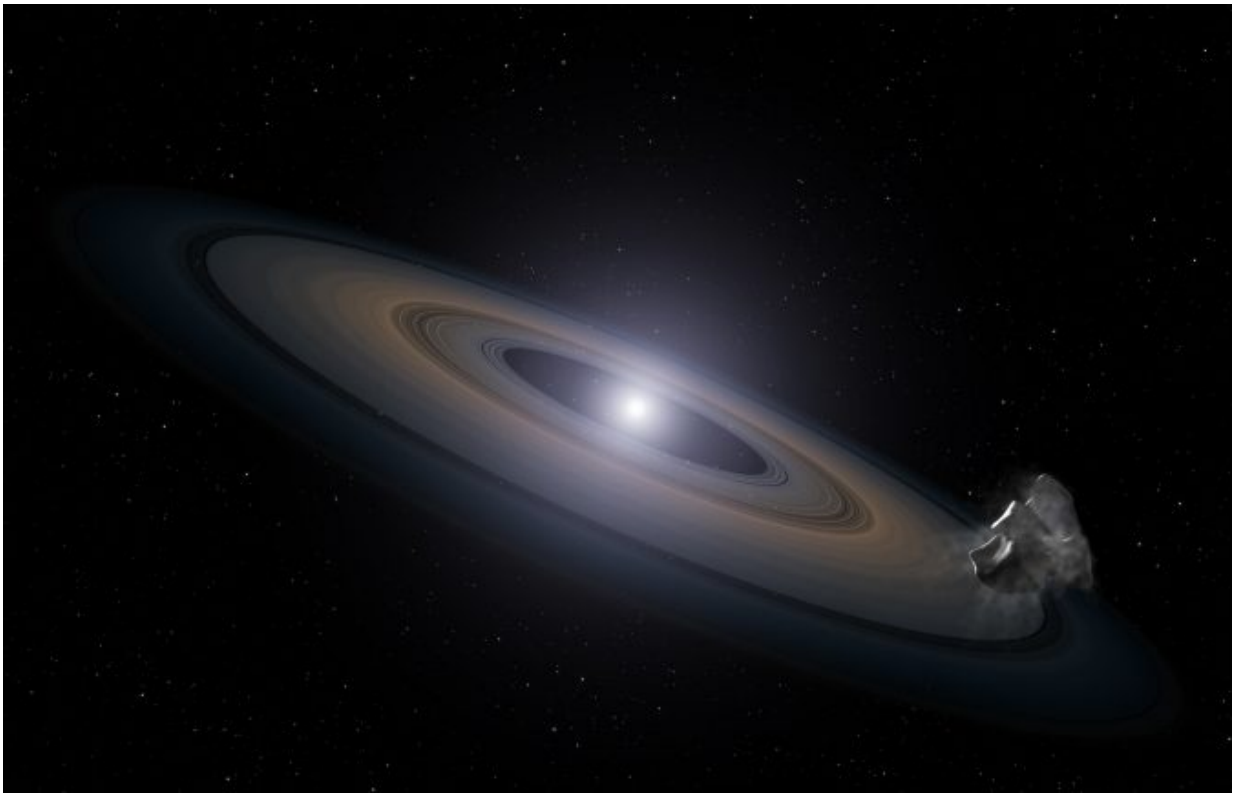
An old glass plate hints at a potential new exoplanet discovery

April 28 2016, by David Dickinson



An artist's conception of a 'polluted white dwarf' star, plus debris disk. Credit: NASA.

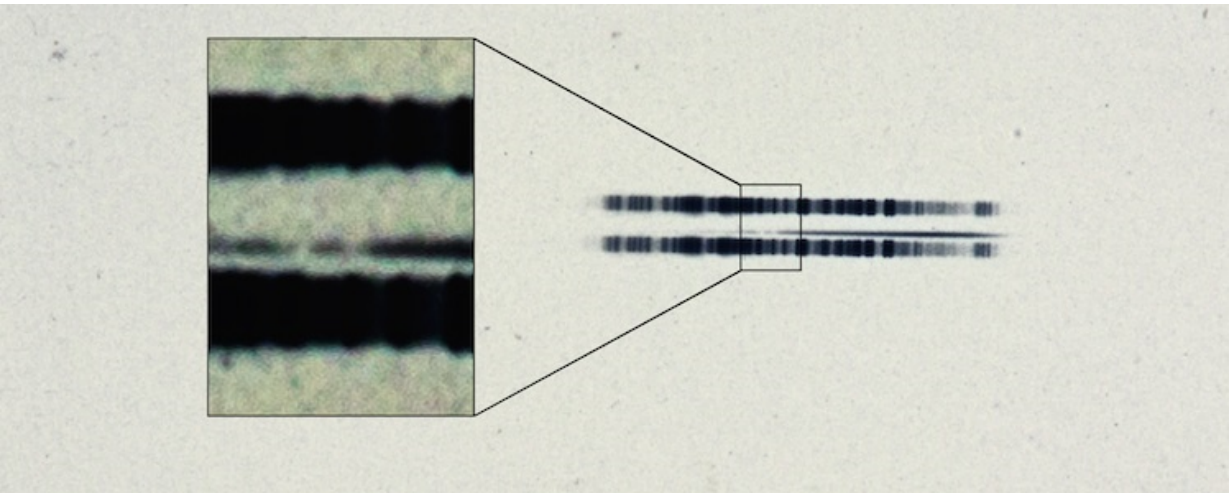
What's the value to exoplanet science of sifting through old astronomical observations? Quite a lot, as a recent discovery out of the Carnegie Institution for Science demonstrates. A glass plate spectrum of a nearby

