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Thank you for the opportunity to be your Talks & Telescopes speaker tonight! When Dan Kohne invited me to be the speaker, I asked what would the audience like to hear about? He said: We tell a lot about Shapley's achievements here. Why don't you tell what he did *after* Mount Wilson?

Tonight I share three stories from Shapley's five decades of public life after he left to become Director of the Harvard College Observatory in 1921. They show how his character – which made him a non-conformist here – also drove him to depart onto odd, bold paths. Why these three stories? Each of these Shapley initiatives have important legacies for us today.

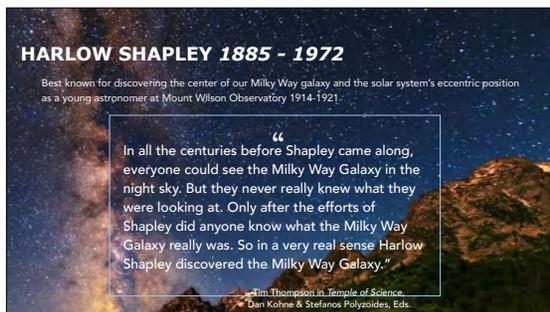
Tonight on the big poster at the entrance and on this slide we launch a 'new' portrait of Shapley. It's about 1925, not long after he left here. He looks like the bold young astronomer. He is recognizable unlike other early ones frequently used. This new Mount Wilson poster is from an excellent print in the US Naval Observatory Archives/Margaret Harwood-Maria Mitchell Observatory Collection. Note what's unusual: no telescope. A scholar of Shapley's later life JoAnn Palmeri writes that he preferred not to pose with a telescope because he didn't do that much observing compared to other leading astronomers. He was known more as Director of Harvard observatory and for his writing; hence the book. (Palmeri, *Cosmos & Culture*, p.. 499)



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The Harlow Shapley Project's main blog is at <https://HarlowShapley.org> . Posts are searchable. [The site offers thees resources: https://harlowshapley.org/bibliography](https://harlowshapley.org/bibliography) and <https://harlowshapley.org/timeline> . Deborah Shapley's writing and bio is there as <https://harlowshapley.org/debthink> . Newest post is the Centennial of Lloyd Shapley 1923-2023. Lloyd was one of Harlow & Martha Shapley's sons and a Nobel prizewinner. Please enjoy videos of Lloyd's favorite games and family stories about him at <https://harlowshapley.org/Lloyd>.

Please visit & join the project social media <https://www.Facebook.com/groups/HarlowShapleyProject> On Instagram and X (Twitter) find @HarlowShapley. And #HarlowShapley. **Contact us:** <https://harlowshapley.org/contact>



3

QUOTE: Tim Thompson, "The Universe as it Really Is," in *Temple of Science: The 100-inch Telescope at Mount Wilson Observatory* Dan Kohne & Stefanos Polyzoides, Editors 2018, Mount Wilson Institute.

Backdrop: Galaxy Stars Over Mountain Wallpaper WallpaperCave. <https://wallpapers.com-Galaxy-stars-over-mountain-wallpapers> Wp5809767. Location not given. Starry backdrop on other slides is cropped from this image. Design: Dr. Wendy Rocks.

HARLOW SHAPLEY - CHARACTER

- INNOVATIVE
- NON-CONFORMIST WITH PURPOSE
- "ENTHUSIASM FOR LIFE AND FOR PEOPLE"

- Albert Einstein describing Shapley to his daughter Mildred when visiting the family in June 1935

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Shapley arrived at the Harvard Observatory in April 1921 in a staff position but aiming to be Director in succession to Edward C. Pickering. On November 1 1921, Shapley was made Director. He remained in the post for 32 years, though mandatory retirement December 31 1952. His Paine Professorship continued through 1956. Jumping ahead, my third story tonight tells how during a difficult phase in 1952-53, Shapley created a new path. In the 1950s and 1960s he spoke and wrote widely about the likely abundance of life on other worlds. In a closing video, you'll hear him say his hopeful message, which inspired many.

CONTEXT: Shapley was awarded many medals, and maybe a dozen honorary degrees. He served many scientific organizations, some for years, such as Science Service. Shapley was author or editor of ~ 13 books (1926 – 1973). His full bibliography is searchable and prints as a 36- page pdf at <https://harlowshapley.org/bibliography>.

Harlow and Martha Betz Shapley raised their five children at the large Director's Residence of where they often held parties for men and women observatory staff, visiting scientists, including those from abroad. See <https://harlowshapley.org/blog/close-up-life-with-the-director>.

SHAPLEY AT MOUNT WILSON - 1914 -1921

Character is my takeoff point for this journey with Shapley up other mountains. Who was he as a person? How does he compare to other leading scientists in those times?

While here Shapley was noticed as different. He was from the Ozarks. He said clever things – too clever. **"Too riotous an imagination"** was one description. He was said to take credit more than he should. He was off collecting ants when supposed to be the Monastery dinner table.

"Ruthless" is a word often used to describe Shapley's methods in his Great Papers that showed the shape and scale of the Milky Way then believed to be the universe.

His results were startling, even **"wild."** His departure from expected paths paid off. Though his results had flaws overall they were gloriously right.

Being "ruthless" and "a wild Missourian," as he called himself, could get him in trouble.

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While Shapley was at Mount Wilson he had allies, including George Ellery Hale. But he also wrote in a letter that if he left, and if acting director Walter Adams had "the deciding voice," he might not be invited back. The death of Harvard College Observatory Director E.C. Pickering in February 1919 sparked Shapley's ambition to go for this post and leave Mount Wilson. There is quite a literature on his ambitious and successful attempt to get the job at such a young age.

