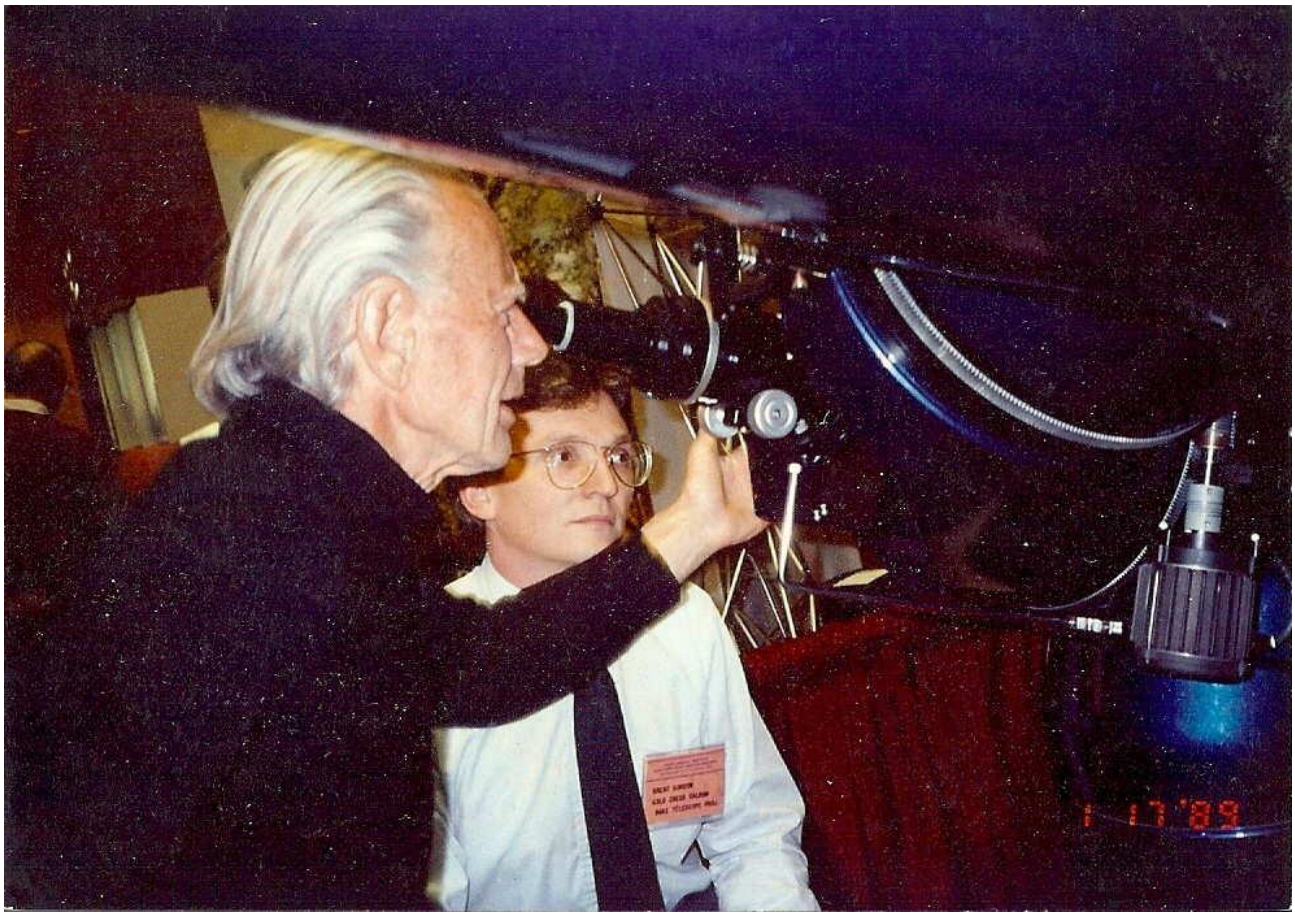

John Dobson with Brent Gordon, designer and builder of the "Big Blue" telescope, while the scope was on display at the annual conference of the American Association for the Advancement of Science (AAAS), San Francisco, 17 Jan 1989. A Coude-Cassegrain "Springfield Mount", with the eyepiece(s) and viewer always in a stationary seated position, it is ideal for wheelchair-accessible, and for all public use, with a 2" stereo-ocular viewer, equipped with two TeleVue 55mm Plossl wide-field eyepieces.

After the convention, Big Blue was partially disassembled and shipped to the Hyatt Regency Maui resort hotel at Lahaina, where it was installed on the hotel roof and used in their nightly "Tour Of The Stars" guest astronomy program for 15 years, until the unique telescope computer guidance system broke and couldn't be repaired. Big Blue was immediately replaced by an off-shelf 16" Celestron scope: the show must go on, and still does, as of early 2019.

EPILOGUE, Feb 2019 Big Blue is now owned by Alaska Applied Sciences, Inc., Juneau, Alaska, which is restoring and upgrading it for return to public educational recreational astronomy, perhaps at a low-latitude resort or at a new multi-telescope public observatory underway in Magdalena, NM.

See: https://alaskaappliedsciences.com/big-blue-telescope/ [photos and video]
https://vimeo.com/217752145

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With a Million Telescopes

by John Dobson

This keynote speech was presented to an audience of about 2,500 registrants, under the stars, on Breezy Hill, at the 52nd annual Stellafane convention Springfield, Vermont, 25 July 1987

First of all, I would like to thank you all for getting me here and then I have to salute Russell W Porter for he really gave the big push to this amateur telescope making, and we really all run in his footsteps. As Newton said, we stand on the shoulders of giants. And I have to salute also the man who had the good sense to support him. I slept in his house last night and I was very pleased. And it cost me six dollars this morning for two eggs and a bowl of cereal.

First, I think I should tell you a story. I was just recently up in Ukiah, that's north of San Francisco about 110 miles, working on two 24- inch mirrors and from there I was invited to the summer scientific meeting of the Astronomical Society of the Pacific down in Pomona in Southern California, so I had to bebop down to San Francisco and have a few minutes rest and off to Pomona.

But that was a very interesting conference. That was the biggest conference they've ever had. They had over 900 registrants. That's not a telescope makers conference, that's an astronomers conference. And Alan Sandage gave what I thought was the nicest talk. He gave a two hour talk, very slow, very deliberate, so that anyone could follow him, and you know he's a Big Bang man.

Somebody suggested while I was at the conference that I should get up and say, "Everything I've heard at this conference is about the Big Bang. What's the Big Bang, anyway?" I didn't do that.

But he gave a very nice talk, and he wanted to show that the Hubble constant has come out at 42. Now some have suggested that it may be as low as 25 and others have suggested 75, 80, 90, or 100, but he wants it to come out at 42 so he can get the Big Bang to go. He says, " I want it to go! "

All through the morning, and it was a two-hour lecture, he spoke about the creation event. And so at the end, during the question period, after several other questions had been addressed, I asked, " Since we are now willing to talk about a creation event, why must we assume that in the absence of space and time there should be nothing? Isn't it an unwarranted assumption ? "

I could understand that in the absence of time, we would have the absence of change. That's a warranted assumption. And that in the absence of space, we would have the absence of dividedness and the absence of smallness. That also seems to me to be warranted. But that gives you the changeless, the infinite, and the undivided, which to me seems like a long way from nothing.

