

SCIENTIFIC AMERICAN

Extremely
Metal Dinosaurs

New Treatments
for Schizophrenia

Reinventing
the Army Corps
of Engineers

The Dark Sector

Searching for a
hidden realm of particles
and forces parallel
to our own material world



An antique German sky atlas shows the position of the star Betelgeuse.

What's in a (Star's) Name?

With billions of stars in the Milky Way, we need some standardization BY PHIL PLAIT

BETELGEUSE! Betelgeuse! Betelgeuse! Did it explode? No? Okay, then.

But it seems fair to ask: Why “Betelgeuse”? It’s an odd-seeming name for a star. That’s because it’s a corrupted translation of the Arabic phrase *yad al-jawzā*, which roughly translates to “the hand of Orion”—a decent moniker for the star that does represent the constellation’s upraised arm.

A lot of star names we use today are in fact Arabic in origin. Alexandrian astronomer Claudius Ptolemy created a star map of the sky for his wildly popular book *Mathematical Treatise*, written in Greek around C.E. 150. It was translated into Arabic more than 1,000 years ago and acquired a nickname, *Almagest*—itself a corruption of the Arabized version of the Greek word for “the greatest”—and many of those Arabic versions of star names were kept even when the map was translated into different languages. Rigel, Deneb, Aldebaran, and many more of the brightest stars in the sky trace their names back to such quirks of ancient publishing.

Phil Plait is a professional astronomer and science communicator in Virginia. He writes the *Bad Astronomy Newsletter*. Follow him on Beehiiv.

Others started more as nicknames, such as Polaris, named for its position in the sky near the north celestial pole, and ruddy Antares, which literally means “rival of Mars.” Still others are named after astronomers who studied them, such as Barnard’s Star and van Maanen’s star. This naming methodology is obviously less than ideal, and it sometimes leads to confusion over what a star should actually be called.

You might think we’d run out of names quickly because there are many thousands of stars visible to the unaided eye at night. Fewer than 1,000 stars have proper names, however, so that doesn’t seem like a crisis—which is a good thing because there are hundreds of billions of stars in the Milky Way! The problem isn’t naming them so much as naming them *consistently*.

Different ancient cultures had their own names for stars, but as the world became more interconnected, astronomers tried many systems to standardize names and naming, with varying degrees of success.

One of the first in the early modern era,

published in 1603, was dreamed up by German astronomer Johann Bayer. He named each star according to its apparent brightness ranking in a given constellation, using a Greek letter and the genitive (possessive) case of its constellation name. So, for example, the brightest star in Orion would be called Alpha Orionis, the next brightest Beta Orionis, and so on. There are two problems with this system, however. First, the Greek alphabet is only 24 letters, so that limits the names you can create this way. Second, stars can change in brightness over time, wreaking havoc on the ordering of a constellation's star names.

About a century later English astronomer John Flamsteed came up with the idea of using numbers instead of letters, which obviates one of Bayer's problems. Also, instead of using stars' sometimes varying brightness, he designated them by their position in a constellation, starting with the western edge of the constellation and moving east. Under this system, 1 Orionis is not the brightest star in Orion but the one closest to its western edge.

This approach has problems, too. Constellation borders weren't officially defined until the International Astronomical Union approved them in 1928, so Flamsteed's catalog occasionally listed stars as being in one constellation when they were actually in another. Also, Flamsteed cataloged only stars he could see from England, which excludes a large part of the southern sky that's invisible from that latitude.

Then there's the Bonner Durchmusterung catalog and its updates, created by astronomers at the Bonn Observatory in Germany in the mid- to late 1800s. This list was the last great catalog assembled before photography revolutionized astronomical observation. It covers stars as faint as ninth magnitude, sorting them by their declination (like latitude but on the sky). After that came the Henry Draper catalog of the early 20th century, named for an American amateur astronomer and astrophotographer. The Draper catalog includes spectroscopic information on stars and thus gives more details on associated stellar characteristics (such as temperature, size and composition).

As telescopes and photographic equipment got better, fainter stars could be seen,

An unavoidable problem here is that any given star can have a lot of names, even if we stick to the legitimate ones.

meaning catalogs got a lot bigger. There were also more attributes of stars to note, including their physical motions in the sky relative to one another, which are usually apparent only after many years of careful observation. All-sky surveys became possible, too, as bigger telescopes were built in the Southern Hemisphere, creating a need for even bigger and better catalogs. By the 1990s the numbers had become, well, astronomical. One project, the U.S. Naval Observatory catalog, used observations made on thousands of wide-field glass plates to organize a staggering one billion objects made from more than three billion observations, listing stars as faint as magnitude 21 (about a million times fainter than the dimmest star you can see by eye).

When the Hubble Space Telescope was being built, astronomers realized that to properly point it, they needed a very accurate list of star positions and brightnesses. So a team at the Space Telescope Science Institute created the Guide Star Catalog, which currently includes nearly a billion stars. These objects are observed by special sensors on Hubble that then use the known positions of the stars to determine where the telescope needs to be aimed.

There are still more catalogs, but the newest and most complete is from Gaia, a European Space Agency mission whose purpose was to measure the brightness, positions, motions, and colors of stars and other cosmic objects with phenomenal accuracy. The Gaia team releases a new dataset every few years as updated measurements home in on stellar characteristics. The most recent release contains new information about nearly two billion stars in the Milky Way.

These more modern datasets (and there are far too many to mention individually here) include so many stars that any kind of naming is hopeless. Instead they generally identify an object by using an alphanumeric designation combining the catalog name with the star's position in the sky; for exam-

ple, you might see a star listed as 2MASS J05551028+0724255 in the Two-Micron All-Sky Survey, representing the coordinates 05 hours, 55 minutes and 10.28 seconds of right ascension and 07 degrees, 24 minutes and 25.5 seconds of declination. Another name for that star? Betelgeuse.

I often notice ad campaigns on social media and elsewhere from various disreputable "star-naming" companies. These businesses promise you the ability to give a star (sometimes of your choosing, sometimes not) a name that will go in a catalog somewhere or be used by astronomers or—get this—get saved in a vault. So fancy! To be very clear: this is nonsense. These are vanity sales, and no astronomer anywhere will ever know or use the star names purchased from these companies. Many of these sellers target grieving people, inviting them to name a star after a loved one who has died, and I personally find such messaging disgusting. Don't fall for this egregious scam.

Anyway, an unavoidable problem here is that any given star can have a lot of names, even if we stick to the legitimate ones. *A lot*. Our old friend Betelgeuse, for example, has no fewer than 46 designations listed at SIMBAD, a database of astronomical objects beyond the solar system. Sure, in this case everyone just calls it "Betelgeuse" because that's its recognized name (and it's fun to say because of the movie *Beetlejuice*), but for other stars the name used can depend on which astronomer is observing it and how it's being observed. A star might have been discovered in an infrared astronomical survey but also independently in a radio-wave observation, so different astronomers will call it different names depending on what part of the spectrum they're most familiar with.

But I'm okay with this variation; it gives us a certain flexibility with naming, and it's not hard to look up which names go with what star.

And of course, in the end, a star by any other name would shine as sweet. ●