FALL 2024

Reflections

The Newsletter of Mount Wilson Observatory
Where We Discovered Our Place in the Universe

Mount Wilson and the Early History of Dark Matter

by Tim Thompson, Science Director of Mount Wilson Observatory

Figure 1 shows what we think the universe is filled with, other than space and time. As you can see, it seems that 95.1% of the universe is some mysterious stuff, called either dark matter or dark energy. All of the ordinary stuff, everything we have ever seen or detected, in any way, including ourselves, makes up a mere 4.9% of the universe. This figure comes from the National Institute of Standards and Technology. Other sources give slightly different numbers, but the story doesn't change much. Think of it as a metaphorical lesson: As fast as our knowledge grows, our ignorance always grows faster. After all the enormous advances in fundamental and practical physics, especially since the dawn of the 19th century, we still don't even know what 96% of the universe actually is. The words dark matter and dark energy are just placeholders for ideas. What we actually know is that something is going on that we can see, but cannot explain. So, we give it a name. That way we can at least talk about it.

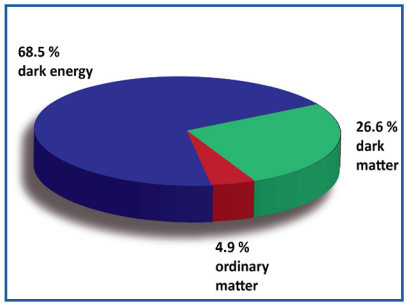

Figure 1
National Institute of Standards Technology

I will set dark energy aside for some other opportunity, and write about dark matter here. Like I said, we can see that something is going on. We know (or think we know) all of the forces that are at play in the universe. We know that gravity is the dominant force, over large spatial scales, for all electrically neutral, normal matter in the universe. By looking at how the matter we see is moving around, we can calculate how much gravity there needs to be, to explain the movement we see. When we do that, we realize that there is about ten times more gravity necessary, than there is gravity produced by all the matter we see. The simple explanation is that there is more matter out there than we can see. If we can't see it, then it must be dark. Hence, dark matter.

It's not a bad idea. After all, the planet Neptune was discovered by people looking for unseen matter. When astronomers realized that they could not explain the motion of the planet Uranus, using all the matter they knew about, the sun and known planets, they naturally decided that there must be more matter. They decided there must be another planet, waiting to be discovered. The idea was evidently first written down by English scientist Mary Fairfax Somerville, in her book, On the Connexion of the physical Sciences, in 1842 (the word scientist was invented by English historian William Whewell in 1833, specifically to describe the work of Somerville). Subsequently, English mathematician John Couch Adams, and French astronomer Urbain Le Verrier, both calculated where an unseen planet would have to be, to add an extra push to Uranus. Following the request from Le Verrier, German astronomer Johan Galle went looking, and quickly found Neptune, only about 1 degree from the spot Le Verrier had predicted (23/24 September 1846). It was the first successful search for previously unseen matter.

During the 1920s, Edwin Hubble had determined that the spiral nebulae were in fact very remote stellar systems, much like our own Milky Way. Hubble had in effect demoted the Milky Way, from being the entire sidereal universe, to just one of the maybe countless stellar systems, in a

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In This Issue

Announcements

The Cosmic Cafe will have shortened hours, **10 am - 4 pm,** until it closes for the winter on November 24, 2024

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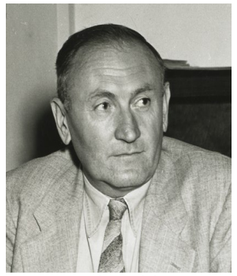
From Page 1 - Mount Wilson and the Early History of Dark Matter

vast universe, far larger than anyone had ever imagined. Today we call them galaxies. Hubble published the most important of these papers in 1929, on the distance to the Great Spiral Nebula in Andromeda, which we now call the Andromeda Galaxy, or M31 (the 31st object in the ubiquitous Messier Catalog).



