

White Dwarf Stars Near The Earth

There are six known white dwarfs within 18 light-years or so of the Earth. Their basic parameters are given below. Column two gives their distances in light-years, column three their surface temperatures, column four their masses as compared to the Sun, and column five is for the astronomers in the audience. (For those of you who are not astronomers, App Mag means Apparent Magnitude, and refers to their brightness as seen from Earth on a logarithmic scale which uses the fifth root of 100 as the base. Aren't you glad you asked?)

<u>Name</u>	<u>Dist (ly)</u>	<u>T(K°)</u>	<u>Mass (Solar)</u>	<u>App Mag</u>
Sirius B	8.58	25,193	1.01	8.44
Procyon B	11.43	7,740	0.60	10.81
van Maanen's Star	14.04	6,220	0.64	12.40
GJ 440	15.09	7,910	0.62	11.75
40 Eridani B	16.25	16,176	0.57	9.52
Stein 2051 B	18.06	7,120	0.68	12.43

Sirius B is the companion to Sirius, which is the brightest star in Earth's sky. As can be seen from the chart, Sirius B is unusually hot, and that means it is unusually young, probably only 250 million years or thereabouts. It is also unusually massive, being the remnant of a giant B-class star that probably weighed in at over five solar masses when it was born.

Procyon B is the companion to Procyon, a bright first-magnitude star not far at all in the sky from Sirius. (Indeed, Sirius and Procyon are the luminaries of the adjacent constellations Canis Major and Canis Minor, respectively, otherwise known as the Big Dog and the Little Dog.) Procyon B orbits very closely to Procyon and is a real challenge to see except with large telescopes.

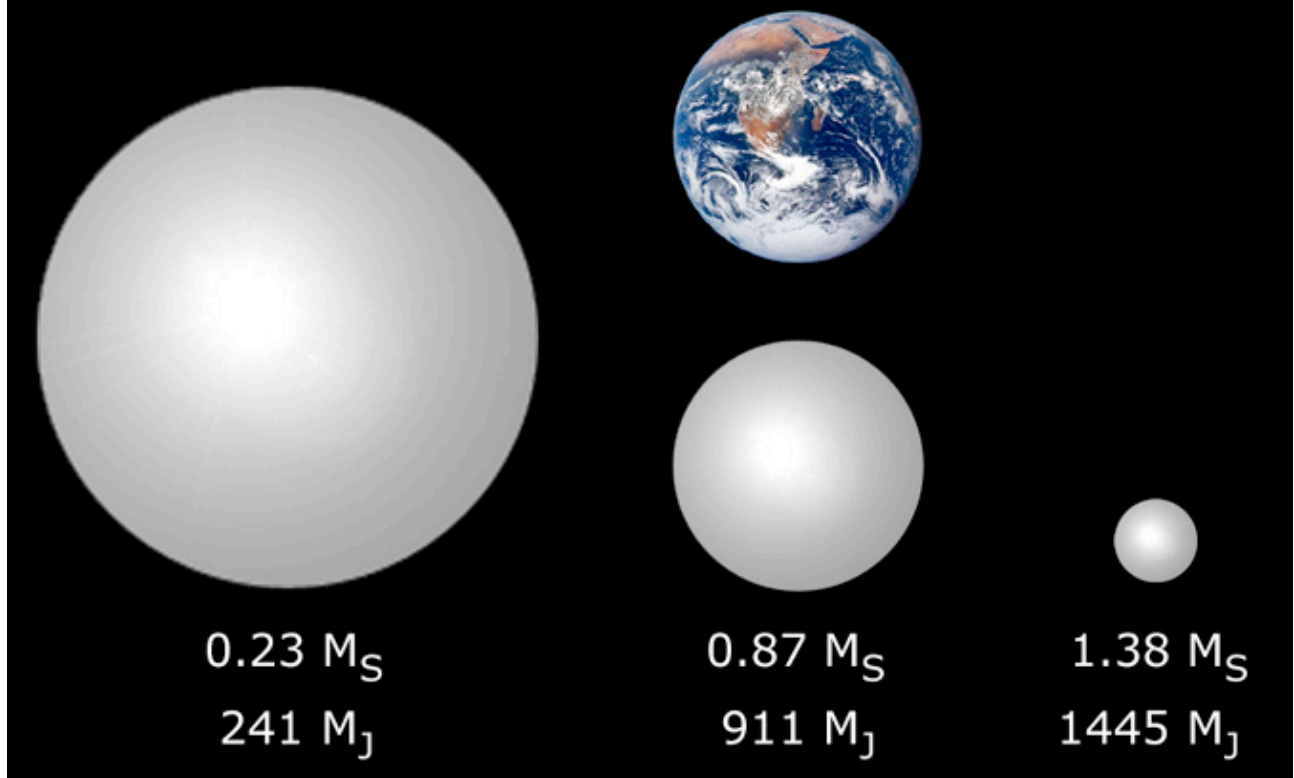
Van Maanen's Star is a lonely solo star and is quite old, as can be seen from its unusually cool temperature. (It is so cool, it is only about 400 K° hotter than the Sun, which means that it is more of a yellow-white dwarf than it is a white dwarf.) It takes a long time to cool off this much, probably nine billion years or more.

The white dwarf known mostly by the rather anonymous catalog number GJ 440 is also a solo star. Its parent star was about double the mass of the Sun when it was young, and the dwarf is neither especially new nor especially old, probably coming in at about three billion years. (When I refer to the "ages" of the white dwarfs on this page, I mean how long they have been white dwarfs, not how long they were main-sequence stars before that.)

40 Eridani B is a member of a triple star system and was once the brightest and most massive of the three, since the other two are relatively cool K-class and M-class stars, respectively. Precisely because it was the most massive, it was the first to make it to the white dwarf stage, probably less than a billion years ago, judging from its high temperature. It is also the lightest white dwarf in this group, indicating that its parent star was only somewhat more massive than the Sun.

Stein 2051 B is one-half of a red dwarf / white dwarf double star, with the red dwarf being so small and so dim that it isn't much brighter than the white dwarf. Stein 2051 B is relatively old, its temperature indicating an age above four billion years.

Comparitive Size of White Dwarf Stars



This figure shows exactly how large white dwarf stars are as a function of mass. (M_S means solar masses, M_J means Jupiter masses. One $M_J = 318$ Earth masses.) The Sun will have a mass of about $0.55 M_S$ after it becomes a white dwarf. The crushing effect of gravity means that white dwarfs become *smaller* as they become heavier.