated in the final line of their paper: “Chondrules are not the direct building blocks of the planets, but merely a byproduct of their accretion.”²

“That statement has outraged meteoriticists more than anything we could have said or done,” says Melosh. “It had been believed that with up to 95% of chondrites chock-full of them, chondrules must be those building blocks, and generations of researchers have put the motherhood statement in their grant proposals. We're denying that and arguing that while chondrules are certainly part of the construction debris, they're not the main game.”

That interpretation doesn't change

the fact that meteorites reflect conditions in the early solar nebula. Rather, the new model is diagnostic of the process—how and in what environment our solar system was built. “Although more work is needed to investigate and test the new model,” says the University of Chicago's Fred Ciesla, “it's likely to open a debate I expect to continue for years.”

Mark Wilson

References

1. For reviews of chondrule-formation models, see S. J. Desch et al., *Meteor. Planet. Sci.* **47**, 1139 (2012); I. S. Sanders, E. R. D. Scott, *Meteor. Planet. Sci.* **47**, 2170 (2012); F. J. Ciesla, in *Chondrites and the Protoplanetary Disk*, Astronomical Society of the Pacific conference series vol. 341, A. N. Krot, E. R. D. Scott, B. Reipurth, eds., ASP (2005), p. 811.
2. B. C. Johnson et al., *Nature* **517**, 339 (2015).
3. B. C. Johnson, H. J. Melosh, *Icarus* **228**, 347 (2014).
4. For details, see B. C. Johnson, T. J. Bowling, H. J. Melosh, *Icarus* **238**, 13 (2014).

found no measurable differences between the two populations, which suggests that Andromeda's on-plane and off-plane dwarfs formed at the same time from the same material. The prevailing cosmological framework struggles to account for such a starkly bimodal distribution. (M. L. M. Collins et al., *Astrophys. J. Lett.* **799**, 13, 2015.) —CD

Monitoring fog with cellular network infrastructure. In terms of economic consequences—including accidents, traffic delays, property loss, and injuries or casualties—fog can be as damaging as winter storms. Common fog-detection systems include satellites, visibility sensors, and human observations, but such methods can suffer from low spatial resolution, high cost, or low sensitivity near ground level, where the information may be particularly needed. A solution might be found, however, in cellular communication networks. Most microwave links in a network's infrastructure currently operate at frequencies between roughly 6 GHz and 40 GHz. Although rainfall produces measurable attenuation of signals at those frequencies, dense fog has a relatively slight effect. But to satisfy the growing demand for higher data rates and wider bandwidth, many countries are turning to higher frequencies, 70–80 GHz. Noam David, Omry Sendik, Hagit Messer, and Pinhas Alpert from Tel Aviv University show that because transmission at those frequencies is much more sensitive to fog, the new links could provide wide-scale, high-resolution monitoring of fog densities. In a proof of principal, the team took a map of existing microwave links in Israel and, for simulated fog, calculated the minimum liquid water content that could be detected using signal attenuation data at 20, 38, and 80 GHz. At 80 GHz, even light fog, with a visibility of up to 750 meters, had a measurable effect. And when the researchers analyzed actual 38-GHz signal data for an evening that was foggy in Tel Aviv but clear in Jerusalem, the visibilities and fog densities they calculated were consistent with recorded observations. (N. David et al., *Bull. Amer. Meteor. Soc.*, in press.) —RJF

Sound strategy for levitating and moving particles.

Bounce a propagating sound wave off an acoustic mirror and the superposition of original and reflected waves may yield a standing pressure wave. A particle located in that pressure field will feel a force driving it to a position of stable equilibrium; indeed, an acoustic standing wave with sufficient amplitude can even suspend a particle against the action of gravity. Numerous researchers have used acoustic levitators



to study behaviors of liquid drops without the complications of a confining vessel. The problem with conventional levitators, though, is that the separation between the wave generator and the reflector must be resonantly tuned if a standing wave is to result. Now Marco Andrade of the Institute of Physics at the University of São Paulo, Brazil, and colleagues have demonstrated a device that can levitate particles—indeed, manipulate them—without the need for fine tuning. Their trap, based on a decades-old proposal by Charles Rey, is shown here suspending four polystyrene balls. It comprises a 10-mm-diameter cylindrical transducer (at the tops of the photos) that generates the sound, and a somewhat larger concave reflector. For the coaxial geometry shown on the left, the trapped balls remain at a fixed distance from the mirror even as the mirror–transducer separation varies from 50 mm to 100 mm. Moreover, as one misaligns the axes of the transducer and mirror (right photo), the balls will adjust their positions, remaining confined all the while. (M. A. B. Andrade, N. Pérez, J. C. Adamowski, *App. Phys. Lett.* **106**, 014101, 2015.) —SKB