SHAPLEY HAD AN EVENTFUL PUBLIC LIFE FOR FIVE DECADES. FROM THAT LONG RECORD I WILL TELL STORIES OF

3 CHALLENGES SHAPLEY TOOK ON

- 1 AS NEWS SOURCE AND POPULARIZER 1920s
- 2 AS HUMANITARIAN RESCUER AND LIBERAL 1930s, 1940s
- 3 INSPIRING MANY ABOUT SCIENCE & ABUNDANCE OF LIFE IN THE UNIVERSE 1950s, 1960s

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Shapley had an eventful public life for five decades after he left Mount Wilson in April 1921 in line to be Director of Harvard College Observatory. He received the formal appointment November 1, 1921, one day before he turned 36. He had many achievements as Director and important member of the astronomical community. But he took on unconventional, bold tasks, too.

Tonight I extract three stories to how how his character – innovative, non-conforming, and thinking big – made him take on big challenges.

The question in these stories is "compared to what?" Not whether he realized his entire goals which were ambitious. But did he use his talents constructively? Did he bring results? At what cost?

I hope you'll agree that by trying to conquer these "mountains," Harlow Shapley left us great legacies today.



7

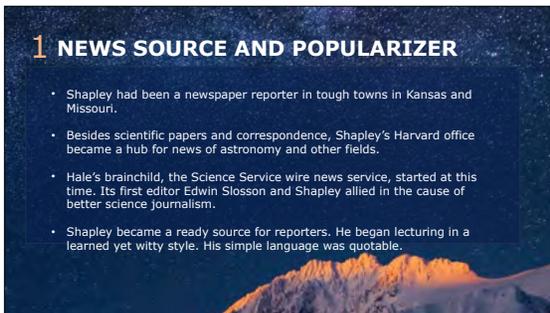
First let's view what we could see of the Center of the Milky Way then and now. Using the 60-in at Mount Wilson Shapley mapped surprising distances to globular clusters. They revealed a skeletal structure with the Center far from where everyone thought since Copernicus placed our sun at the center in 1543. Shapley showed in Paper VII (1918) that the globular clusters were arrayed around a region in the constellation Sagittarius.

The actual Center could not be seen with optical telescopes. Yet this black-white image of the densest part of Sagittarius is dramatic. It was taken in 1921 at the Harvard station in Arequipa Peru. This print was saved by Margaret Harwood who worked at Harvard College Observatory and directed the Maria Mitchell Observatory. I show it by permission of USNO Archives Harwood Collection.

Decades later, using infrared, astronomers could study the Center in detail. The main image is Wide Field Infrared Milky Way Center by Judy Schmidt in 2016. <https://www.flickr.com/photos/geckzilla/30413693773>.

The real center is the supermassive black hole Sgr A*. In May 2022 a group of astronomers using the Event Horizon Telescope released an image of this amazing black hole. You may see where the center or Sgr A* is on these images by request at <https://harlowshapley.org/contact>. Harlow Shapley Project Advisor Jeff Kanipe has put an arrow overlay pointing to Sgr A* on each. But tonight we wanted to show you the center in its naked glory as seen, then and now.

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8



9

Here is Shapley in his office dictating with a Dictaphone. His famous revolving desk at left. Image is Family Collection.

The Dictaphone was modern. Mostly he relied on wax cylinders he spoke into. He had one machine in his bedroom, one in his office and eventually one in his car!

When he had finished dictating a batch of correspondence, articles, lectures, etc, he would carry the cylinder to the desk of his secretary, Arville D. Walker. "Billy" Walker would set that cylinder going and start typing like the wind! I have now read hundreds of pages of documents typed by 'ajw,' but there are thousands. She stuck with him from 1922 through 1952 at least. She was a Christian Scientist so never missed a day due to illness!

Source: Katherine Lynne Bryant: "The Great Communicator: Harlow Shapley and the Media, 1920-1940," Harvard AB thesis (1992).

THE MODERN SCIENCE PRESS IS BORN



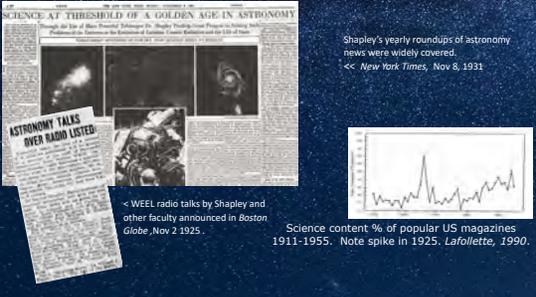
Einstein draws crowds of reporters and people wherever he goes. A huge crowd greeted his first arrival in the US in New York City in April 1920.



But anti-science is powerful. Telegram from Clarence Darrow asking Shapley to testify in defense of Professor Scopes, May 1925.

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In the 1920s science articles sell papers! The new radio broadcasters sought to fill the airwaves. Shapley made his Harvard office a news hub, by wiring stories to reporters and to Science Service. Science Service itself wrote and sent more quality science news to subscribing papers. The 1925 trial of Professor Scopes for teaching evolution in Tennessee was a watershed. News coverage of science spiked. Shapley was carrying out G.E. Hale's wish that astronomers get out of ivory towers and reach out to the public. The modern science press was born. Shapley continued assisting Science Service through the 1950s, eventually on the Executive Committee and as President.



Shapley's yearly roundups of astronomy news were widely covered.
 << New York Times, Nov 8, 1931

< WEEL radio talks by Shapley and other faculty announced in Boston Globe, Nov 2, 1925.

Science content % of popular US magazines 1911-1955. Note spike in 1925. LaFollette, 1990.

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"Astronomy Talks Over Radio Listed," *Boston Globe*, November 2, 1925. Shapley initiated this series of 15 talks by him and other members of HCO staff.
 "Science at Threshold of A Golden Age in Astronomy," *New York Times* Nov 8, 1931. This was one in a series of yearly roundups Shapley provided the press which got wide coverage. See *op. cit.* Bryant, "*The Great Communicator.*"

Chart shows the ratio of science to non-science content in popular magazines grew 1911-1955; Fig 2.1 in Marcel C.LaFollette, *Making Science Our Own*, U. of Chicago Press, 1990.

SHAPLEY PROMOTES THE 200-IN TELESCOPE

1928 Rockefeller Foundation makes two awards:

- For 60-in telescope to modernize Shapley/Harvard South Africa station
- For 200-in telescope to Caltech, which will take US astronomy to a new level

These decisions put the West Coast in the lead locking out Harvard.