It's not that he could handle the question; he couldn't touch the question. But before I was through some lady saw where it was going and she muffled a shriek, and it caused a real stir.

I think really this is a very important question. Apparently the Big Bang people are willing to assume that in the absence of the universe there is an absence of space and time, and that in the absence of space and time, there is nothing. And I don't think that's a warranted assumption.

And I would rather look at it this way. We have to ask our physics what the physics says is behind what we see. Whether there is any evidence in our physics that there is a changeless behind what we see. And whether there is any evidence that it's the undivided in the infinite behind what we see.

And that's what I think the evidence in the physics is. I think inertia is the evidence that what's behind our physics is the changeless. And that the electrical charge on the electrical particles is the evidence that what's behind our physics is the infinite, not zero. And that the fact that all the dispersed particles fall together by gravity is an evidence that undividedness is what we have mistaken for this universe.

Anyway, I didn't go through all that down in Pomona, because we just had to flush the question down the tubes when he was unwilling to talk on it. But I think that's a very serious consideration.

I never was really all that interested in telescopes. I know my name has become attached to a telescope, and it had no business to do that. So far as I know, I am

the only one who has always said Maksutov, Schmatsutov -- Cassegrain, Schmassegrain -- Schmidt, Schmidt. And now it's Dobsonian, Schmobsonian.

At any rate, it's like reinventing the gun. The military has been shooting each other dead with these things ever since they had gunpowder. And there's nothing odd about it, but apparently nobody ran telescopes this way, and I cannot figure out why.

At any rate, I was not particularly interested in telescopes, I'm interested in information. I'm interested in the problem of making it possible for the people who live in this world to see this universe the way it really is, and you have to do that through telescopes, and you have to do it at night. And to help them understand this world.

Now to me, it is not so much how big your telescope is. It's not so much what the figure of the mirror is, or the lens, or what have you. It's not so much what pretty pictures it takes. It's how many people, in this vast world, less fortunate than you, have had a chance, through your telescope, to see and understand this world. To me that is the one thing that drives me.

We Sidewalk Astronomers are astronomical entertainers, by appointment to Her Majesty the American public. And the reason we use long-focal-length optics is because she has to get in there with her eyeglasses on, or it's all over. If she has to refocus it, you can get a few hundred at the most across the eyepiece in one evening, but if she doesn't have to focus you can get more than a thousand. Often at Ghirardelli Square we get more than a thousand people across the eyepiece. And even in the National Parks with our 24- incher, where they have to climb a 12- foot ladder, we have several hundred people, 300, 400. But we usually have other telescopes there like an 18, 16, sometimes others.

One time when we were at the Grand Canyon the ranger asked us to keep track of how many people use the equipment. And we were there for 16 days and nights and it was 20,000 people !

Now we have sun telescopes in the daytime. By the way, I have some pictures of our fail-safe sun telescopes, and I wish more of you would look at those pictures. We have a front cover plate that's at 45°, and it's partially aluminized on the backside. You keep the front side bare so that people with ice cream on their

hands can get at it, and you can get it off again. But the inside surface is aluminized and lets through about 5% of the light. Then the objective is un-silvered and returns about 4% of that. Then that little bit, about one part in 400 or 500, is reflected from the back surface of the front plate through a welder's glass onto the eyepiece, and the welder's glass eats about 99% of that remainder.

So we let you use about 20 millionths of the incoming beam, and it's an unobstructed reflector. And it's fail-safe because if the front plate is broken you are looking at the ground through a welder's glass, and that is known to be safe.

The only way you can burn your eye with one of these Sidewalk Astronomers sun telescopes is to set fire to the telescope and carefully hold your eye over it while it burns.

I mentioned that we use pretty long-focal-length optics. Our 24- incher has a focal length of over 13 feet. It's an f 6 .5. We didn't want to cheat when we made it because we knew it was going to be made for public use. We never set these telescopes up to look through them. We set them up for other people to look through, and it's usually in national parks or state parks. We don't use these bigger ones in the city much. But the 24-incher has been some 80,000 miles in public service. And the reason we use long-focal-length optics is partly, as I said, because people have to get in with their eyeglasses on without having to focus it, and partly because we have noticed that the rod cells are stupid.

You know you have two kinds of cells in your eyes. You have the cone cells, the ladybird beetles cells, I call them. If you look at the ladybird beetle in the palm of your hand, you put her picture on your fovea, and that's full of cone cells and they're very sharp.

And if there were a barn owl sitting on one of these trees and it's daytime you could see his eyes, and his beak, and his feet, and his feathers. But if it's nighttime you'd see only a lump. Okay, just think about it. If there were a barn owl in one of these trees, and it's this time of night, you'd see only a lump. But you know perfectly well that if you walked right up to it, you'd see his beak, and his eyes, and his feathers, and his feet. That is because the rod cells by which you see the barn owl by night are stupid. They cannot get the information unless the picture is big.

And this is where I have a bone of contention with Jim Braginton down at Coulter. He makes these f 4 .5 things, and he's got some mental persuasion that you can see better if it's very bright like that but you try it yourself: you can get more information out of the image if you run it to six powers per inch of aperture then you can at four and a half. You just try at any time and ask a whole bunch of people to come and see where they get more information. I think everybody, at least almost everybody, gets more information at six powers per inch of aperture then at four and a half. Now I'll admit that it's brighter at four and a half, but there is this terrible difficulty that the rod cells are stupid.

Anyway, I haven't got Jim Braginton persuaded to make longer focal length telescopes. But he did recently cut us a 24- inch blank which we just recently ground because Gerard Pardeilhan has borrowed the 24- inch mirror, our old one made out of the porthole which is only 1 inch thick at the edge and three quarters inch thick at the middle, and it's 24 1/2 inches across. And that one I'm sure is forbidden by all the telescope making books that were ever written, but it works very well. We've had four professional astronomers say they never had a better show, anywhere, any time.

Anyway, that mirror has been taken down to the Lawrence Hall of Science, and so we're left with the old machine. And so we built a new mirror to go in the old machine. That will give us two 24- inchers to run with, if we can get funding to run. And recently our friend in Texas has funded us for a summer trip, so next summer we'll go.

Now next summer, the summer scientific meeting of the Astronomical Society of the Pacific is going to be in Vancouver, British Columbia. It's going to be the 25th of June. So we want to take the telescopes out a little earlier and go to Mount Lassen, then to Lava Beds, then Ashland, Oregon, then Crater Lake, then up to Vancouver, British Columbia, and then maybe run through the British Columbia provincial parks, and then maybe go up to Mount Kobau, BC, again where we were last summer.

At that star party at Mount Kobau last summer, they had eight 17.5 inchers running over that hill like cattle. I was impressed. I had no idea there would be so many big telescopes up there. There were two 20- inchers, and eight of those things. And they had an optical judging contest. And I entered our "Little One".