solitary white dwarf known as Van Maanen's Star shows evidence of rocky debris ringing the system, giving rise to a state only recently recognized as a 'polluted white dwarf.'

First, let's set the record straight. This isn't, as many news outlets have reported, a new exoplanet discovery per se… or even an old pre-discovery of a known world. Astronomers have yet to nab a bona fide exoplanet orbiting Van Maanen's Star. But obviously, something interesting is going on in the system that merits closer scrutiny.

The discovery: it all started when astronomer Jay Farihi of University College London requested early plate observations of the star from the Carnegie Institute. Dating from 1917, the plate shows the bar code-looking spectrum of the star. Astronomer Walter Adams captured the image from the Mount Wilson observatory, noting on the sleeve that the 'ordinary' looking star (Van Maanen's Star wasn't identified as a white dwarf until 1923) was perhaps merely a bit hotter than our own Sun.

But to Farihi's trained eye, something was up with Van Maanen's star. Specifically, it was the presence of the third set of absorption lines between the standard pair that showed evidence of calcium, magnesium and iron —materials that should have long since sunk down to the dense core of the degenerate star. Somehow, these heavy—remember, to an astronomer, the periodic table consists of hydrogen, helium and 'metals'—were being replenished from above.



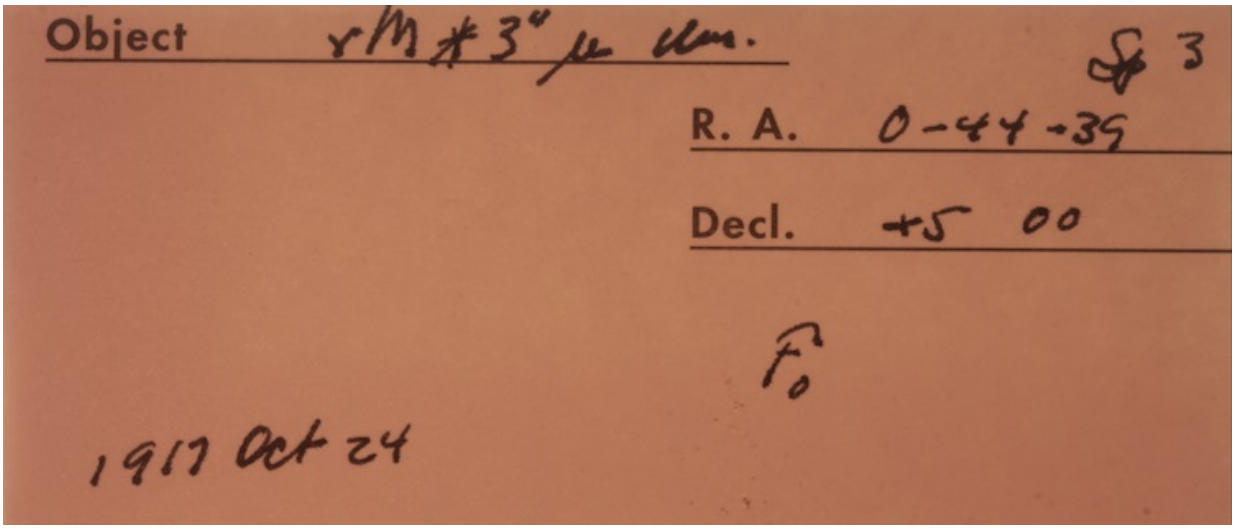
The 1917 spectra of Van Maanen's Star. Note the key absorption lines for heavier elements (inset) Credit: The Carnegie Institute.

"The unexpected realization that this 1917 plate from our archive contains the earliest recorded evidence of a polluted white dwarf system is just incredible," says Carnegie Observatory director John Mulchaey in a recent press release. "And the fact that it was made by such a prominent astronomer in our history as Walter Adams enhances the excitement."