YET Shapley briefs reporters what a 200-inch would do for astronomy. Hubble and others on the West Coast resent Shapley describing their work in the press.

Allan Sandage calls Shapley a "carnival barker" in his *Centennial History of CIW*, Vol. 1.

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The Rockefeller Foundation made two decisions in 1928 that were fateful for US astronomy. It awarded funds to Caltech for the next generation telescope, double the size of the 100-in on Mount Wilson. Thus Caltech, Carnegie, Mount Wilson and Lick would benefit. The decision was a long-term blow to East Coast astronomers and Harvard.

Shapley compensated skillfully by using Harvard's extensive array of southern and northern telescopes to map many star and cluster types and galaxies. This work expanded and used Harvard's huge catalog of past plates. The Shapley-Ames Catalog of Brightest Galaxies published in 1932, using Hubble's classification system, was used by West Coast astronomers. See Owen Gingerich, Marcia Bartusiak and other sources. Carnegie's Allan Sandage later wrote that the Shapley-Ames catalog "was the best thing Shapley ever did." It was updated only in 1981 - by Sandage.

"200-INCH EYE" is New York Times, 11-6-30.

In 1931 Howard Blakeslee of AP asked Shapley what he would do with a 200-inch telescope. Shapley replied: "See Exodus, Chapter 20, 17th verse. Thou shalt not covet they neighbor's house." Bryant, *op cit*, p. 27.

SHAPLEY'S LECTURES REACH MANY

- Shapley's writing and media activities from 1921 on built public interest in astronomy.
- He had redefined the universe before, so reporters kept asking him what the latest discoveries meant.
- Shapley's lectures were inspiring and sometimes irreverent.
- He gave broadcasts in the new medium of radio.

“
 He spoke with extraordinary directness, conveyed the reality of the cosmos in masterly strokes. Here was a man who walked with the stars and spoke of them as familiar friends. They were brought within reach. One could almost touch them. He even descended to levity, but it was a levity born of intimacy.”
 —Cecilia Payne, upon hearing Shapley for the first time in London in May 1922. Afterwards, she told him she wanted to come to work at the Harvard observatory.

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Shapley's writing and media activities from 1920 got the public excited about the baffling revelations by LeMaitre, Slipher, Hubble, Einstein and others. The stories made popular newspaper copy in the gay 1920s and in the Great Depression.

Cecilia Payne-Gaposchkin quote is in "The dyer's hand," p. 124 .in Katherine Haramundanis, ed., *Cecilia Payne-Gaposchkin An autobiography and other recollections*, Cambridge U. Press, 1984, 1996.

BIOGRAPHY - 1920s, 1930s

As Harvard Director of Harvard Observatory:

- Raised funds for original research & more plates data;
- Founded graduate school in Astronomy; Cecilia Payne is first PhD, many PhDs became leaders in the field;
- Hired more and promoted women and foreigners;
- Guests at the Residence: Russell, LeMaitre, Einstein;
- Southern station moved to S. Africa, Rockefeller 60-in telescope 1928;
- 1932 New northern station at Oak Ridge with 60-in telescope;
- New fireproof building for plates, "computer" workspace and library.

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Sorry, this chart didn't have space for medals and honorary degrees Shapley received in this era. He also was on the cover of Time June 29, 1934.

Page does not show Shapley's service for & leadership of major scientific societies: American Philosophical Society, Sigma Xi, Phi Beta Kappa, AAAS, etc. A more complete list is at See Harlow Shapley by Owen Gingerich in *Dictionary of American Biography*, Scribner's, vol. 12, New York, 1975, pp. 345-352.

2 HUMANITARIAN AND LIBERAL

- Shapley campaigned to rescue scientists displaced by the Nazis from 1933 and through the war.
- A big obstacle was tough US immigration policy.
- Also in the Depression university department heads were saving jobs and pension funds for home-town talent. So Shapley set out raising funds for salary and pensions for the "rescues," so they could be offered jobs.
- Shapley defied the House Un-American Activities Committee (HUAC). This and other liberal positions made him a hero, but had consequences for him and his wife Martha Shapley.

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By the early 1930s Shapley had a good life; his observatory was growing, new equipment was coming online, the first PhDs in astronomy were emerging from his new graduate program; The big Residence had five lively Shapley children and a competent warm wife to manage it; the family hosted musicales, seminars, and distinguished guests. "Let's invite everybody" he said when "cooking up" a party.

Yet from 1933 Shapley added another bold departure: his campaign to rescue scientists displaced by the Nazis and bring them to good jobs in the US.

Obstacle One was strict US immigration rules. Ken Burns' "The US and the Holocaust" makes clear that the top State Department official, Breckinridge Long, did not want foreigners including Jews entering our country. In fact most Americans did not want them, either.

An applicant could only get a visa if they showed a valid job offer so they would not become a "public charge." Shapley asked Harvard and other universities to identify suitable jobs to be matched with scientists and scholars needing to flee.

Obstacle Two was the Depression. University department heads pinched to give jobs and eventual pensions to home-grown talent. Shapley's program required both pay and a pension as part of the deal for each man. So he went around raising funds for the "rescues." But his goal of a national asylum program led by Harvard did not happen.

SHAPLEY'S CAMPAIGN



To the Rescue of the Learned: The Asylum Fellowship Plan at Harvard: 1938-1940
Bessie Zaban Jones
 American Library Bulletin
 Vol XXXII No. 3 Summer
 1984



Bessie Zaban Jones

Harlow Shapley 1930s

16

Notice this photo of Shapley in the 1930s. So where's the happy, successful astronomer? We never saw him glower like this! The photo was chosen for the only detailed account of Shapley's campaign to rescue scientists and scholars – most of them Jews – from the Nazis. On the left is Bessie Judith Zaban Jones. I'll call her Bessie on account of her lovely lace collar. She was one of eight children in an orthodox Jewish family which emigrated from eastern Europe to Atlanta in 1895. She got to the University of Chicago. There she met Howard Mumford Jones, a Harvard Professor. They married in 1927. Later, Bessie co-authored a history of the Harvard Observatory. But in the histories she found a gap. Shapley's campaign to save Jewish and other scholars was missing! She went to the Harvard Archives and produced this, the only account, published in 1984. (The files are there. Someone could go back and fill the story in and find their descendants.)