Fritz Zwicky

Fritz Zwicky published his paper, The Redshift of Extragalactic Nebulae (Die Rotverschiebung von extragalaktischen Nebln), in the journal Helvetica Physica Acta, in 1933, hot on the heels of Hubble's big discovery. One of the many things Zwicky did in this paper was to estimate the mass of the Coma cluster of galaxies. He used the spectral redshifts of cluster galaxies, interpreted as Doppler velocities, along with their apparent brightness, and his new found knowledge of their distance. The brightnesses allowed him to estimate the masses, and the Doppler velocities allowed him to estimate the gravitational field of the cluster. This led him to realize that the cluster mass implied by the brightness, and that implied by the gravitational field, were very different from each other. Much of these data, especially the spectra, were acquired at Mount Wilson Observatory.

The paper was written in German, but in English translation, Zwicky says:

> *In order to obtain, as observed, a medium-sized Doppler effect of 1000 km/s or more, the average density in the Coma system would have to be at least 400 times greater than that derived on the basis of observations of luminous matter [This would be in approximate accordance with the opinion of Einstein and de Sitter as discussed in Sect. 4.]. If this should be verified, it would lead to the surprising result that dark matter exists in much greater density than luminous matter.*

This is, to the best of my knowledge, the first reference to dark matter (dunkle Materie, in Zwicky's own German) in the astronomical literature. In previous exercises, like the discovery of Neptune, astronomers were looking for previously unseen matter, but matter that was in all other aspects, perfectly ordinary, and readily visible, as long as you knew where to look. And Zwicky was likely not thinking of some strange or exotic new type of matter, as we are today. He surely knew that there could be a great deal of ordinary stuff, like gas, dust, and planets, that would appear dark to him. But even in that case, it was a remarkable result, worth his time to point out.

Horace Babcock

Now we turn the historical page to Horace Babcock. His father Harold Babcock had joined the staff at Mount Wilson in 1909, and son Horace officially joined the Mount Wilson Staff in 1946. But unofficially, Horace had been a member of the Mount Wilson social & science scene, since his early childhood, brought to the observatory often, by his father. In the late 1940s, Harold & Horace teamed up as solar astronomers.

Horace had earned his Ph.D. from U.C. Berkeley in 1939, his doctoral thesis being a study of the rotation of the Andromeda Nebula (they were not yet generally called galaxies). His paper, The Rotation of the Andromeda Nebula, appeared in the Lick Observatory Bulletin, in 1939. Babcock was not the first to study the rotation of Andromeda, bur he did extend his observations much farther from the center of the galaxy than had ever been done before. Figure 2 here, is the combination of figures 4 and 5, from this paper. His observations were made mostly on the 36-inch Crossley telescope at Lick Observatory, although "some of the plates" were made using the 60-inch telescope at Mount Wilson.

This paper marks the discovery of anomalous rotation in any spiral nebula. The press, and popular folklore credit this discovery to the work of Vera Rubin and Kent Ford, in 1970. And their paper does cite Babcock several times. But the fact that the discovery is actually due to Babcock, not Rubin, is now essentially unknown.

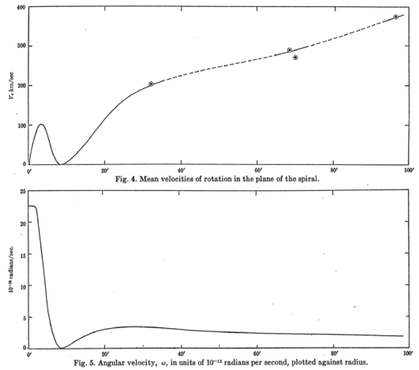


Fig. 4. Mean velocities of rotation in the plane of the spiral.

Fig. 5. Angular velocity, ω, in units of 10^{-14} radians per second, plotted against radius.

Figure 2

The Rotation of the Andromeda Nebula, Lick Observatory Bulletin, 1939

Of course, in the absence of dark matter (which neither Babcock nor Rubin explicitly mention), one would expect the outer reaches of a spiral nebula to rotate slower, the farther out one gets, in keeping the Kepler's laws of motion. But both Babcock and Rubin knew that if the mass distribution paradoxically increased, as one moves farther from the center, that would explain the anomalous rotation curves.