The very fact that this crucial bit of evidence was sitting on a plate locked away in a vault for a decade is amazing. We now know that rocky rings of debris around white dwarf stars can give rise to what's known as polluted white dwarfs. And where there's debris, there are often planets. As newer exoplanet hunters such as TESS, JWST, WFIRST, LSST and the Gemini Planet Imager begin to scour the skies, we wouldn't be at all surprised if Van Maanen's Star turned out to have planets.

The Carnegie Institute maintains a collection of 250,000 glass plates taken from the Las Campanas, Mount Wilson and Palomar observatories

dating back over century. These stellar spectra were painstakingly all examined by 'Mk-1 eyeball,' and enabled early astronomers such as Annie Jump Cannon and Henrietta Swan Leavitt to categorize stars by color and temperature and identify standard distance candles known as Cepheid variables. Both concepts are still used by astronomers today.

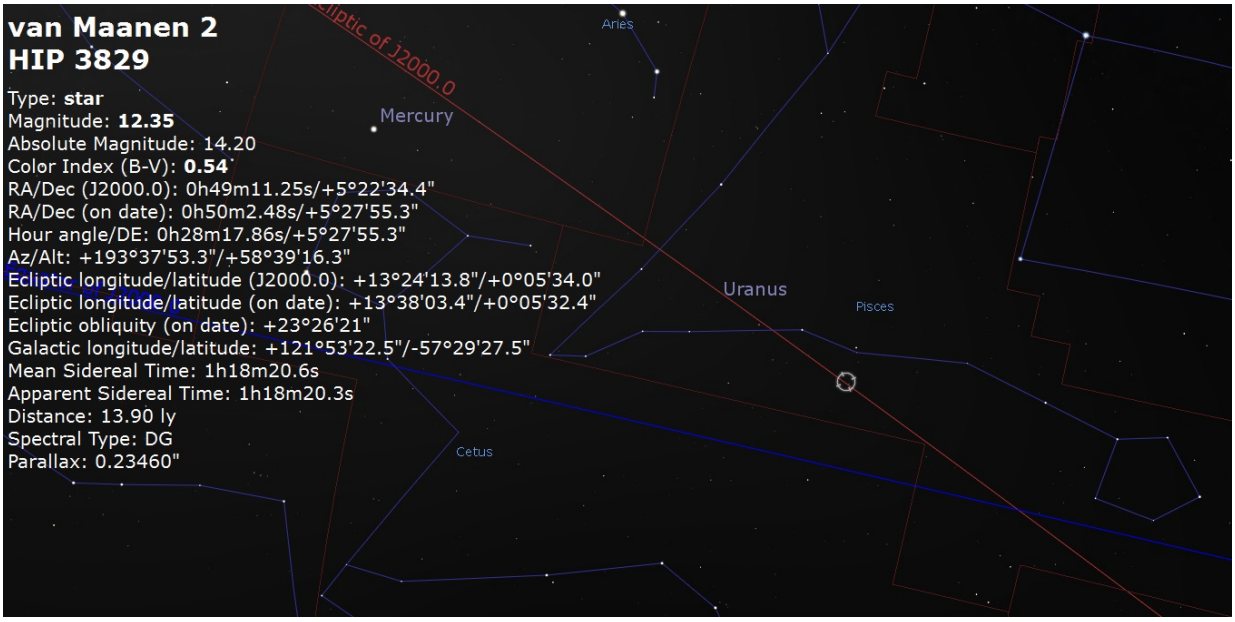


The original envelope containing the key 1917 glass plate holding the spectrum of Van Maanen's Star. Credit: The Carnegie Institute.

Finding Van Maanen's Star

Located 14 light years distant, the high proper motion of Van Maanen's star was first noted by Adriaan Van Maanen in 1917, the same year the plate was made. A high proper motion hints that a star is located near our solar neighborhood. Van Maanen's Star is the third white dwarf discovered (after Sirius B and 40 Eridani B) and the third closest to our Sun (after Sirius B and Procyon B). Van Maanen's Star also holds the distinction of being the closest solitary white dwarf to our solar system.

Located in the constellation Pisces, Van Maanen's Star shines at magnitude +12.4. It also made our handy list of white dwarf stars for backyard telescopes.



The location of Van Maanen's Star in the constellation Pisces. Credit: Stellarium

Many false alarms of claimed exoplanet discoveries dot the history of 20th century astronomy. One of the most notorious were the claims of a planet orbiting Barnard's Star, betrayed by supposed wobbles detected in its high proper motion. The first true modern exoplanet was actually a trio discovered orbiting the pulsar PSR B1257+12 in 1994. Ironically, though the exoplanet tally now sits at 2108 and counting, no known worlds have been identified around Barnard's star.

What other future secrets do those old glass plates hold? "We have a ton of history sitting in our basement," says Mulchaey in this month's press

release. "Who knows what other finds we might unearth in the future?"

Source: Universe Today