We have a telescope called "the little one" that's an 18- incher, with a 9 foot focal length. And I entered that into the contest, but it couldn't be judged because all the rest of the telescopes in the contest had bought [factory-made] mirrors. They should've had homemade mirrors, so we couldn't be judged. I thought that was hilarious.

Anyway, I'm very interested, you see, that all the people who have telescopes should help make it possible for the people who don't have telescopes, and who live in this wide world, to see what the universe really looks like. Porter really got us all started making telescopes. And now it has become a possible thing: if there were a million people -- only a million people with telescopes -- willing to let a few thousand other people look through them, it's possible that everyone who walks on this Earth, with eyes to see, could see.

The solution is within our power to reach. We only have to have a few more telescopes than we have, and the willingness to let the other people in this world use them, and we can go.

Now I mentioned that we just were working on this second 24- incher and somebody else up there in Ukiah is making a 24- incher that'll give us three 24-inchers. And we've just bought back Gerard's 22- incher from Steve Dodson up in Sudbury Ontario, and I asked my friend in Texas if he wanted to buy it, and he bought it. And so he'll get me down to Texas, and we'll build that up and probably take it to the Texas Star Party.

But you must understand one thing about the Sidewalk Astronomers: we do not spin our wheels for astronomers. You can spin your own wheels. We will spin our wheels in public service, and if we can do public service on our way to one of these things, we will go to one of these things, but not just for you. You can take care of your own problems.

But I am severely interested that all the people who live in this world should have a chance to see what it is like. And so I beg you to use your telescopes, as far as you can, to make it possible for all the less fortunate people in this world to see and to understand.

Arm yourself with information. Arm yourself with information ! It's so silly, you know, often I come where these astronomers have these telescopes and you hear

people still saying the Ring Nebula is an exploded star. You still hear these quaint old things. Up at Mount Kobau we had an astronomer give a very nice talk on these things called cold planetary nebulae. You know the astronomers name these things before they know what's going on, and they get the wrong names.

But at any rate, he said that stars like the star in the Ring, and the one in the Dumbbell, probably used to be something like eight solar masses, and probably something like five solar masses have gone away as stellar winds in the red giant phase. And what we see now in the Dumbbell and the Ring is only about one tenth of a solar mass, and it's lit up by the bright star at the center which is really a dwarf star. And there is oxygen coming off those dwarf stars, and it's coming off by a slightly different mechanism.

But anyway, you need to understand some of these things. There is no use going on telling the public that the Ring nebula is an exploded star. You need to arm yourself with proper information. The public needs information.

Now in this country to a certain extent, information comes down like rain. People run around with bumbershoots to keep themselves dry. But it is not so on the other side of the Pacific. In 1983, I was on a four- month lecture tour in India, and what I found was that they are extremely anxious for information. We took not only slides, but we took $100 worth of these big colored astronomical posters, because we knew that the power would fail. The power fails all the time over there, and you cannot depend upon giving a slideshow from beginning to end without a power failure. But sometimes you can't even show posters under those conditions.

Anyway, we took those pictures and we showed them all over, and the people were flabbergasted. They don't have all these magazines with pictures like this. They don't have all these public television shows with all these pictures in them. They've never seen these pictures and they were flabbergasted.

I suppose now if you people want to ask me some questions, you could ask me some questions. I won't be able to see your hands; just shouted out.

"How did you first get interested in what you are doing now?"

Well, I was in a monastery in those days. We always called it a "monastery". I joined the monastery in 1944 and I got thrown out in 1967, for helping the kids

in the neighborhood make telescopes. No, actually you don't get thrown out of a monastery for helping people make telescopes. You get thrown out for being AWOL. You understand AWOL ? Absent With Out Leave -- AWOL -- absent without leave. It's a military term, but you see in a monastery if you're AWOL they assume that you did it and that is the problem.

Anyway, before I got thrown out of the monastery, and that was in Sacramento in 1967, there were already fifteen 12-inch telescopes around the neighborhood. You could throw a stone from one house with a 12-incher to the next. And I had already figured two 18-inchers. One of them is now set up and we use it all the time. That's the one I said is called "The Little One". We never did call a telescope "The Big One." But we do have a 31 inch blank, but we never made it into a telescope. We need somebody to cut it into two slabs. It's 6 1/2 inches thick. And we do not run around with forklifts to put our mirrors in their cells.

At any rate, I got started because I was concerned with the problem of understanding this whole universe. I had been raised at the University of California as a chemist and I knew that the universe has to be made out of hydrogen. But in the 1940s this was not written down anywhere. Nobody apparently in the in the 40's thought the universe is made out of hydrogen. And I knew that universe had to be wound up on gravitational energy, not on some other kind.

Now some of you may think it's wound up on nuclear energy, but you have to think very carefully. If all the matter in the universe began as hydrogen and ended as iron, the energy you would get out that way would only be 1% of the energy we would get out of out if it all fell together by gravity. The hydrogen has the maximum nuclear energy and iron has the minimum: it has none and yet if all that nuclear energy from the whole universe became available, it's only 1% of the energy available by gravitational collapse.

Anyway, I could see that way back in the early 40's and so I was looking, you see, through whatever texts I could find in the monastery to find out whether anybody thought like this, and I couldn't find it out. And so, then I wanted to see what the universe was like, and so a friend of mine and I made a 12- incher, which the abbot had thrown in San Francisco Bay. I'm sorry about that, I shouldn't tell all

these stories out of school. But at any rate, eventually I got thrown out also, but not into the bay. You see, making telescopes was not part of our curriculum.

Anyway, that's how I got started. I wanted to see the universe, but when we made a telescope and I saw the moon, that one-third-quarter night, and I thought, "My God, you know it looks as though you are coming in for a landing!" I had no idea the moon looked like that. And so I said to my friend, "Everybody in the world has to see this!". But now you see what's happened to me, I got thrown out. Anyway that's how that happened.

But I'm primarily interested, you see, to understand why do we see a universe at all ? And why, if we do see a universe, do we see the kind of universe that we see? Why do we see the universe spaced out in space and time? And why is it made of gravity? Why is it made of electricity? Why does it fall together by gravity? And why do bicycles coast?

Now you know, we send all the kids to high school before we let them go to the university. You know why that is. So that they will not ask the professor why the spoon fell to the floor. The professor hasn't a ghost of an idea why the spoon fell to the floor, and he doesn't want to be quizzed on it.

But I cannot take those things for granted. I cannot take for granted that these teeny-weeny particles have to be electrical. To me the only reason, the only explanation, is because the infinite has to show through in the small. And I cannot take it for granted that all these dispersed particles have to fall together by gravity. As I see it, the only reason they fall together by gravity is because the undivided has to show through in the appearance of division. And the only reason that bicycles coast is because the changelessness shows through in the appearance of change. You remember how Newton put it:

> *" Corpus omne perseverare in statu suo quiescendi vel movendi uniformiter in directum, nisi quatenus illud a viribus impressis cogitur statum suum mutare. "*
>
> " Bodies all persevere in their states of quiescence or of motion uniform in direction, unless by forces impressed upon them they are compelled to change their states. "

Now I suppose, if you like, I could show you some slides or do you want to go look through the telescopes ?