In 1939, it was thought that in fact the Milky Way did rotate as one would expect. Babcock points this out, at the end of his paper: A new discrepancy is now apparent when the rotations of the two systems are compared, for the nearly constant angular velocity of the outer parts of M31 is opposite of the "planetary" type of motion believed to obtain in the outer parts of the Galaxy.

In the 31 year gap between Babcock & Rubin, radio astronomy added the ability to include 21-centimeter neutral hydrogen data to the mix (Volders, 1959), and Rubin does mention it. But most of the observations more famously made by Rubin and Ford are similar to those made by Babcock, although with higher precision. And the general conclusions reached by both studies are essentially the same.

Since the 1970s, dark matter has become a big topic in astronomy & cosmology. Today we can precisely observe gas and dust, in ways that Babcock, and later Rubin and Ford, could not do. Babcock could easily argue that the anomalous rotation curves were the result of an anomalous mass distribution, involving normal matter, and appears to do just that. But we have now reached the point where observation can rule out normal matter.

For Zwicky, Babcock, and Rubin, the evidence for peculiar behavior amounted to Zwicky's observations of the Coma cluster, and the Babcock & Rubin & Ford observations of galaxy rotation. But discoveries made since then have added new lines of evidence that the earlier scientists could not have anticipated—the Cosmic Microwave Background, and gravitational lensing chief amongst them. And we can now see forms of ordinary matter, such as gas and dust, in galaxies, and galaxy clusters, that could not be seen before. We no longer have the luxury of assuming that dark matter is just ordinary matter that we can't see yet. We are obliged to seek out new and exotic forms of matter. Or, perhaps we can modify our theory of gravity, and eliminate the dark matter problem altogether. Lots of scientists are trying to do that, but so far they have been thoroughly unsuccessful.

There was a time when we knew what 100% of the universe was made of. Now we only know what 5% of the universe is made of. Hopefully, we will not continue indefinitely to know even less.

A Greater Debate? Beyond the Epic Events of 1924

by Jed Laderman

On February 19, 1924, Edwin Hubble penned a now-famous letter to his former Mount Wilson colleague Harlow Shapley, by then, Director of Harvard College Observatory, informing him of Hubble's decisive discovery of a variable star in the Andromeda Spiral Nebula. Placing that system some 930,000 light years away, it signaled a quick end to the "Great Debate", and to Shapley's view that the spirals were connected with our own galaxy.

On November 23, 1924, the New York Times announced it to the world: Edwin Hubble "Finds Spiral Nebulae are Stellar Systems... confirms the view that they are 'Island Universes' similar to our own."

Harvard astronomer Cecilia Payne-Gaposchkin later recalled how, as a graduate student then working for her Ph.D., she had been in Shapley's office when Hubble's discovery letter arrived. Shapley scanned the note carefully and held it out to her with the memorable words, "Here is the letter that has destroyed my universe."

Except, it didn't.

The ink was barely dry on Hubble's 1929 paper ("A Spiral Nebula as a Stellar System, Messier 31") when Shapley, in that very same year, began working with Adelaide Ames at Harvard on what would become the "Shapley-Ames Catalog of Galaxies". An exhaustive inventory (down to 13th magnitude) of 1,246 galaxies, the catalog was published in 1932. These dates show that Adriaan van Maanen's reluctant 1935 backpedal, that the internal motions he *still* noted within spiral nebulae (indicating nearness) be viewed "with reserve," was by now largely a formality—even for Shapley.

Hubble, who used the Shapley-Ames Catalog extensively in his work on redshifts and galaxy counts, voiced his approval of the compendium. And why not? It used Hubble's galaxy classification system, not Shapley's!

Shapley and Ames, making skillful use of the large fields offered by their relatively small (24-inch) telescope, emphasized the uneven distribution of galaxies across wide stretches of sky, even coining the term, "supercluster". Hubble, examining numerous but smaller fields with the 100-inch, obtained stunning results through his use of galaxy clusters, but emphasized their large-scale uniformity on the sky. Shapley would receive extra-galactic credit on this one: A conglomeration of clusters he identified and studied in 1930, some 600 million light years away toward the constellation Centaurus, is now recognized as the largest concentration of matter in the local universe: the "Shapley Supercluster".