Tonight my question is: Compared to what? When have the leaders of science jumped into humanitarian rescue of colleagues devastated by evil regimes and war? Syria? Iraq? Ukraine? In the 1930s, which other institutions and leaders took on this challenge?

MAIN RESCUE PROGRAM



EMERGENCY COMMITTEE of INSTITUTE FOR INTERNATIONAL EDUCATION from May 1933
 Stephen Duggan Chairman - New York
 Edward R. Murrow - London



ROCKEFELLER FOUNDATION
 took the lead in supporting emigrés in many disciplines. List is *Who's Who* of the vitality of the United States after the war.

The funds Shapley raised for National Research Associates passed to the Committee. It paid grants and pensions for the NRA 'rescues' into the 1950s.

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From 1933 Shapley served on the Emergency Committee Executive Committee, with other pre-eminent supporters "to make the activity appear to the public to be worthy of approval."

Shapley's "asylum plan" for US universities to take scholars became the National Research Associates, "a small group of displaced scholars at an age beyond which places might be found at a college or university." pp 84-85 The funds he raised were turned over to the Emergency Committee to provide a "modest yearly grant" until the fund was expended in the early 1950s.

Source: Duggan, Stephen and Drury, Betty, *The Rescue of Science and Learning: The Story of the Emergency Committee in Aid of Displaced Foreign Scholars*. <https://www.iie.org/about/history/>

I digress briefly to another fascinating legacy. You've heard of Edward R. Murrow?

Murrow served from London as Assistant Secretary of the Emergency Committee from 1932. He arranged the exits of scholars and scientists needing to get out. He had sources behind enemy lines and elsewhere – reporting who was hiding under a bridge, or last seen on a road somewhere. In 1935 Murrow joined CBS Radio as European Chief of Staff. From 1937 Murrow's live broadcasts reporting on the unfolding war in Europe were based on the network of informants he developed for the Emergency Committee. After going to CBS, Murrow continued to aid refugee scholars and Emergency Committee. p 185. Murrow photo: wikis.uit.tufts.edu.

RESCUE AND DIVERSITY

“Richard Prager, the famous variable star observer at the Berlin Observatory, ... told me quietly and seriously that every night at least a thousand Jewish scientists were saying a prayer for Harlow Shapley’s humanitarian efforts, which had helped save them and their families.”



Foreign group at Harvard College Observatory, 1939

— Bart Bok

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At Harvard College Observatory Shapley hired British, Canadian, Dutch astronomers. In the 1930s and 1940s he hired several from threatened countries. In the 1939 “foreign group” photo we circled Richard Prager, the variable star expert from Berlin.

Quote: Bart Bok, “Harlow Shapley: An Appreciation,” National Academy of Sciences Biographical Memoir (1978, p. 253).

Shapley writes in *Rugged* (1969 p. 127) “Nearly a hundred rescues went through or touched my office.” But the folders in Harvard Archives are thick suggesting more than a hundred people were likely helped by his campaign. Note: Activists like Shapley kept quiet to avoid getting others involved in trouble, so great was the suspicion of helping foreigners.

Postwar scientist activism: Peter J. Kuznick, *Beyond the Laboratory: Scientists and Political Activities in 1930’s America*. U of Chicago Press, 1987. Quoted in Palmeri, op. cit. p 16.

RESULTS OF ADVOCACY



Philipp Frank, Einstein’s friend, was hired by the Harvard physics department partly due to Shapley.



- House Unamerican Activities Committee from 1938
- Shapley’s political positions are not liked by some on the Harvard Corporation which governs the Observatory.
- Harvard President James B. Conant stands up for free expression.

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The Shapleys welcomed foreign arrivals to parties to share some “joys,” as he put it. In one letter he wrote: “Tonight, it happens, the wife of professor Philipp Frank is teaching about 30 of the Observatory people Hungarian folk dances in my home.” Jones, op. cit. p 229. The FBI began following him in 1946. (He did not know this.) Actually Shapley had no past or current communist inferences, unlike Robert Oppenheimer, for example.

In that era many people were scared. Among co-workers and friends were there spies? Thank you for coming to my lecture tonight instead of the premiere of *Oppenheimer!* You’ll feel the tension and suspicion people felt toward others when you see the film or read Kai Bird and Martin J. Sherwin’s terrific biography *American Prometheus*.

Shapley’s liberal political activities made him enemies on the Harvard Corporation which oversees the Observatory.

DEFYING THE RIGHT & LIBERAL POLITICS



I have never seen a witness treat a committee with more contempt.

— John E. Rankin, D-Mississippi, Chair of THE Investigations Subcommittee of House Un-American Activities Committee following a closed-door hearing November 14, 1946

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In 1946 Shapley was subpoenaed by John Rankin (D-Miss) Chair of the Investigations Subcommittee of the House Un-American Activities Committee HUAC). The charge was way off - baseless. But Shapley with the Harvard lawyer and their secretary appeared in the Subcommittee Hearing Room November 14, 1946. Rankin made the lawyer and secretary leave, so only him, Shapley and one committee staff were left. A contretemps; Shapley wrote their words on notepaper, which Rankin grabbed.

The press was outside the hearing room when they came out. The afternoon editions quoted Rankin (“never...more contempt”) and Shapley’s charge of “Gestapo Tactics” by a “Star Chamber.” Shapley’s defiance of Rankin and HUAC was widely reported. He became a hero to the Hollywood Ten whom HUAC was also targeting.

Rankin “row” sources: Bart J. Bok Harlow Shapley 1885-1972 A Biographical Memoir National Academy of Sciences, 1978. p. 256. Wang, J. “American Science,” 119-130.

Shapley called to abolish HUAC immediately and in following years. October 27, 1947 NBC broadcast a “Parade of Stars” opposed to HUAC. Shapley spoke along with Humphrey Bogart, Lauren Bacall and other stars. A typical appearance.

