

## Thoughts on “crystal”

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What is a crystal? The Commission on Aperiodic Crystals, in a recent report, listed three statements “that each by itself might characterize the crystalline state”:

- (1) a solid with an essentially discrete diffraction diagram;
- (2) a solid with an atomic structure with long range order;
- (3) a solid with an atomic structure that can be obtained as a section of an  $n$ -dimensional periodic structure ( $n = 3, 4, \dots$ ).

The report noted that “advantages of and problems with each of these definitions were discussed.” I wasn’t there, so I don’t know what was said, but I was a member of the Commission at the time that (1) was adopted as a working definition, and I remember why we chose it over (2) and (3). We understood that a solid of type (3) is a solid of type (2) is a solid of type (1). For logical equivalence, however, the converse must also be true, and that was far from clear at the time. Characterization (1) at least had the virtue of being observable, and a clear mathematical description. So we agreed it would serve until “long range order” was better understood.

It is better understood now, of course, but many gaps still remain. A new look at the question “what is a crystal” should begin with a survey of what we now think a crystal should be, what we’ve learned – theoretically and experimentally – in 13 years, and what we still don’t know about the relations among these (and other possible) characterizations.

But while the research program implied by the survey is important, the definition isn’t. I think of the furor last summer over Pluto’s demotion from planetary status. The astronomers’ debate centered on a new definition of “planet”. According to one proposal, Pluto would remain a planet – but various asteroids would become planets, too. Asteroids were excluded by the definition finally adopted, Pluto along with them. Throughout it all I wondered, who cares? Whatever its label, Pluto still circles the sun, and planetary scientists still study it.

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