"Slides, please !"

All right, before I do, I have some Sidewalk Astronomers flyers here and some old newsletters. I'm sorry I don't have enough. If I had brought enough for all of you, I would've had to come on the bus.

[He throws them in the air all over the crowd]

If you want to ask any more questions you may.

" How did you grind your first mirror ? "

Furiously! Rough grinding is a caveman's job. Eat well, sleep well, and work like hell. Fine grinding is in the suburbs. Polishing is in the city. Figuring is just like downtown.

" How big should a telescope be ? "

A telescope is too big if you can't move it. If you can get it into the backyard, it's too small. Oh, I should tell you one thing, I finally found out how to say what's special about Dobsonian mounts: they don't drink and they don't drive.

[SLIDE SHOW NARRATION by John Dobson follows]

Now, the order of the slides may not be very good. This is the bunch of slides that fell out in the rain, all over the sidewalk one time, and I don't think they ever got back in a very reasonable order, but you may find them interesting.

Okay. Now this is before my hair got white, and this is in Bruce Sams' backyard. He was grinding a 10-incher, and I had to grind one at the same time. So we're both grinding, but his mother wanted pictures of me. She's got plenty of pictures of Brucie, so she wanted some pictures of me. So when those pictures were taken, I'm grinding, but half the time he was grinding. But you see him later on, there, grinding a 10.5 incher. These are porthole glasses. That's a posed picture; I don't do it like that.

Now, there's Bruce Sams, you see, at nine. He came up to about my nipples. And he's now down it Cerro Tololo. He's doing research for his PhD in astrophysics at

Harvard. He graduated from Caltech several years back and he's big enough to splash me against this tree.

When he was 13 years old, he made an 18-incher and won the grand first prize in the science fair for the state of California, when he was three years too young to go to the national science fair finals. And when he was about 13 he got his mother's permission to make a 60-incher if he could fund it.

"Did he fund it ?"

No, he's down in Cerro Tololo now. He gets to use that big 4 meter thing now. Anyway, he liked to do his own nailing and everything. Now in that tube, that shiny business, that's the plastic lining of these cardboard tubes. But this was one of the very early ones, and we hadn't peeled out the plastic yet.

Now, there he's testing the focal length, shining the reflection of the sun on his brothers tummy. That's not the way to do it, you cannot afford to get it in your brother's eyes.

Now, there is his finished telescope. He was my assistant when I taught the class at the Jewish Community Center in San Francisco. When he was that size he was my assistant in the class, who wouldn't listen to what he said. But you see, he's made this 10.5 inch telescope and these were all novices -- hadn't made anything, you know -- and they wouldn't listen to what he said. So I gave the whole class a tongue lashing. I threatened to beat them up singly and in bunches if they didn't do what he said. Anyway, he was offered 500 bucks for this thing on the street when somebody saw it. But it's a very good mirror.

And now, that's one of the ones I built in the monastery. And it has old wagon wheels on the front. This is one of the ones I used to wheel around from house to house in Sacramento, until some kid would asked me what it is, and I'd say, " It's a telescope. Do you want to borrow it ? " So, of course he wants to borrow it. So, we find some mother who is brave enough to have it in her garage for a month. And then I'd sneak out of the monastery at night and shoot off my trap at the eyepiece until all the people in the neighborhood had a chance to see. Then I'd wheel it in again.

Now, you see some people do prettier work and they save my reputation. Now that's the rear end, see those little lead weights on the back there, to make the

rear end heavier? Now you see there's his tailgate. Now you watch, he's going to upholster it. See this thing in the lower left? He's going to put it on. How do you like that? Well, anyway, some people save my reputation. I make telescopes that are ugly to look at but okay to look through.

Now, here's some kid grinning from ear to year, pouring on his rough carborundum on a 10.5 incher. These are all portholes. Years ago, I borrowed a bunch of money and went down and bought 4 tons of porthole glass from American Salvage. That glass is long ago gone. People asked me sometimes how many telescopes I've helped people make. I can only give you an estimate in the tonnage. I don't even know how many tons, but it's in the neighborhood of 4 tons of glass that were made into mirrors. Because a lot of that was tool glass, of course, but I bought several tons of glass since then.

Anyway, here were doing the caveman job. And there he's testing to see if he's in the ballpark for his focal length. There he's testing the focal length and he hasn't got his brothers tummy. There he's being regurgitated by the tube.

One of my friends once said about me, " John Dobson (JD) eats pitch and sleeps in a tube." But of course we do, you know, we do sleep in the telescopes. We sleep in the 24-incher all the time when it's not set up. It takes two people end-to-end, unless they're more than 6 feet. And the record for sleeping in the 24 is eight weeks. Gerard had to sleep eight weeks there when the bus broke down.

Now, this man made a very charming 12- inch telescope, with very careful workmanship and all, and he painted that tube with seven coats of marine enamel. Now, I have always argued that there is no need to paint telescopes white. I don't have any idea how it ever got started. They're not used in the daytime. If they were used in the sun, while you're looking at Jupiter, that would be one thing, you'd want them to be able to handle the sunlight. But they're used at night, and what you want them to be able to handle is the infrared. Now marine enamel will not handle the infrared. And on a night when no other telescope "dews down", this one dews down between one and two hours after sundown.

And at the Lawrence Hall of Science in Berkeley, with the sun streaming down on the top of that tube, the top of the tube was cooler than the bottom. I couldn't believe my hands, so I turned my hands over and called my friends. They couldn't

either believe it, until they had turned their hands over. But the top was a great deal cooler than the bottom.

The bottom cannot handle the infrared radiation from the pavement, but the paint can handle the visible light from the sun. And so I've always argued, you see, that telescopes need to be painted with some kind of paint that can handle in the infrared. It don't make no-never-mind what they do in the visible unless they are sun telescopes and the sun telescopes face straight into the sun anyway all day long and it don't make no-never-mind what they're painted with.

Anyway, some people do nice neat work. This is the psychedelic giraffe. This is a long-focal-length one. And this is also made out of a Navy porthole. It was made by a sixth-grader. And people used to ask me sometimes, " What you do to get a telescope ? " I say, " First you get the Navy to scuttle a ship, then you get a sixth-grader."

Now, this next one was made by a 15-year-old girl, and she was into The Hobbit. And so she's got all kinds of pictures, I'll show them to you later. But when we were figuring her mirror, she came to my house to figure the mirror, and I told her we've got it already to 1/8 of a wave. I said with a little care we might get it to 1/16. She says, " What's the use ? It's only a 9 incher. " My hero!

Now, here is one of our little sun telescopes; you see the front end is cut at 45°. This is just a little peewee that lived in Phoenix for a while.

Now, there's the front end of our big sun telescope, that's a 10.5 incher; it now lives in Colorado. I haven't seen it for many years. I had to sell it for diagonal mirror glass. But that one gives the sun at 93 power, and that's very convenient. You can tell people, that's the way the sun would look if you were 1 million miles away behind a big thick Welder's glass. But in five minutes the Welder's glass would vaporize. In another five minutes you would.