Edward U. Condon was the most prominent scientist targeted by the Right in the late 1940s. But Condon was in government and could not speak out. Shapley had the platform of the university and his fame. He spoke for academic and government scientists, intellectuals – everybody. Shapley stood up for Negro rights and championed Truman’s anti-lynching bill.

1940s - HIS ACTIVISM AS A POLITICAL LIBERAL WAS "NECESSARY" TO SHAPLEY'S CONSCIENCE AND STATURE AS A PUBLIC VOICE

Other leaders of science might have laid low. It was a scary time.

“
 “I am exceedingly unhappy when I see injustice. I am neither Negro, nor Jew, nor Jesuit, nor Communist. So far as I understand them, I do not hold with Catholicism, Communism, or Judaism. But I am a fellow-traveler of all of these minorities in turn when their constitutional rights are invaded by a thoughtless majority or by malicious aggressors who seek political advantage, material gain, or sadistic satisfaction through persecution.”
 -- Harlow Shapley "Personal Program," February 11, 1948

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About his meetings with refugees Shapley wrote: "The Federal Bureau of Investigation watched all this, but we didn't worry too much about that...We knew that a person who had escaped from an East European country might be tinged with communism." *Through Rugged ways to the Stars* (1969) p. 127.

In his politics "Shapley showed the same independence of thinking and approach that had brought him fame during his studies that led to the discovery of the center of the galaxy," Bok "Harlow Shapley, Biographical Memoir" op. cit. p 255.

"I am a fellow-traveler" is quoted in Shapley's *New York Times* obituary, Oct. 20, 1972. The quote here is from Palmeri's thesis op. cit., is from his correspondence: Shapley to "W—," 11 February 1948 pdf 131 at note 95.

David Levy, *The Man who Sold the Milky Way: A Biography of Bart Bok* U of Arizona Press (1993) <https://archive.org/details/manwhosoldmilkyw00levy/page/n11/mode/2up>

BIOGRAPHY - 1940s

- 1943 Copernican 400th at Carnegie Hall – like Ukraine today. Message from FDR.
- 1946 Martha Sharp ICSAAP letter sparks subpoena by Rankin. Shapley tells press HUAC is a "Star Chamber."
- 1949 Organizes peace rally at Madison Square Garden, attended by 20,000.
- 1950 opposes Velikovsky's book *Worlds in Collision*.
- 1950-51 Martha Shapley yanked from job by military security. Family fights & wins.
- Sept 1952 Baade's 2 populations of Cepheids remeasures the universe. Shapley missed it!

1943, 1946 *Treasury of Science*

1942 *Science from Shipboard* (Science Service) issued to thousands of servicemen

Design for Fighting postwar vision for basic science (NSF, NIH)

Got the S in UNESCO

Elected President of AAAS for his support of intellectual freedom 1947. Truman at AAAS defends scientific freedom 1948

5-year debate in Congress leads to launch of NSF in 1950

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1943 Shapley organized with US Polish society Copernican Quadracentennial 1943 to a packed Carnegie Hall. Albert Einstein, Henry Ford, other celebrities honor Polish freedom.

Martha Sharp (of Ken Burns' *Sharp's War*) ran for Congress from Massachusetts. She asked for funds from ICSAAP, a peace group Shapley was involved with. This set off suspicion by HUAC and the FBI.

Shapley chaired ICSAAP's peace conference in 1949, opposed by right wing press and others. 20,000 gathered at Madison Square Garden with police outside.

1950 Shapley opposed publication of Velikovsky's *Worlds in Collision*.
 1950 Martha Shapley was told by military security not to go near the MIT lab she had worked at fulltime since 1942. Family organized her appeal for reinstatement and won; she went back.

In 1952 he learned Harvard Corporation will not make him a University Professor. He continues as Paine Professor through 1956.

HCO has too many facilities. Staffing low. So is pay. Whipple and Menzel get HCO large federal funds.

At Rome IAU conference in Sept 1952 he hears Walter Baade present findings there are two populations of Cepheids. Thus with the 200-in telescope at Palomar, Baade is remeasuring the universe. (It came online in 1948). Shapley missed this chance for another big discovery, "It was his King Lear moment," said Gingerich.

3 INSPIRING MANY ABOUT SCIENCE, LIFE IN THE UNIVERSE

- 1952-1953 were strained years for Shapley. Yet he created a novel course, defining the field we call Cosmic Evolution.
- Based on new science, he changed his view to say life must be abundant in the universe. This was contrary to mainstream scientific views.
- He formulated a computation for how many stars may host or habitable planets. He reckoned there were 100 million "life theaters" in the known universe.
- For life to arise on a planet, it must orbit in "the liquid water belt" of distant to its star. Dole defined this as the "habitable zone" in 195x.
- Shapley spoke widely as a science educator. He shared his Dante-like vision of man in one corner of an infinite universe with abundant life.

"We are not alone" - 1953

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1952-1953 were difficult years. Yet Shapley created a Harvard course that combined disciplines in the field now called Cosmic Evolution.

New science led Shapley to change his past views. He concluded life must be abundant in the universe. In 1953 Shapley defined the "liquid water belt" among six conditions for a planet to support life.

In 1953 he set out a calculation of the odds a star might host a habitable planet. He spoke and wrote on this theme through the 1950s. In January 1960 Frank Drake credited Shapley's estimation of the odds. So Shapley framed the 1961 Drake Equation, the second most famous equation in science.

Shapley shared his new vision of man's place in the universe in talks, books and a film 'Of Stars and Men.' You'll hear him to the tune of lovely imagery in a few minutes.

Explore further: Shapley described "cosmography" Shapley, H. *American Scientist* 42 (3) July 1954_p. 471-486.

"THE LIQUID WATER BELT" - 1953



Six Conditions for Planetary Life:

- 1 Water will stay liquid.
- 2 - 5 Rotation and orbit features. Surfaces, air and sea must be "not inimical" to life.
- 6 Life once started must "establish a tenacious hold."