There was even a flicker of dissension about Walter Baade's 'Population' concept—the idea that there are two broad classes of stars in galaxies. Shapley claimed that the concept was inherent in his studies of globular clusters, with the brightest stars in them being red, not blue, as in our own stellar neighborhood. A key moment in Baade's breakthrough came in 1939, when he used the 100-inch to resolve the Sculptor and Fornax dwarf galaxies into myriads of reddish stars, complete with globular cluster-type variables. (This was half a decade before he resolved the redder, now understood as older, populations of the Andromeda Galaxy and its companions, over five times more distant.) Who worked with Baade to characterize, in detail, the stars in these two faint systems, though they never rise more than 22 degrees above Mount Wilson's southern horizon? Hubble! Who had recently discovered those very galaxies, the first known examples of their type? Shapley!

Among numerous accolades, Hubble now has an eponymous space telescope, which has been used to analyze globular clusters in the vast Shapley Supercluster. Given Shapley's suggestion that his discovery of the great size of our Milky Way increased its chances of harboring advanced civilizations, one might even imagine space telescopes amid the Shapley Supercluster, studying Hubble's Law!

Who was the ultimate winner of these debates? Perhaps we should just be grateful that, partly by their very differences on matters of science, these two giants of astronomy gave us a clearer picture of our place in the universe—a universe made tremendously greater by their discoveries. And that makes *us* the real winners, does it not?

Mount Wilson's Telescopes Revived for Science & Education

by Pat Boyce

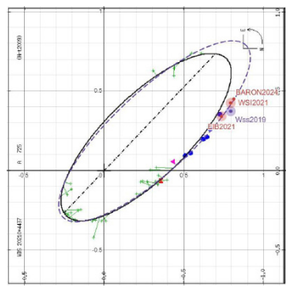
Having first revived the functionality of the 60-inch telescope in 2008, the technical team at Mount Wilson Observatory by 2015 returned the 100-inch telescope to use as a powerful scientific and educational tool. Finding that the Mount Wilson telescopes are particularly well suited to the study of binary stars, a group of astronomers, engineers, educators, and students, launched an effort to use the 60- and 100-inch telescopes for published scientific research, specifically astrometry of binary stars that orbit each other around a common center of gravity. Astrometric measurements of the relative angular separation and position angle of binary stars as they change over time enable the mathematical determination of their orbits and masses. Such measurements are little affected by light pollution, so Mount Wilson Observatory's skies are not a limiting factor as in other fields of astronomy.

The growing engineering research team, now called STELAR, has designed and tested new instrumentation for measuring binary stars. Now with the latest astronomical instrumentation and the use of speckle interferometry, the team can eliminate the disturbing effects of the atmosphere. In this way one can observe very close binary stars with a resolution comparable to having taken the telescope into orbit.

Team assembling a new instrument

Close binary stars reveal their mass values much more quickly than wider pairs which can take hundreds to thousands of years to complete an orbit. The larger the telescope's aperture is, the smaller the measured angular separations can be and hence the shorter the period, allowing new orbits to be defined in years instead of centuries. Using the 100-inch with speckle interferometry facilitates fundamental scientific research in some of the steadiest skies on the planet.

During this development, InStAR (Institute for Student Astronomical Research) and Boyce-Astro (formally Boyce Research Initiatives and Education Foundation, or BRIEF), along with STELAR members, have been creating science education programs based on measuring binary stars. Over the past decade, this collaboration refined and formalized the instrumentation and operation of the 60-inch telescope, resulting in the publication of over twenty scientific papers coauthored by over thirty students, instructors, and amateur and professional astronomers.



Solid ellipse is the original orbital plot; dashed is the improved one from the new observations

Development of the 100-inch telescope for science is following a similar path. The first published speckle interferometry observations by our group using the 100-inch were made in 2015. In June of 2024, we installed an advanced speckle interferometry instrumentation suite fully utilizing the excellent optics and aperture of the 100-inch. The first scientific papers by our team and students from these observations are nearing publication now.