Now, here we are at Fremont Peak State Park. That's our 24-incher over there, and various other telescopes are there.

Here's the 24 incher at Glacier Point. The 24-incher has sat more than 100 nights at Glacier Point, and that's a fabulous place. It's 7,200 feet above sea level, and it's right on the brink of a cliff, and there is only a little high ground above it. And the air that comes down over the high ground, comes right through the forest,

and comes out very slowly, and falls right off the rocks. And the seeing conditions there are very, very good. It's very, very dark. We've seen the Corona Borealis cluster of galaxies from there, and that's about far enough away so that the light we see now left those galaxies during the formation of the late Precambrian rocks at the base of the Grand Canyon Gorge. And over those rocks seven oceans have come and gone while the light's been coming.

Anyway, that's the farthest away thing we've seen, and we've seen it from Glacier Point. And it's a fabulous place, very dark, and the transparency is very good, and the turbulence is very low, and it's cozy and warm at night. And when we first got to Glacier Point, with this telescope ... well, I should tell you the story.

Brian Rhodes and I made that telescope. It took us three months to make the telescope from start to finish, took us 19 hours to grind and polish that mirror. Took us longer to figure it because we had to get it out of town. It was the foggy season in San Francisco and so we had to get it out of town, but we finished it in three months. And so after we finished it I told Brian that probably Glacier Point in Yosemite is one of the best places in this whole world for a public telescope, but I said, there's that damned hotel. But anyway, we went up there and the hotel had just burned down.

So, this telescope has sat on the grounds where the old hotel used to stand, either there or on the front road, for more than 100 nights. You know you can't test the seeing conditions for a big telescope with a little one, but you can test the seeing conditions for little telescopes with big ones. Anyway, Glacier Point is a very good place. I'd like to see at least eighteen or twenty 18-inchers permanently mounted there.

But one of the rangers at Yosemite had it figured out in the right way. He said, " If we put telescopes in the national parks, will have to house the telescopes, will have to procure the telescopes, will have to take care of the telescopes, will have to hire trained rangers to run the telescopes."

And he says, " If we leave the telescopes, and the slideshows and the know-how with the Sidewalk Astronomers, we can get you from park to park for about five grand a year." He had it figured out in just the right way, and we never met him again. They transferred him to some other park.

Anyway, here we are at Glacier Point in the snow. I was sick that day and down in the floor of the valley. Here we are at another time. And there's that 10.5 inch sun telescope, the one painted all fancy red and yellow, over there now. It's gone through a lot of paint jobs.

Now, here we have an unobstructed mask in on the front end of the 24. You see that? We're looking at Venus in the daytime. Now on the 24-incher we have a little more than a 13-foot focal length. And with that 10" x 15" ellipse on the front, we have an unobstructed reflector like a Schiefspiegler, a 10" x 15" unobstructed reflector, and with that we have seen Schiaparelli's *canalae* on Mars, and all kinds of junk on Mars that I haven't even seen in the books.

Now, here we broke down at Buttonwillow, near the population center of California, and my van broke down. And so Brian Rhodes had to take the engine apart and rebuild it, and in two days we were back on the road. But meanwhile, I took a sun telescope over to the school, and we ran the whole school, class by class, through the sun telescope, and I gave them all a slideshow. Now they have these fabulous murals in the hall. One of the teachers and the kids made all these fabulous murals. They're made out of broken glass, and white glue, and various colored things, and they are absolutely fabulous, and they belong in the Metropolitan Museum of Art. If you get to Buttonwillow while school is on, go to the school and asked the superintendent of schools if you can look at the murals in the hall.

Now, there's Dr. Lucignan, a professor at Stanford University, in communications, and he's making a 16 incher. I'll get to it when it's finished after a little while. He watches the TV while he does it.

Now here we are at 7,000 feet in the Sierra and there's the 24- incher over there past the van, and the one on the left is Ruthie. That's an 18- inch unobstructed reflector. It had astigmatism and we figured the curve so the axis of the curve is about 1 inch in from the edge of the glass. So the diagonal is right over your eyepiece tube. Your eyepiece tube comes in through the side of the big tube, and then you have a diagonal right over it, and you can't see anything past the eyepiece tube except the objective. And so that's an unobstructed reflector.

At one of the star party sites they stole everything from his telescope except the objective because they couldn't get it out of the box top. It was locked in.

Now, there we are figuring that 16- incher for Dr. Lucignan. And here I'm running my thumb around. It has a hill just a little ways inside the edge. When I first saw that picture I couldn't imagine why I had my thumb on the glass. But I remembered afterward. There's Jean Lucignan, I think she's a ballerina now. She's grown and gone. And she's pressing the pitch lap for him. She standing on the mirror.

Those are my hands on Thanksgiving day. Now here's the telescope when it's finished and it's called the "Magnificat", because it magnifies. And we're at Furnace Creek Visitor Center in Death Valley and he has the tube come apart like that. Six of us and that telescope went in that little motorhome. And those are the Funeral Mountains behind us. This is on the floor of Death Valley, below sea level, but the seeing conditions there aren't as bad as you might think.

But one year we took the 24-incher up to Dante's View, that's 4,500 feet above the salt flats. And that was the best view we ever had of Omega Centauri. All the way across the eyepiece field and out into the wings with these minuscule stars. It was absolutely fabulous. From there we went to the Riverside Telescope Makers meeting, but the seeing conditions at Riverside were nowhere near like they were at Dante's View.

There we are putting it away in a vehicle. There I am lining up the optics. Here we are looking at Saturn in Death Valley.

I guess we ran out. Yep, we ran out. [END OF SLIDES]

I have some sun telescope pictures which Gerard Pardeilhan made, and I will leave them up here on the front if any of you people want to look at them, you can do that. I'll leave them up here on this barrel. Pictures of how our sun telescopes work.

HOST: " John Dobson, ladies and gentlemen. Thank you very much, John. "

END

POSTSCRIPTS

Tape recorded by: Dale Bryant, Cape Cod Astronomical Society
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The delightful story, " Astronomy for Children under 80 ", by John Dobson, tells more about the changeless, the infinite, and the undivided mentioned above.

Pictures and text about the Sidewalk Astronomers can be found in:

- Sky and Telescope, April 1980, pp 338-344
- Sky and Telescope, January, 1973, pp 56-59

See also:

- Telescope Making # 20, 1983, p 21 and p 43-46
- Telescope Making # 8, 1980, p 40
- http://www.sfsidewalkastronomers.org/

A good photo of the 24-inch Dobsonian Telescope, "Delphinium", then the world's largest portable telescope, appears in the book The Amazing Universe, by Howard Friedman, National Geographic Society, 1975, p 29. The photo shows a small group with the telescopes, at dusk, above a fog bank, at Fremont Peak State Park near Monterey, CA.

TUTORIAL BY JOHN DOBSON Proprietary, undated

Apparently the prologue for a book on telescope making.