Shapley, H. Chapter 1 "Climate and Life" in *Climatic Change*, 1953, based on conference he chaired at American Academy of Arts and Sciences in May 1952.

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Full text of Shapley's "Six Conditions for Life" on page 7 of *Climatic Change*:

- "1 - Water...must be available in liquid form...The basic requirement, therefore, is that the living planet must be at a proper distance from its star – in the liquid water belt - not as close to the sun as Mercury and not so distant as Jupiter.
- "2 - A suitable rotation period so that nights do not overcool nor days overheat.
- "3 - The orbital eccentricity must be low to avoid excessive differences in insolation as the planet moves from perihelion to aphelion and back.
- "4 - The chemical content of air, ocean, and land surface must be propitious
- "5 - The controlling star must not be variable by more than 4 or 5 percent ...
- "6 - Finally, life must get started and establish a tenacious hold on seas, shores or inland."

The **liquid water belt test** suggests which planets around a star might have life and be worth searching for, which was technologically impossible at that time. Yet Shapley's discussion of how to locate "life theaters" was prescient. The test - also called the **habitable zone test** - is used in **today's exoplanet search at the frontier of astronomy and astrophysics**.

For the record: The concept of "zones" of distance from a star that might host life was introduced in 1953 by Hubertus Strughold, an aviation medical expert, in *Mars the Green and Red Planet*. The term used in exoplanetary studies is CHZ, Circumstellar Habitable Zone. The term "habitable zone" was introduced in 1959 by American astrophysicist Su-shu Huang. [Wiki CHZ article](#).

"WE ARE NOT ALONE" - 1953



The odds are one in a trillion that any given star supports life of the 'high' sort.

But since the total number of stars are in excess in 10^{20} "there must be... one hundred million life theaters, scattered throughout the Metagalaxy.

[They] indicate that the life phenomenon is widespread and of cosmic significance. We are not alone.

Shapley, Ch. 1 in *Climatic Change* (1953)

In 1952 Stanley Miller showed organic molecules can arise from inorganic matter in conditions like the early earth. May 15 1953 Science published his results, since known as the Miller-Urey experiment.

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Sources: Miller, Stanley L. (1953). "Production of Amino Acids Under Possible Primitive Earth Conditions" (PDF). *Science*. **117** (3046): 528–9. [Bibcode:1953Sci...117..528M](#). [doi:10.1126/science.117.3046.528](#). PMID 13056598.

Shapley responded fast as a scientist away from his previous view that life could not occur elsewhere. In the 1950s most scientists saw no way advanced life could exist elsewhere; their views were important rebuttals to the UFO scares of the period.

Then astronomers began to agree that planet formation could occur naturally around star. To this Shapley factored in Miller's results, that validated earlier theories of the British biochemist J. B. S. Haldane and the Russian biochemist Aleksandr I. Oparin (1924, 1936, 1938).

Graphic: Representation of early earth (Ron Miller) Source: Earth Lightningimages.pages

UNCONVENTIONAL RETIREMENT

Shapley went on the road. He chose to visit underserved colleges in the Midwest and South and women's colleges.

He believed all people benefit from exposure to science. As more people engage with science society matures. So he set out to reach people where they were.

One example. He was the first Visiting Scholar in Phi Beta Kappa's Visiting Scholars Program. VPS was cooked up by PBK's President Kirtley Mather and Shapley himself.



He was in Albion, South Dakota on October 4, 1957, when the Soviet Union changed history by launching the first satellite Sputnik. The hall he spoke in was jammed. "I couldn't roll 'em in the aisles. No place to roll 'em," he wrote.

The PHI BETA KAPPA Society
THE NATION'S OLDEST ACADEMIC HONOR SOCIETY
Founded December 5, 1776

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Shapley's retirement allowed him to connect with projects and speak on themes that related to his widening world (or cosmic) view. Science and religion was one theme. He spoke in favor of 'rational religion' and against 'hocus pocus.' He knew the fundamentalist cultures from his midwest upbringing, so had points of connection with these audiences. He wanted them to see the world more through the eyes of science not "hocus-pocus."

He chose to visit small underserved colleges in the Midwest and south. Albion College, U of Arkansas, LaFayette College, Randolph-Macon Womens' College and Southwestern at Memphis were among those he visited in 1957-58 for the Phi Beta Kappa Society.

History changed on October 4 1957 when the Soviets launched the earth-orbiting Sputnik satellite. Americans were shocked by the Soviet advance.

Shapley writes to the Phi Beta Kappa office, from a motel in Vermillion, S. D..

At Albion "there was a riot" People along the edges and in the aisles. "I couldn't roll 'em in the aisles--no place to roll!"

CELEBRITY TRAVEL EXPENSES

VSP today
<https://www.pbk.org/VisitingScholars>

The PHI BETA KAPPA
 THE NATION'S OLDEST ACADEMIC HONOR SOCIETY
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Actually the PBK Visiting Scholar program was created by then President Kirtley Mather, a Harvard geologist, with Shapley. The Scholar would agree to make "a few" visits to campuses during an academic year. He would be paid \$250 for complete in two days on a campus, plus travel expenses. Shapley would speak to the school audience, meet with faculty and students, maybe also speak at chapel. Local reporters covered the famous visitor, so his message spread via the press.

in 1971 Mather said no Visiting Scholar had equaled Shapley's record of visiting 25 campuses in one academic year.

The PBK office loaned me an old folder with Shapley's correspondence with Frances Robb, the official who managed Shapley's travel arrangements and expense account. Now I'll quote from their letters shown on the slide. These are about the last visits on his tour.

October 1957 "Goshamitey! I found a scrap of paper+ for a few minutes [to report] that the tour (if you will kindly excuse the understatement) is something. People, dammm, like me and I talk, talk, talk...." But Dr. Shapley what's this about Hoyle, and about flying saucers, and Russian spies? When you grow up and do this tour, don't come to Cornell..."

Deb read their final humorous exchange about his expense account, in May, 1958.

The V Program is going strong today. See <https://www.pbk.org/VisitingScholars>.

