

Let's talk about BL Lac objects!

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When I was an astronomy graduate student, I heard a talk that mentioned a class of luminous variable galaxies called BL Lac objects. The name comes from the archetype of the class BL Lacertae. Audience members more versed in astronomical lore than I was would have recognized what the name entails, even if they were unfamiliar with BL Lac objects themselves. *Lacertae* is the genitive of *lacerta*, which is the Latin for “lizard,” the constellation where BL Lac resides. “BL” designates the object as a variable star. That’s because when Cuno Hoffmeister first observed BL Lac’s variability in 1929, he thought he had discovered a variable star.

BL Lac objects are not the only confusingly named celestial bodies. Planetary nebulae have nothing to do with planets. Quasistellar objects are not like stars at all. It might be fun to mock astronomers for sticking with original names, but the rest of physics also has terms that, while not outright misleading, are not as helpful to students as they could be.

The constant that characterizes the strength of the electromagnetic interaction has a name—the fine-structure constant—that says little about its role to someone encountering it for the first time. On the contrary, “fine structure” suggests a refinement rather than something fundamental. Also confusing is the chemical potential as applied to condensed-matter physics, which is where I first encountered the term. What does a change in free energy when electrons are added or removed have to do with chemistry? Talking of chemistry, in my high school I learned that valence electrons are the outermost ones that participate in chemical bonding. Later, in an undergraduate physics class, I learned that a semiconductor’s valence band lies beneath, not above, its conduction band.

BL Lac objects form one species in a zoo of active galaxies. Other species include Seyfert 1 and Seyfert 2, radio-loud and radio-quiet, blazar and quasar, and LINER and OVV. In the 1980s, when I first became acquainted with the zoo, astronomers were beginning to realize that some differences among the various species are a matter of viewing angle. The luminous plasma that swirls around a supermassive black hole looks different if you view it askance through an accretion disk or directly from above the disk. Although schemes to unify active galaxies remain incomplete, they nevertheless can simplify how we think of them—and, potentially, how we name them.



You might think I’m in favor of banishing antiquated and confusing names. I’m not, but with one proviso: If you’re teaching physics and get to the part of your lecture when you first mention the fine-structure constant, don’t just write the alpha on the blackboard and recite the name. Tell your students about its history and why it has the name it does.

In 1887 Albert Michelson and Edward Morley measured the spectrum of the hydrogen atom with unprecedented precision. They observed a splitting, a “fine structure,” that remained puzzling until Arnold Sommerfeld extended Niels Bohr’s treatment of the hydrogen atom to include special relativity and elliptical orbits. The name fine-structure constant reflects the crucial role of atomic spectroscopy in the development of quantum mechanics in the early 20th century.

Also potentially confusing (or at least unenlightening) is astronomers’ tendency to give a group of seemingly similar things the same name until they find examples that aren’t similar enough, in which case they introduce type I, type II, type III, and so on. Superconductors were initially classified in a similar way. In the case of supernovae, the first two types were identified when their optical spectra began to be routinely measured in the 1930s. Spectra that lacked hydrogen lines were denoted type I,

and those with them, type II. Later, astronomers came to realize that the different spectra and light curves were manifestations of different types of progenitor: accreting white dwarf and collapsing massive star.

Exoplanets, which you can read about on page 24, have a range of names, such as hot Jupiters, super-Earths, and mini-Neptunes. Astronomers will eventually figure out how those and other exoplanets came to have their various characteristic properties. When they do, I suspect they’ll retain the old names. **PT**

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The jeweled lacerta (*Timon lepidus*) inhabits southwestern Europe.