When we look at a ladybird beetle in the palm of your hand, we put her image on the fovea, on the part of the retina which is populated primarily by cone cells, color cells, what we may call ladybird beetle cells, and they are very clever about distinguishing color and details. They allow you to see all six of her legs, her feet, her antennae, her spots and her color.

But if you wait until nightfall, you may not be able to see the beetle at all, let alone her legs, her spots and her color. Why ? Because at night you have to see her with your rod cells, which are stupid about color and stupid about details. If your rod cells have been a long time in the dark, they are pretty clever about seeing dim stars and large dim objects like nearby trees, but they are hopeless for seeing color and detail. They are also hopeless for seeing galaxies and other faint objects well through small telescopes, because small telescopes, however well-made, cannot provide large enough images to be well seen by the rod cells without hopelessly lowering the brightness.

To overcome this difficulty, amateur astronomers often take pictures of these objects so they can look at the pictures with their cone cells and thus make out details which their rod cells could not make out at the eyepiece. But pictures are pictures, and if pictures will do, better pictures are available from the observatories. But the impact on the mind of seeing these faint objects with your own eyes through a telescope on a dark mountaintop is very, very different from the impact left on the mind by seeing the pictures with your cone cells in the daytime. And anyway, galaxies are really never that bright. None of them, including our own, are bright enough to see with your cone cells.

The difficulty of seeing these dim objects with our own eyes can be largely overcome by using telescopes with much larger apertures to provide images both large enough and bright enough to be fairly well seen by the rod cells. That is the reason that the aperture of amateur telescopes has jumped from 6 to 17 inches over the last decade. It takes the reach of the human eye at the eyepiece out of the solar system and out of our galaxy to the far reaches of the universe beyond.

If the aperture of the telescopes jumps from 6 to 18 inches, the size of the galactic images goes up threefold in both directions without any loss of brightness. That is what allows the rod cells to handle the images, but unfortunately it also makes the telescopes bigger, heavier, and harder to mount.

To handle the problems of increased apertures, many astronomers have abandoned the older equatorial telescope mounts, designed for photography, and gone to simple wooden Altazimuth mountings, nowadays called Dobsonians. They are easier to make and less expensive, easier to move, and easier to use. Though they are designed to entertain soft, warm eyes rather than photographic plates, Adrian Poncet and others have recently redesigned them for that use also. Nowadays, such telescopes are also available commercially from Coulter Optical Company at Idyllwild, California and elsewhere, and at very low cost. And they have by now become so popular that 17.5-inchers run over the hills like cattle at the star parties that used to be populated by four- and six-inchers.

But there is another problem facing us when we try to view distant galaxies, or faint objects within our own Milky Way. That is the problem of contrast. Most of these objects are little or no brighter than the nighttime sky over urban areas, so if we want to see them well, we will have to get our equipment out of town. If possible, we want to be high above sea level and far from lighted cities. So what is the good of a telescope that is too big to move ? That is why so many smaller telescopes, many of them also on Dobsonian mounts, run through the hills like sheep in the dark.

Smaller telescopes are cheaper to make, or to buy, easier to get around, easier-to-use without ladders, and much less plagued by atmospheric turbulence. For these reasons, they see a great deal more use than the larger ones and often give better views of the planets and the moon when the seeing conditions are not at their best. They are also better for terrestrial viewing. If the eyepiece is up when the telescope is aimed near the horizon, the viewer can get the image right-side-up simply by turning his back toward the object while leaning over the eyepiece.

In considering the deleterious effects of atmospheric turbulence on the images in larger telescopes, it is helpful to consider a larger one as made up of a number of smaller ones. Think of the mirror as divided into parts. The effect of the turbulence on the image from one of these parts is twofold. It blurs it a little and

causes it to dance. The difficulty with the full aperture is that the images from the various parts dance out of phase. On many a night, when the turbulence is slow, Saturn, through a smaller scope, will look as though it's made of leather and immersed in the water of a flowing stream. You can see the rings and the ball slowly dancing.

But through a larger scope it looks like a bright blurry football-shaped blob, because all the leather images are dancing out of step. That is why the Sidewalk Astronomers often use aperture masks on their larger telescopes. When the turbulence is slow and we're showing people the planets or the moon, we put a big piece of cardboard over the front end with a circular or elliptical hole in it. That reduces the aperture, improves the focal ratio, and gives us an unobstructed reflector.

If you are planning to build a telescope, or even to buy one, all these things should be borne in mind. And, if possible, you should get to the star parties and look through some of the these telescopes before you move on your plans. You need to know how telescopes of different sorts and different sizes behave.

It is this atmospheric turbulence that causes what we see as heat waves in the daytime, and what causes the twinkling of the stars at night. The shadows of this turbulence can often be seen moving on the ground on a sunny day, and, under the slit illumination of the sun close to totality in eclipse, these shadows become the famous "shadow bands".

It is largely to avoid the effects of this turbulence that we set our telescopes on ridges or on mountain peaks, if possible, for public use. But mountaintops are not the right places for sun telescopes, because the heat waves climb the east slopes in the morning, the south slopes in the middle of the day and the west slopes in the afternoon. So what we want for sun telescopes is an island in a lake in the hot desert.

But who gets his choice ? The telescopes must go where people go or what good are they ? That is why the Sidewalk Astronomers run their telescopes through the national parts and other public places, and through the Indian Reservations as far as their funds permit. We are Astronomical Entertainers by appointment to Her Majesty the American public, and anyone else who will have us. And the reason we run with telescopes of rather long focal length is so we can operate at high

enough power with low-power eyepieces to allow the viewers to get in with their eyeglasses on. That way the viewers don't have to refocus, and many more people can see.

It is in the hope of dispelling the notion that such telescopes as are used by the Sidewalk Astronomers are too difficult and too expensive to build at home that this book is written. It is written in the further hope that millions of people may be encouraged to build such telescopes and to set them up on the mountains, in the parks, and in the cities for the whole world to use.

It should be borne in mind that telescopes can be made in many different ways and of many different materials, and that they can be used for many different purposes. This book is not designed to cover all cases. It aims only to suggest some simple and inexpensive ways to make very serviceable astronomical telescopes for visual use.

END

BIOGRAPHY from: http://www.sidewalkastronomers.us/id32.html

John Dobson - A Brief Biography

John Dobson has been called the "Pied Piper of Astronomy," the "Star Monk," and the "MacGuyver of Astronomy." He is arguably one the most influential personalities in amateur astronomy in the last 50 years. He has almost single-handedly revolutionized backyard astronomy by bringing it out to the street, making it accessible for anyone who has ever looked up in wonder, and asked "Why?"

John Dobson was born in Peking (Beijing), China, on September 14, 1915. His maternal grandfather was the founder of Peking University. His mother was a musician; his father taught Zoology at the University.

In 1927, John and his family moved to San Francisco due to political and social unrest in China. John had 3 brothers: Ernest, Lowry, and Harrison. John's father accepted a teaching position at Lowell High School and taught there from 1927, until he retired in the 1950's.