OF STARS AND MEN - 1958

The Human Response to an Expanding Universe
 Shapley distills his vision and message to a brief, lucid book.

"Millions of planetary systems exist, and billions is the better word...."

Whenever the physics, chemistry and climates are right on a planet's surface, life will emerge, persist and evolve....

Biochemical evolution on, let us say, one half of the suitable planets [may have] equaled or attained much greater development than here.

- Harlow Shapley, *Of Stars and Men*

"His remarkable views on the probability of widespread life throughout the universe [are] sharply at variance with the ideas of many modern scientists."
 - *Sydney Morning Herald*

Marilyn Monroe's copy
 Four printings. Trans. into 8 foreign languages.
 Recommended by PM of India Jawaharlal Nehru and other thought leaders.

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Quote sources:

Of Stars and Men: "Millions of planetary systems...." p. 112.
 "Whenever the physics...emerge, persist and evolve" p. 113
 "Biochemical evolution on... equaled or attained much greater development" p. 144.
Sydney Morning Herald: "His remarkable views..." March 22, 1959.

Filmmakers John and Faith Hubley approached Shapley about turning his book into an animated film. "Of Stars and Men" was released at the Venice film festival in 1961. Previously Shapley was heard in lecture halls and the radio. Now the public also heard him read the poetic text of his book. You'll hear him too in a few minutes.

Marilyn Monroe's copy of a first edition on EBAY. Shapley was a hero to many Hollywood stars from his calls to abolish the House Un-American Activities Committee. When Cong. John Rankin, Chairman of the HUAC Investigations Subcommittee subpoenaed Shapley in 1946, at the time he was going after the Hollywood Ten. This story is on previous slide.

A FEW DARE TO LISTEN

Frank Drake makes a daring proposal to tune the new NRAO to listen for signals from ET. Otto Struve, Director of NRAO, backs a quiet attempt: Project OZMA in April 1960: gets a signal - but it's false! News leaks to *New York Times* causing a furb.

Why is it reasonable to think advanced civilizations in our galaxy might signal us? Drake's Jan 1960 piece in *Sky and Telescope* cites Shapley's "conservative" view of the odds.

"It appears that strong intelligent radio transmissions may emanate from the vicinities of, at best, 25 per cent of the stars and, at worst, perhaps one star in a million, which is the extremely conservative estimate recently suggested by Harlow Shapley in his book, *Of Stars and Men*.... They make the possibility good that at least one of the 10,000 stars soon to be within our reach has a civilization using radio techniques."

Otto Struve, Director NRAO

85-foot. Tatel Telescope at NRAO, 1960

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Why it was daring:

Once word of Project OZMA leaked, Struve wrote that it has "aroused more vitriolic criticisms and more laudatory comments than any recent astronomical venture. It has divided the astronomers into two camps: those who are all for it and those who regard it as the worst evil of our generation." "Astronomers in Turmoil," Struve, *O. Phys Today*_13 (9)_ Sept 1960_pp. 18-23.

Birth of SETI :

W. Sullivan, *We Are Not Alone (1964)* pp. 200-206.

Soviet astronomer Josif Shlovsky wrote the pioneering book in the field, *Universe, Life, Intelligence* (1962). Carl Sagan's 1966 book *Intelligent Life in the Universe* would be the Bible of the SETI movement. [NASA](https://www.nasa.gov) allowed some funding for SETI in 1971.

SHAPLEY FRAMES THE DRAKE EQUATION

The second most famous equation in science

The furor about OZMA made Drake and Struve go back to the drawing board and secrecy. To figure out a systematic approach they and nine others met on November 1-2, 1961 at the NRAO in Green Bank, W. Va. The meeting was quietly supported by Space Science Board of the National Academy of Sciences. Direct government funding was a no-no. These eleven are known to history as SETI Pioneers.

Shapley wasn't at the meeting. But A.G.W. Cameron, who was there wrote: "Harlow Shapley set the stage for our discussions in his book *Of Stars and Men*."

Drake drew on the blackboard an equation of 7 Factors to determine the number of detectable civilizations in the Milky Way, or N.

"Harlow Shapley was among the intellectual fathers of SETI, preceding even Drake and Sagan" — Steven J. Dick

How the Drake Equation expresses Shapley's formulation is in Dick, "The Drake Equation in Context."

Shapley 6th condition for life in the universe (1953)
 "6. — Finally, life must get started and establish a tenacious hold on seas, shores or inland." In other words, it must survive for millions of years and evolve to be detectable

Drake Equation factor L (1961)
 Longevity of a technological civilization.

$$N = R \cdot f_p \cdot n \cdot f_l \cdot f_i \cdot f_c \cdot L$$



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"Harlow Shapley was among the intellectual fathers of SETI, preceding even Drake and Sagan," interview, Steven J. Dick. Best source: Dick, Chapter 7 "The Drake Equation in Context," reprinted in *Space, Time and Aliens*, pp. 81-99. https://link.springer.com/chapter/10.1007/978-3-030-41614-0_7

A.G.W. Cameron *Interstellar Communication: A Collection of Reprints and Original Contributions* (1963). Cameron's introduction quotes Shapley's "overly cautious view of the probabilities of life in the universe" on pp 1-2. One of the eleven was Carl Sagan, then a 29-year old graduate student.

Drake had studied at Harvard College Observatory from 1952. He earned his PhD in 1955. Per earlier slide, from 1952 Shapley launched is popular course in Cosmology and wrote the paper "Climate and Life" for *Climatic Change*, published 1953.

For more on Drake, Sagan, Cornell, Arecibo, and the Pioneer message see https://en.wikipedia.org/wiki/Frank_Drake.

SHAPLEY SPREADS HIS MESSAGE - 1960s





At Darwin Centennial in 1959, leaders debate if man will go extinct. Shapley warns of homo's extinction by nuclear war.

Typical pose with cigar

The Great Man welcomed to Australia, Feb 1961

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Author has lots of clips like this in Newspaper Clips 1959-61. See newspapers.com.

Main image is Stevens Point, Wisconsin, Danforth Lecture, Oct 15, 1959.

