

Hi this is Steve Nerlich from Cheap Astronomy [www.cheapastro.com](http://www.cheapastro.com) and this is *A Sidewalk Astronomer*.

What do you get if you cross George Ellery Hale with Timothy Leary? Well, I'm not sure either, but here's a podcast about John Dobson.

Born in 1915, Dobson is now in his nineties. It is unclear whether he is still wheeling his home-made telescope up and down the sidewalks of San Francisco waving over complete strangers to come and look at the Moon or the sunspots in the daytime or whatever happened to be up in the sky that might immediately captivate a casual observer. But it's nice to think he still is.

After completing a degree in chemistry at UC Berkeley in the 1940s, Dobson developed an interest in astronomy, and about the same time became a kind of Hindu monk of the Ramakrishnan order at a monastery in Sacramento – and he was encouraged by his order to reconcile his interest in astronomy with Hindu philosophies – which led him, as a Hindu monk with no money to speak of, to start building his own cheap telescopes.

The standard Newtonian telescopes available at the time were generally expensive to say the least, requiring a thick pyrex glass mirror, favoured due to its tolerance for changes in ambient temperature. As an alternative, Dobson set to making his own hand polished mirrors out of porthole glass that he found at a nearby junkyard – which was at least thick and fairly uniform in structure. Making a mirror meant grinding a cavity into the glass to create a parabolic reflecting surface.

Just to keep it interesting, Dobson also wanted to make a short focal length telescope – which would be easier to build and easier for the casual passer-by to look through.

OK – so, let's stop there a second. A Newtonian telescope, was designed in principle by Isaac Newton in a Da Vinci-esque kind of fashion, since the technologies of the day didn't actually allow it to be built.

The principle involves pointing a hollow tube at the sky, so that light falls into the tube, then bounces off a parabolic mirror to be concentrated and focused at a point distant to that mirror. Just where that point happens to lie is called the focal length.

If the concavity of the parabolic mirror is very deep – then the focal point is close to the mirror – if the concavity is shallow, then the focal point is much further away. A standard Dobsonian telescope can have an eight inch diameter (or 20 centimetre) mirror and be only 1.2 metres long – meaning people could comfortably look through the eye piece without needing a ladder. By comparison the Hubble Space Telescope has a 240 centimetre mirror and a 56 metre focal length. This long focal length, gives the Hubble fantastic magnification, though a tiny field of view and a dimmer image – but neither of these are a problem as it doesn't get looked through by casual passers-by.

Anyway, back to John Dobson. By using relatively cheap glass, the portholes, Dobson was faced with two issues. He was working with relatively thin glass to start with and he had ground a deep concavity into it to produce a short focal length.

But OK, if the resulting mirror was obviously fragile, why not rest on it on a cushion – all it has to do is to bounce light off its mirrored surface, after all. And since this is all about doing things on the cheap – why not make that cushion, say a bit of old carpet?

Easily accessible internet history does not record just how a Hindu monk got his ground glass mirrors aluminised – a key step in creating a 20<sup>th</sup> century telescope mirror – but in any case he did. And with a plywood frame, some old carpet and a ground, polished and aluminised porthole glass he had himself a cheap, but totally functional reflector box.

Now, next time you see a round concrete column, say 12 inches in diameter, you should go and look closely at its surface. You will probably see a spiral pattern – which is the remains of a cardboard tube moulding the concrete was set in – and guess what John Dobson used to make his telescope tubes with?

So then, with a cardboard tube collecting light down into the reflector box which focuses the light up to a second small and flat mirror – set at a forty five degree angle to project the focussed image off to the side, all he needed to do is stick an eyepiece into the side of the tube at that point. Dobson apparently used discarded 7x35 binoculars for a cheap eyepiece – though where you will find such collections of discarded binoculars is not really clear. Alternatively, purchasing a real telescope eyepiece probably won't blow out your budget that much.

And lastly, the real genius of the Dobson design is its alt-azimuth mount. An alt-azimuth mount is kind of like a gun turret, with a rotating base able to spin 360 degrees (the azimuth part) and a rocker allowing the telescope tube to be tilted from 0 degrees at the horizon up to an altitude of 90 degrees - meaning that it's pointing straight up.

Again plywood can be chosen for the frame of the mount – and Teflon is used on the bearing surfaces which could be extracted from some old cupboard hinges, back at the junkyard. So now you have a mount you can point anywhere in the sky at the touch of a finger. You can't easily set a motor drive to it – which are generally designed for equatorial mounts, but if you're building telescopes out of plywood and cardboard, a motor drive is unlikely to be high on your list of priorities.

By the late sixties, Dobson had the making of his cheap Dobsonian telescope down pat – and was increasingly helping others in the neighbourhood to build their own. But apparently, his order could not believe he was spending all his absentee time from the monastery in benevolent public service and – a little appallingly – kicked him out in 1967.

So he hitch-hiked to San Francisco and by 1968 had co-founded the San Francisco Sidewalk Astronomers, operating principally from the corner of Broderick and Jackson streets, but increasingly wherever it seemed a good to place to go and engage complete strangers in astronomy.

The basic tenet of sidewalk astronomy is that you don't just show people stuff for the oohs and the aahs, but you tell them something about what they are seeing – to educate them and to hopefully engage a long term interest in the wider universe.

Apparently many thousands of people have followed in Dobson's footsteps – spending a rewarding week of rough grinding their main mirror, another of fine grinding, another of pitch polishing, another of constructing the telescope, another – well actually two other – weeks of mirror testing and adjustment until you are finally ready to aluminize it and then take your new telescope out for its first run.

And that's all very wonderful, but somehow here at Cheap Astronomy it all sounds like a lot of work and no-one seems immediately convinced that once you've spent a few weeks polishing your first mirror, you'll be hooked for life. I mean, *really?*

Cheap Astronomy's vision is a world where you can just stroll into a department store, buy a half reasonable telescope with some spare change – and be home looking through it that evening... you know, if it's not too cold outside.

But hey, cheap is cheap – so here's to you John Dobson.

Thanks for listening. This is Steve Nerlich from Cheap Astronomy, [www.cheapastro.com](http://www.cheapastro.com). Cheap Astronomy offers an educational website in a universe without admission fees. No ads, no profit, just good science. Bye.