After completing a degree in Chemistry at the University of California at Berkeley in 1943, John worked in a number of defense-related jobs. John was what he describes at a "belligerent" atheist. Attending a service at the Vedanta center in San Francisco, he realized they were on to something and soon after, he joined the Vedanta Monastery in San Francisco in 1944, becoming a monk of the Ramakrishna Order. He spent the next 23 years in the Monastery. When he joined the Order, known for its intellectual rigor and public service, he was given the assignment of reconciling the teachings of religion with those of science.

Having graduated from the university as a chemist, he wanted to see for himself what the Universe looked like, so John built his first telescope in 1956. It was a 2", made from a lens he got in a junk store and an eyepiece from an old pair of Zeiss binoculars; through it, he could see the rings of Saturn. One of his fellow monks told him that it was possible to grind a telescope mirror, so John then made his first mirror out of a marine-salvage 12" porthole glass. When he looked at the third-quarter moon with his finished telescope, he was surprised and

deeply moved by what he saw. His first thought was, "Everybody's got to see this."

So began John's long commitment to public service in astronomy.

John was transferred to the Vedanta Monastery in Sacramento in 1958 and started getting seriously involved in telescope making. The first telescope he made at Sacramento was a 5-inch reflector; the mirror made from the cut-out bottom of a discarded gallon jug. It was John's greatest delight to share the beautiful things he saw through the telescopes with others. One of his friends was so amazed by what he saw through the 5-inch telescope, that he told John, "You've got to make something bigger!", and donated some salvaged portholes.

The portholes had to be smuggled into the monastery in fertilizer boxes. John also had to screen his own sand for grinding and made his own rouge out of garden supplies (ferrous sulfate and oxalic acid). All of this had to be done without attracting the attention of those members of the monastery who felt that his continued telescope making and public service astronomy were not an appropriate pursuit for monks nor the best use of his time.

The noisy job of grinding mirrors had to be done under water to deaden the sound. Since John was a monk and had no money, he had to find a way to mount the mirrors using scrap materials that could be gathered up at no cost. His telescopes were made from discarded hose reels, lumber core cut-outs from school house doors, and scrap wood.

Such was the humble origin of what has come to be known as the "Dobsonian" telescope. These are Newtonian telescopes. A Dobsonian mount is really a type of alt-azimuth telescope mount. What makes it so unique is its simplicity, it moves up and down, left and right.

John never thought of getting a patent for his design although many suggested it. It's like re-inventing a cup, we've had cups all along, and if you try to patent a cup with a handle, you can't. While patenting his design might have been difficult, it wouldn't have been difficult to copyright the name "Dobsonian", but that was never something John even considered. His mission was to get as many telescopes out there as possible by making it as easy as possible, not making it harder with restrictions.

The desire that drove John to make more and larger telescopes, and to put himself in increasing peril of expulsion by monastic authorities, was to give everybody the opportunity to see the Universe first-hand. He put discarded wagon wheels on his telescopes to facilitate wheeling them around the residential neighborhood surrounding the monastery -- delighting kids and adults with the views of the night sky.

Naturally, when people started to look through John's telescopes some of the neighbors and their kids wanted John to help them make their own telescopes. He realized that this would make his life more difficult because his AWOL hours from the monastery would increase. Nevertheless, he continued and expanded his activities, till he was asked to leave the monastery in the Spring of 1967, after 23 years as a monk. Ironically, the "last straw" event was a mistake: they thought John was absent with his telescope but in fact he was weeding the lawn outside the wall, out of sight. He was not expelled because the monks were against his telescope making, but because it was perceived to be taking time away from his monastic duties.

With no "profession" and an overwhelming desire to show the night sky, John decided to dedicate the rest of his life to public service astronomy and hitchhiked to San Francisco. Then as now, John had many friends, and they helped to keep him fed, clothed, and sheltered. He retrieved some of his telescopes from Sacramento and set them up at the corner of Broderick and Jackson streets in San Francisco every clear night. Thousands of people looked through the telescopes while John talked to them in detail about what they were seeing.

This practice is still an integral part of Sidewalk Astronomy: astronomical information must be supplied by the telescope operator so the viewers can understand what they see. Eventually, John was able to support himself by teaching classes in telescope-making and astronomy at the Jewish Community Center and at the California Academy of Sciences.

In 1968, some of the kids who had made telescopes under John's guidance, and who joined him in setting up scopes at Jackson and Broderick, started a public-service organization named the San Francisco Sidewalk Astronomers. As the organization grew, larger telescopes were made and taken out to the streets. By 1970, the Sidewalk Astronomers had a 24-inch telescope which was freeway

portable. The possibility of showing deep sky objects to large numbers of people through very large telescopes led the growing band of Sidewalk Astronomers to National Parks and Monuments, Native American reservations, and out of the country to places where "dark skies and the public collide."

In 1978, Swami Swahananda, formerly of the San Francisco and Berkeley Vedanta centers and recently transferred to Hollywood, invited John to give a series of lectures at the Vedanta Society of Southern California. The lectures were a great success so he began teaching telescope making and for 26 years, he continued to teach in Hollywood, spending at least two months there each year. The Brothers at the Vedanta Society in Hollywood have always supported John and his vision.

While John was no longer a monk, his beliefs and his former task of reconciling Vedanta and science had a great influence on him and his interpretation of the cosmos. He has written two booklets, Advaita Vedanta and Modern Science and Astronomy for Children Under 80, which explain his thoughts and prove him to be as much a philosopher as he is a popularizer of astronomy.

Because of his influence, millions of people all over the world have looked through the telescopes of the Sidewalk Astronomers (the "San Francisco" was dropped when chapters started forming worldwide). John has helped to simplify the art of mirror making, enabling thousands of children and adults with no previous experience or special training in optics to experience the joy of turning slabs of glass into powerful eyes into the heavens with their own hands. The "Dobsonian" mount has made large, "user friendly" telescopes affordable and accessible to the general public. Thousands of people have made their own sturdy, low-cost telescopes under John's direction or on their own by using his simple design.

Telescopes with light-weight mirrors previously considered unusable, long focal ratios previously considered unmanageable, and apertures previously considered unthinkable are now in the hands of lovers of astronomy around the globe. With so many home-made Dobsonians showing up everywhere, commercial telescope makers joined the trend and now most offer relatively inexpensive Dobsonians. Because of the popularity of home-made and commercial Dobsonians, it is impossible to measure the impact John has made on amateur astronomy and because of the changing role of amateur astronomy in discovering comets and

other celestial objects, it is equally impossible to measure the true contribution his inspiration has made to our knowledge of our Universe.

Timothy Ferris, in his book, Seeing in the Dark, states, "the amateur astronomy revolution was incited by three technological innovations - the Dobsonian telescope, CCD light-sensing devices, and the Internet." When asked about the "Dobsonian Revolution", John usually replies that all previous revolutions were fought with cannons on Dobsonian mounts.

In 2004, Advaita Vedanta and Modern Science was retitled, BEYOND SPACE & TIME - Is there an uncaused cause behind the Deep Field ? and is now available. Another new title THE MOON IS NEW, a novel, is also in the publishing process and should be out early in 2005.