The text continues:

"Dr. Shapley is credited by some of his colleagues with having delivered more lectures on science especially astronomy than almost any other ranking American scientist. He combines wit, verve and eloquence with mastery of his own field and his knowledge of other fields of science. His interests extend from the psychology of the ant, on which he has written three technical papers, to the farthest reaches of space."

Photos: Australia welcome and 'cigars' are by permission of Harvard University Archives.

"THE CARL SAGAN OF HIS TIME"

“

Through the 1950s and much of the 1960s when age forced him to step back, Shapley was the only prominent, credible figure spreading this idea. He was the Carl Sagan of his time.

— Steven J. Dick, interview. See Dick "Cosmos & Culture"

FOR NARRATIVE AND IMPACT:
 JoAnn Palmeri, *Astronomer Beyond the Observatory: Harlow Shapley as a Prophet of Science*, Ph D Thesis, U. of Oklahoma (2000). Also Palmeri Chapter 15 in *Cosmos & Culture*, Dick and Lupisella eds., Nasa History Series (2009).

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Sources: Steven J. Dick interview with Deborah Shapley, April 2020. "Drake and Sagan get the credit but Shapley is the intellectual father of SETI." —S J Dick interview.

Forerunner: In 1913 Lawrence J. Henderson put forth the idea "for the whole evolutionary process, both cosmic and organic, is one." Quoted by Dick in *Biological Universe* p. 257. Henderson was not publishing in the 1950s and 1960s, when Shapley seized on Miller-Urey experimental results and the latest in plant formation to develop and promote this message.

See also JoAnn Palmeri, "Bringing Cosmos to Culture: Harlow Shapley and the Uses of Cosmic Evolution." Chapter 15 in *Cosmos & Culture: Cultural Evolution in a Cosmic Context*, Steven J. Dick and Mark J. Lupisella, eBook, NASA SP 2009-4802 pp. 469-521.

BOOKS 1960 - 1973

All books from 1960:

- Source Book In Astronomy (1960)
- Science Ponders Religion (1960)
- Galaxies: Revised Edition (1961, 1st ed. 1943)
- View from a Distant Star (1963)
- Beyond the Observatory (1967)
- Treasury of Science (1943, 1946, 1948 1954, 1963)
- Through Rugged Ways to the Stars (1969) Memoir
- Galaxies: Third Edition (1973 with Paul Hodge)



BIBLIOGRAPHY of all HARLOW SHAPLEY PUBLICATIONS by Thomas J. Bogdan is on our website harlowshapley.org/bibliography

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Please note how long many of his books stayed in print. *A Treasury of Science* was a regular Book-of-the-Month Club selection, with five editions from 1943 to 1963.

Shapley's relentless production of readable books (and articles) may be why Sylvia Nasar, in *A Beautiful Mind*, writes that Harlow Shapley's name was known to every educated American household." No doubt an exaggeration. But tonight my question is – What drove this unusual activity? And compared to whom? What was the legacy?

Another quote from S.J. Dick: "In the 1960s Shapley's books spread these ideas worldwide" intro to *Cosmos & Culture* p 47.

VISION AS INFLUENTIAL AS DANTE'S

"The Einstein-Shapley-Hubble image of an enormous universe with the earth stuck in one corner of a galaxy among billions formed an important background to all arguments on the plurality of worlds after the 1930s.

"Shapley was no Dante, but the worldview that he expressed in *Of Stars and Men* was an influential image for the twentieth century no less than Dante's *Divine Comedy* was for the middle ages."

-- Steven J. Dick, *Biological Universe*, 1996

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Quote source *Biological Universe* page 57. It continues: "impressive photos of galaxies (fig 2.3 of Andromeda) belied [Alfred Russel] Wallace's worldview and came to symbolize the new universe, without a center or even the possibility of a center."

One statement of Shapley's vision (*Of Stars and Men* p.149): "With our confreres on distant planets; with our fellow animals and plants of the land, air and sea; with the rocks and waters of all planetary crusts, and the photons and atoms that make up the stars -- with all these we are associated in an existence and an evolution that inspires respect and deep reverence.... As groping philosophers and scientists we are thankful for the mysteries that still lie beyond our grasp."

LEGACY

Shapley during *Of Stars and Men* filming ca. 1960



"Shapley, almost single-handedly,....did for the Milky Way System, our home galaxy, what Copernicus had done 400 years earlier for our solar system"

- Bart J. Bok

"He was the most wonderful talker I have ever known."

- Cecilia Payne-Gaposchkin

"We all owe much in the public funding of science to this one man's multi-faceted efforts...to arouse in an interested public a...fascination with topics astronomical."

- Owen Gingerich

"He is a stubborn advocate of his own ideas and one of the supreme egotists of our time. He has an inherent dislike for authority, and will invariably do the opposite of what he is told or supposed to do."

- FBI Boston office, ending surveillance in 1953

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Sources:

Bok quote in *Heritage of Copernicus*, Ch, 2 by Bok "Harlow Shapley and the Discovery of the Center of our Galaxy" p. 26.

Haramundanis, Katherine, Ed., *Cecilia Payne Gaposchkin An Autobiography, 2nd Ed.*, p. 155.

Gingerich in "Harlow Shapley's Impact," reprinted in Matthews, Mildred Shapley *Shapley's Round Table*, p. 287

FBI quote is from Ortega, Tony, "Red Scare Astronomer Harlow Shapley Reshaped the Universe, but the FBI considered him a risk." Article was in Jan 2002 *Astronomy* and Available on *The Underground Bunker* <http://tonyortega.org/red-scare-astronomer-harlow-shapley-reshaped-the-universe-but-the-fbi-considered-him-a-risk/>.



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Let's hear Shapley explain his message himself! Slow down. Get in the mood to look up at the stars in wonder. Now you can enjoy a video clip from the end of "Of Stars and Men". This is the animated film of his book made by John and Faith Hubley. They selected passages from the book to illustrate, music by Bach, Vivaldi, Mozart, and Shapley as the narrator reading his poetic words.



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Final slide. Flip to Title slide for questions.