Over the past decade, InStAR has developed a robust program focused on double star astronomy education under the leadership of InStAR's President, Dr. Rachel Freed. Numerous colleges throughout the United States have adopted InStAR's double star class. Dr. Freed states, "My goal for InStAR is to help interested students around the world get access to telescopes, whether it is within their local communities, on the mountain or remotely, through global telescope networks."

In June, InStAR facilitated a program involving five students from Colorado Mountain College, led by Paul McCudden, the head of CMC's Physical Sciences Department, to conduct research over three nights on the historic 60-inch telescope. Their observations and analysis papers are in peer review now. They were joined by Russ Genet, an astronomer at Gila County Community College and two students who are working on additional papers. A newly awarded NSF grant will allow students from CMC, GCCC and additional community colleges in the Four Corners region to return to Mount Wilson annually for similar programs.

After years of research participation at MWO, Boyce-Astro designed a one-night Research Experience for MWO in June. Students from Miramar, Mesa and Grossmont Colleges, Ferris State, UCSD, University of Georgia, and high schools in Seattle and San Jose participated. Mount Wilson's docents guided them through the observatory's history, machine shop, power systems, and solar observatories during the day. Boyce-Astro MWO research graduates led the new students for the night's research observations on the 60- and 100-inch telescopes with the assistance of STELAR engineers followed by a night in the MWO "Monastery". Another twelve students from the US and India participated remotely in the science program.

The 24-hour immersion received 5-star reviews from the students and parents. Participants are now in the process of completing nine scientific papers and five science posters from their observations.

Pat Boyce, founder of Boyce-Astro, states, "Since our founding as a non-profit in 2013, our mission has been to introduce students to STEM through research in astronomy. Our MWO Research Experience is a capstone to the DoubleSTARSTM part of our programs that target highly motivated students who do not have research opportunities in their high school or college."

STELAR, the science and engineering backbone of this initiative, has evolved under the leadership of David Rowe, the Chief Technology Officer of PlaneWave Instruments. Dave, whose name is well-known in telescope design, leads this international engineering team to push the technology and capability forward. He developed the software to perform the speckle interferometry and recently added the ability to model the binary star orbits as well.

Dale Ghent, STELAR, describes the camera and computer suite he has assembled for the 100-inch to students doing binary research in June 2024

In Dave's words, the mission for STELAR "is to bring amateur and professional astronomers, students and teachers together to take advantage of the latest developments in CMOS cameras, advanced software and systems knowledge to do state-of-the-art, scientifically important binary star measurements including astrometry and differential photometry using Mount Wilson 100-inch telescope. These measurements lead directly to new orbital parameters and stellar mass estimates to enhance our understanding of the physics and evolution of stars."

With the help of Tom Meneghini, STELAR is developing a roadmap for the broad scientific operation of the Mount Wilson 100" telescope. The first step is to reactivate the south port for various instruments which will permit multiple types of research projects by the team and others. New instrumentation tests are underway that will broaden the scope of science objectives to be pursued.

With these developments, Mount Wilson Observatory offers unparalleled opportunities in education and research. Light pollution has limited the scientific use of the 60" and 100" telescopes despite their exceptional capabilities. Using new technologies, the limitations are overcome for the science of astrometry and Mount Wilson is resuming its scientific legacy. The research is educating and inspiring students with unique scientific experiences at the world's most famous observatory.

Photos Courtesy of Boyce-Astro/STELAR

A Message from the Chairman, Sam Hale

Dear Mount Wilson friends,

We just wrapped up our Events Season and I am SO grateful for another good year at the Observatory. Our sold-out lectures, Concerts in the Dome, Public Telescope Nights and Engineering Tours kept our staff and volunteers incredibly busy – and those successes help to advance the story of Mount Wilson to the public at large.

In 2024, our Talks & Telescopes series continued a celebration of Edwin Hubble and his profound discovery at the Observatory in 1923-24 that the universe extends far beyond the Milky Way Galaxy. Auditorium audiences heard about Hubble at Mount Wilson in the early 20th century, and what contemporary Space telescopes tell us about Hubble's universe today. We also set up our first panel discussion with JPL experts who led the repair of the Hubble Space Telescope in 1993 – leading to stunning deep space photography and important discoveries during the past 30 years. I participate in all these special nights and am so impressed by the intergenerational attendees who are hungry to find out more about cosmology.