John has recently been shown in two documentary films. In the first, "UNIVERSE - The Cosmology Quest", John appears along with Sir Fred Hoyle, Dr. Halton C. Arp, Dr. Margaret Burbidge, Dr. Geoffrey Burbidge, Dr. Jayant Narlikar, and a host of other astronomers, cosmologists, and philosophers questioning the currently popular Big Bang Cosmology. The second film, released in the summer of 2005, A Sidewalk Astronomer, is a profile on John in tribute to his contribution to amateur astronomy. Completely unscripted, it provides a unique insight into a likewise unique individual.

Until 2008, John spent most of his time traveling and spreading the art of telescope making and sharing his views on cosmology to amateur astronomy clubs around the world, as their guest. He spent a short two months of the year at his home in San Francisco and another two months in Hollywood. The rest of the time he was teaching in Oregon, Connecticut, Chile or even Siberia. While John was no longer a monk, he still lived very simply, spending most of his time in the homes of amateur astronomers.

In the spring of 2008, John suffered some health issues that have considerably limited his ability to travel as he had in the past and at this time he permanently resides at the Vedanta Society in Hollywood. He has not become a monk again, but has been accepted into the community where he is surrounded by the caring brothers and members of the society. With their continuing support, he still does sidewalk observing and gives talks to the Vedantans and amateur astronomers on a limited basis.

John Dobson's life has been a tremendous inspiration to a great many people. The Sidewalk Astronomers continue to serve the public with large telescopes, providing free "star parties" and slide shows under dark skies and city lights, encouraging the citizens of this planet to think and wonder about the Universe and give them a chance to see its beauty with their own eyes.

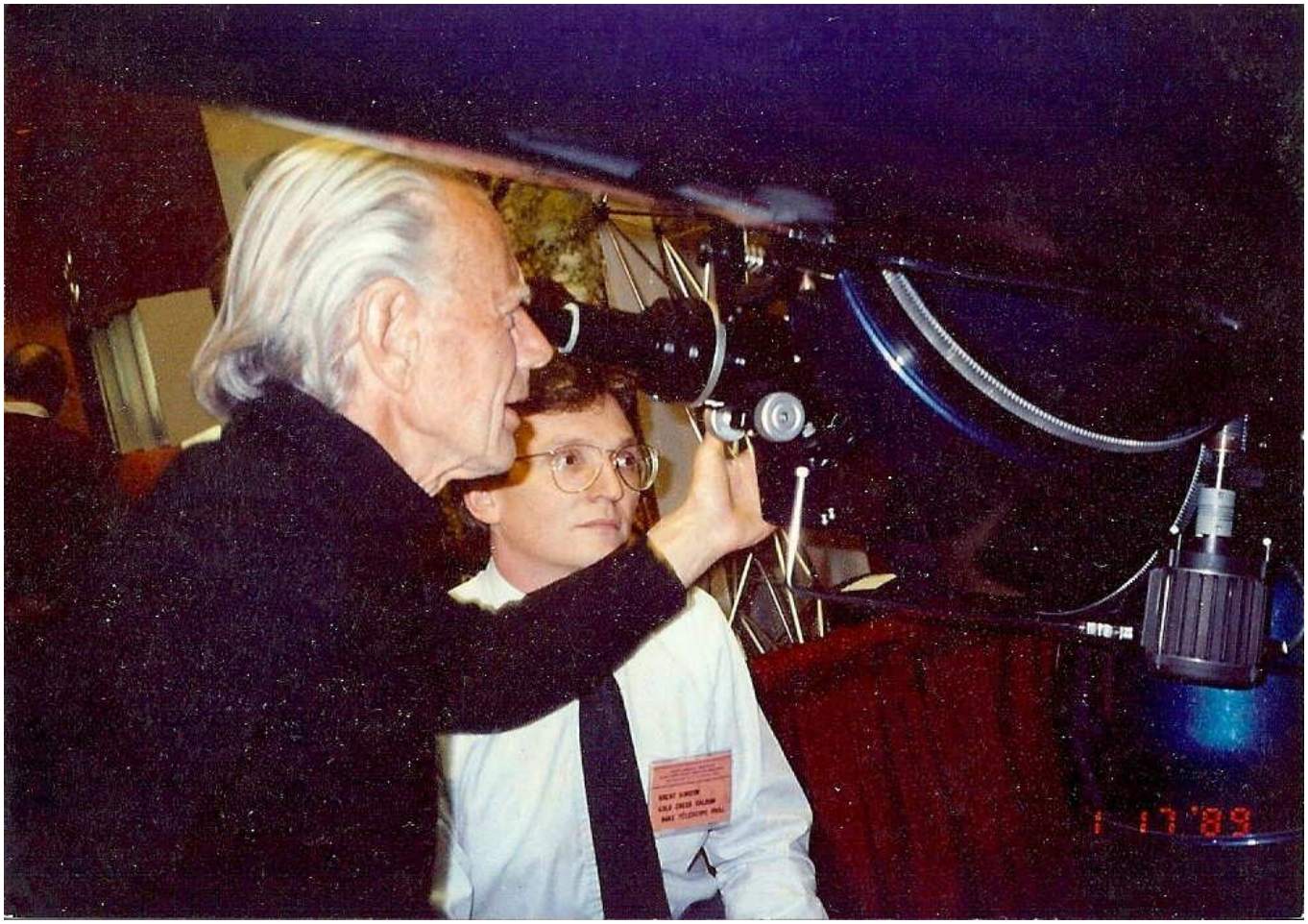
To members of the Sidewalk Astronomers, John continues to provide guidance and inspiration. His unending desire to always keep learning and discovering things for himself has affected all of those around him. One of his favorite sayings is "If you figure something out for yourself, it doesn't make no-never-mind who figured it out first, its yours."

His life of enthusiastic, selfless public service and his genuine love and concern for this planet and those that live on it are the foundation and guiding principle of our organization.

Dedicated to Public Service Astronomy

EPILOGUE https://en.wikipedia.org/wiki/John_Dobson_(amateur_astronomer)

John Dobson died January 15, 2014 (aged 98), in Burbank, California, U.S.



John Dobson with Brent Gordon, designer and builder of the "Big Blue" telescope, while the scope was on display at the annual conference of the American Association for the Advancement of Science (AAAS), San Francisco, 17 Jan 1989. A "Springfield Mount", with the eyepiece(s) and viewer always in a stationary seated position, it is ideal for wheelchair-accessible public use, with a 2" stereo-ocular viewer, equipped with two TeleVue 55mm Plossl wide-field eyepieces.

After the convention, Big Blue was partially disassembled and shipped to the Hyatt Regency Maui resort hotel at Lahaina, where it was installed on the hotel roof and used in their nightly "Tour Of The Stars" guest astronomy program for 15 years, until the unique telescope computer guidance system broke and couldn't be repaired. It was immediately replaced by an off-shelf 16" Meade scope: the show must go on.

EPILOGUE, Feb 2019 Big Blue is now owned by Alaska Applied Sciences, Inc., Juneau, Alaska, which is restoring and upgrading it for return to public educational recreational astronomy, perhaps at a low-latitude resort.

See: https://alaskaappliedsciences.com/big-blue-telescope/ [photos and video]