Cellist Cécilia Tsan continues as our brilliant Artistic Director of Concerts in the Dome. The monthly concerts take full advantage of the incredible acoustics in the 100-inch dome and were featured in PBS' NOVA 50th anniversary special, which aired in May. This same dome was the setting for "Of Sea and Sky," an exhibition of immersive video and large-scale print works by artists Rebeca Méndez and Stephen Nowlin respectively. We continue to find and curate exhibits that tie together art and science, reflecting the interests of our founder, George Ellery Hale.

It was our great pleasure this year to host a group from Los Angeles' Youth Mentoring Connection, who participated in the August 24 lecture and a tour. YMC leaders nurture disadvantaged youth in part by exposing them to enriching experiences in the wider world – and they described their Mount Wilson experience as "enlightening." We plan to do more of this in the future through our STEM programs, and by reaching out to those in underserved areas.

Photo by George Elder

And improvements... We continue to upgrade our campus in so many ways. But we couldn't do it without our volunteers who have "done a heroic job of keeping the grounds and telescopes open for visitors... "(LA Times, October 2023). And indeed, volunteers are crucial to our success.

There's more to do as we look forward to 2025. We hope you continue our journey with us as we carry Mount Wilson's vision into the next century.

Happy Holidays from the Observatory family,

Sam Hale

ABOUT US

The Mount Wilson Institute operates Mount Wilson Observatory on behalf of the Carnegie Institution for Science. Mount Wilson Institute is dedicated to managing and promoting the Mount Wilson Observatory for scientific research, historic preservation, education, public engagement, and the arts. *Reflections* is published bi-annually by the Mount Wilson Institute.

INFORMATION

For information about the Observatory, including status, activities, tours, and reserving 60-inch and 100-inch telescope time, visit our website: www.mtwilson.edu

Reflections is dedicated to the memory of Marilyn Morgan, the longtime volunteer editor and designer of this newsletter.

For the use of historical photographs of Mount Wilson, we thank the Observatories of the Carnegie Institution for Science, the Huntington Library, and other sources as noted.

Cover photo by Steve Padilla.

NEWS & NOTES

Mount Wilson Celebrated in 2024 Productions

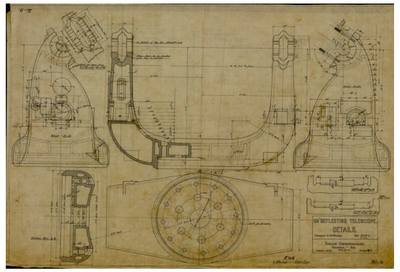
PBS's NOVA observed its 50th anniversary with "Decoding the Universe" on May 22, 2024. The episode highlights our expanded understanding of cosmology over the past half-century. But special note was made of two key discoveries made at Mount Wilson Observatory in 1923-1924, when Edwin Hubble verified that the universe existed beyond our Milky Way Galaxy – and, within a few years, that the universe was expanding. NOVA's discussion of Mount Wilson's contributions to astronomy also included footage of our beautiful Concerts in the Dome. Watch it HERE: pbs.org/Nova

Pasadena Media, which manages four local non-commercial TV channels, chose Mount Wilson Institute as one of a few non-profits to cover in 2024 with a special "Day-in-the-Life" documentary. A crew of four arrived on a Spring weekend and spent hours filming the campus – the auditorium, Cosmic Café, the Snow Solar Telescope, the 100-inch telescope – and interviewing Science Advisor Tim Thompson and Docent Patricia Hill. They also captured footage of a Concert in the Dome and spoke with Artistic Director Cécilia Tsan about the special connections between music and science. A final interview with Chairman of the Board Sam Hale wrapped up the insightful documentary, the first with a focus on the Observatory as a public destination. If you haven't seen it -- or want to send a Mount Wilson "tour" to an out-of-town family member or friend – watch it HERE: www.mtwilson.edu/PMdoc

Greg Smith's Continuing Legacy - a Great Example!

During his lifetime Greg Smith gave much to Mount Wilson Observatory. He was an exceptional optical engineer and an involved volunteer. Even though he is no longer with us he continues to give every single day. His bequest allows us to maintain the facilities, pay salaries, keep the lights on, and embark on critical improvements. Without him, Mount Wilson could not provide what our visitors enjoy day after day. Mr. Smith believed that this would be the best way for him to continue to support and participate in something he so appreciated during his lifetime. Interested in doing the same? See www.mtwilson.edu/legacy-giving for more information.

The Erstad Archive of Legacy Technical Drawings



60-inch Reflecting Telescope Drawing
The Erstad Archive of Mount Wilson Observatory Legacy Technical Drawings

In a back corner of the old Library at Mount Wilson Observatory there is a fire-protected room of flat files containing the original technical drawings for all the scientific buildings, instruments, and their parts, dating back to 1905. They are works of art, most of them on linen, all drawn by hand using the drafting tools of the trade. These drawings were used to make the blueprints essential for the creation of this Observatory and research center. Only a very few people have had the privilege of seeing these significant artifacts. Until now.

Starting in April of 2022, Jerry Erstad of Erstad Engineering generously committed the resources and staff of his company to digitizing the more than three thousand drawings at archival levels of resolution. This monumental task was completed in August of last year.

This was a labor of love, and an invaluable contribution to the legacy of our Observatory. We are incredibly grateful for this gift of resources—it required an archival level scanner, which was more than Jerry required for the drawings and blueprints that engineering functions on. Yet more, it was a gift of time, which is anyone's most valuable possession.

These works of art that engineers and draftspeople produced have already been proven useful to our own engineers who keep the Observatory functioning. Erstad Archive link: www.mtwilson.edu/erstad-archive.

Thank you Jerry, Zac, Jay, and all your team at Erstad Engineering.

Docent Training

Docent volunteers are vital to the public outreach programs at Mount Wilson Observatory, and the most important duty of a docent is to provide guided tours of the Observatory grounds and facilities. In 2024 four enthusiastic communicators who want to tell the wonderful story of Mount Wilson's scientific heritage were certified: welcome Evan Chan, Michael Hoffert, Robert Maronde, and Patricia Sanhueza! We are always interested in receiving applications from potential docents. No in-depth knowledge of astronomy is required, and all the necessary training is provided to new docents taking on outreach responsibilities. Our next training will start in Spring 2025! www.mtwilson.edu/docents

Volunteering at Mount Wilson Observatory

by Tom Masterson

I started volunteering at the Observatory when I met Director of Telescope Operations Tom Meneghini through online astronomy groups back in 2016. Tom invited me up to the observatory to shoot photos of events, and I've been hooked ever since!

I've had the opportunity to volunteer in varying roles with a great group of volunteers who are all fun people who, like me, are passionate about Mount Wilson Observatory. These volunteers come from a diverse set of backgrounds and experiences ranging from events management and promotion to engineering and astronomy. It's the volunteers who make the observatory run as smoothly as the clock drives that once ran the 100-inch and 60-inch telescopes and which still run the 6-inch Brashear telescope.

A major area of volunteer work is supporting the public events—lectures, concerts, exhibitions—that take place May through October. These events are a wonderful opportunity for the public to come up and take in all that the observatory has to offer. The positive vibes coming from our visitors are infectious. At these events I've worked as a parking attendant, food preparer, and photographer. There are many other roles volunteers take on such as ushers, telescope attendants, food catering, drinks, driving the shuttle – the list goes on.

Another way I have volunteered at the observatory is by working on technical projects to keep the telescopes, domes, equipment, and facilities running as smoothly as possible. The list of such projects at the Observatory is never ending – from lubricating the machinery that moves the 60-inch and 100-inch domes, to maintaining the proper functioning and upkeep of the telescope systems, as well as general maintenance of the observatory grounds.

One project I worked on with a group of very talented technical volunteers was the 60-inch dome-rotation system. The 60-inch dome rotates by way of a cable that runs along the circumference of the dome, which is gripped by 60 grippers and then pulled by a pulley-and-gear reduction that's driven by a 5-horsepower motor. This system was having issues when operating because the cable would slip and not move the dome. The solution was to control the ramp-up of speed of the motor to allow for smoother movement when starting up, which is now done by a donated Variable Frequency Drive. This was just one of the remarkable projects I've worked on with the crew of Technical Volunteers led by Bill Leflang.

As a Volunteer Photographer, Events Volunteer, Technical Volunteer and Volunteer Telescope Operator (in training) at Mount Wilson Observatory I've had a ton of rewarding experiences. There are so many great opportunities to volunteer at Mount Wilson Observatory, and I look forward to helping for many years to come.




2024 Docent Training Graduates

Event Volunteers

Concert in the 100-inch Dome

The Technical Volunteer Team

Photos by Tom Masterson

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Become a member of Mount Wilson Observatory today. Enjoy member benefits while supporting this astronomical treasure. Visit our website for full details at: www.mtwilson.edu/membership

HOW TO GET TO MOUNT WILSON OBSERVATORY

From the 210 freeway, follow Angeles Crest Highway (State Highway 2 north) from La Cañada Flintridge to the Mount Wilson–Red Box Road; turn right, go 5 miles to the Observatory gate marked Skyline Park, and park in the lot below the Pavilion. To reach the Observatory, walk on the access road (far left side of parking lot) about 1/4 mile to the Observatory area.

WELCOME, VISITORS!

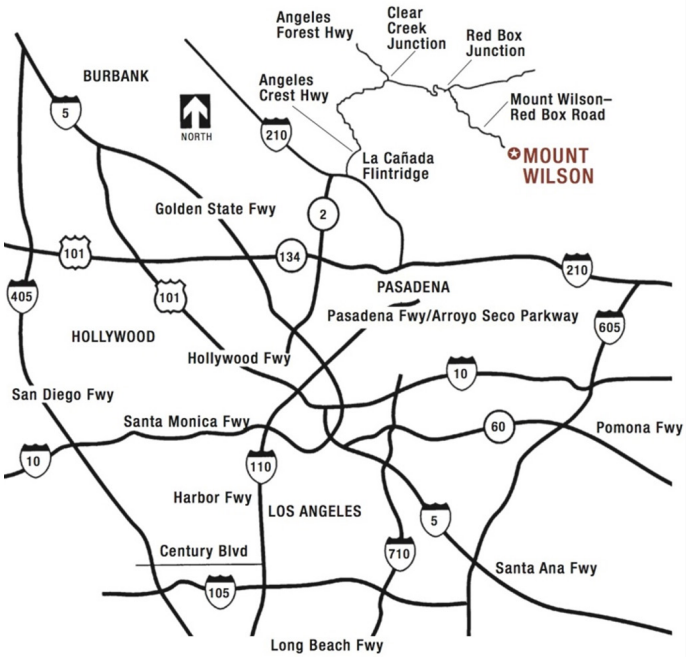
The Observatory is open from 10:00 a.m. to 5:00 p.m. daily, and until 4:00 p.m. in the off-season. The Cosmic Café at the Pavilion offers sandwiches and Observatory memorabilia on Saturdays and Sundays, but will be closing for the winter in mid November.

SELF-GUIDED TOURS

When the grounds are open, you are welcome to walk around the outside public areas of the Observatory. Our website has printouts for self-guided tours. The Observatory and the CHARA array both have small museums, and the 100-inch Telescope dome has a visitor's gallery to view the famous 100-inch Telescope.

PARKING AT THE OBSERVATORY

We are open almost every day of the year. The U.S. Forest Service requires those parking within the Angeles National Forest and the National Monument (including the Observatory) to display a National Forest Adventure Pass. Display of a National Parks Senior Pass or Golden Age Passport is also acceptable. Passes can be purchased at the Cosmic Cafe. For information, visit www.fs.usda.gov/angeles/.



We Thank Our Lucky Stars

A very big thank you to all our members and donors.

We offer a very heartfelt thanks to all who support the Observatory through your memberships or donations. We don't have an endowment (yet) and we receive no regular funding from governments or other institutions, so your contributions are vital to our three-part mission of science, education, and public benefit. We thank you all—your support has enabled us to take important steps to preserve, improve, and expand this singular monument to human achievement.

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