

The Great Debate. II.

The Debate

Giulon Ragu in *Second Life*

In Real Life: Giuseppe Longo

University of Napoli Federico II, Italy

Visiting associate - Caltech

longo@na.infn.it



This speaker does not agree with the Italian Government Politics for University, Scientific Research and Culture

Heber Curtis

born in Muskegon, Michigan, on June 27, 1872.

A.B. and A.M. degrees at the University of Michigan



1893-94 Professor of Greek and Latin at Napa College (California). In 1896 became Professor of Mathematics and Astronomy at the College of the Pacific

In 1900, Curtis accompanied the Lick Observatory - Crocker Eclipse Expedition as volunteer observer. This was followed by an appointment to the Vanderbilt Fellowship at the University of Virginia, which he held for two years, receiving his Ph.D. degree in Astronomy in 1902.

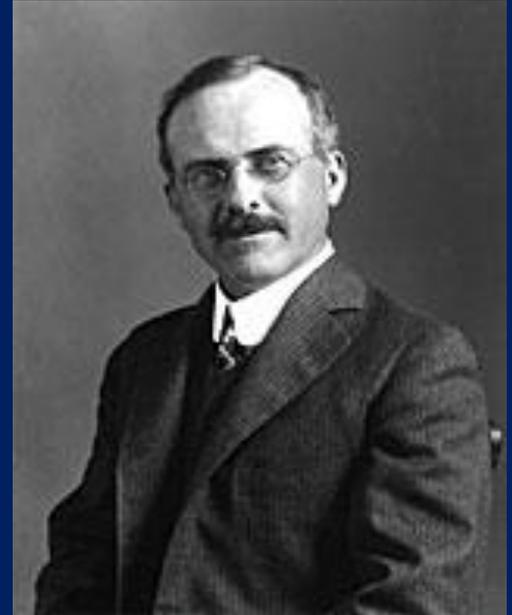
For eighteen years, starting in 1902, Curtis was associated with the Lick Observatory.

From 1902 to 1905, he served as Assistant and Assistant Astronomer, from 1906 to 1910, as Acting Astronomer in charge of the D. O. Mills Expedition to the Southern Hemisphere at Santiago, Chile, and from 1910 to 1920 as Astronomer at Lick Observatory.

The war years, 1917 to 1918, were spent in organizing and conducting a navigation school for the United States Shipping Board in San Diego, California, in teaching navigation in the Naval Officers' School in Berkeley

Upon his return from Chile in 1910 was placed in charge of the Crossley reflector to continue the survey of the nebulae begun by Keeler. (a work which he regarded as his most important contribution to astronomy)

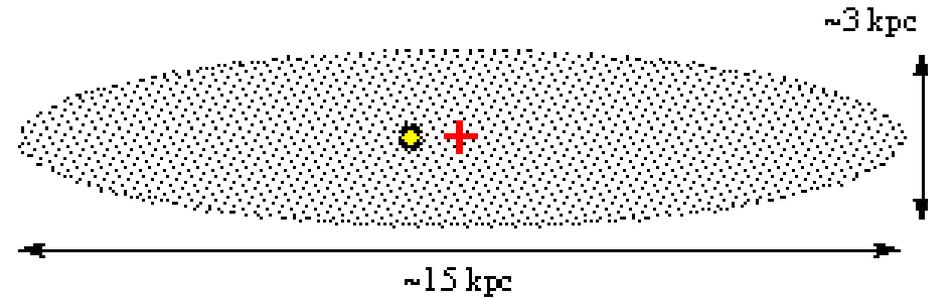
In 1920 the University of Pittsburgh selected Curtis as the Director of the Allegheny Observatory.



Kapteyn's Milky Way (1922)

Kapteyn's star:
Proper motion = 8 arcsec/year

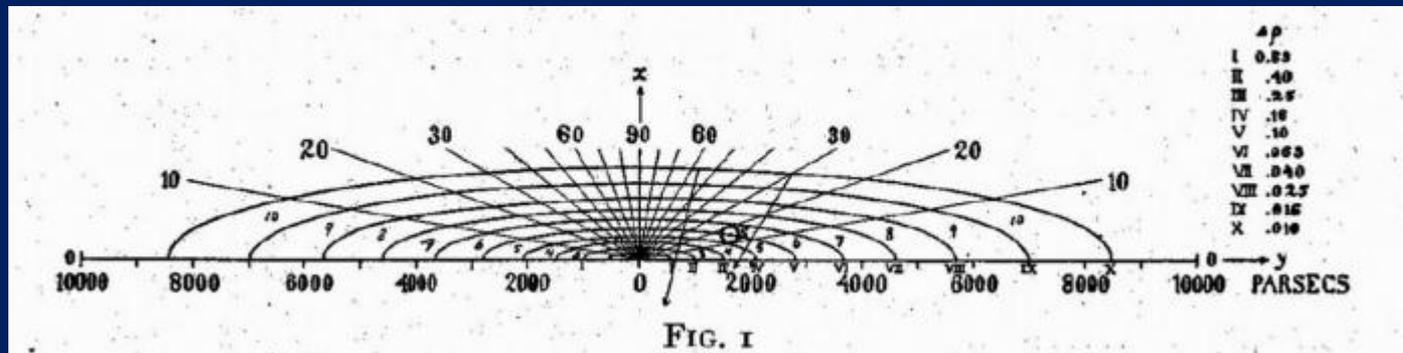
Kapteyn Model (1922)



kpc = kiloparsec = 1000 pc

Kapteyn's star counts lead to a Milky Way of ca. 15 kpc x 3 Kpc

The Sun is very close to the center of the System



Heber Curtis

in 1917, George Ritchey at Mt. Wilson while taking long exposures of spiral nebulae to measure “proper motions and rotation”, finds a nova of apparent magnitude +15.

In 2 months, 11 more nova were discovered, many by Heber Curtis, who uses them to get a handle on their direct distances.

Curtis found that there was an average difference of 10 magnitudes (apparent) between galactic novae and those novae found in the spiral nebulae.

If this was the case, then if spiral novae were 10 magnitudes fainter, then they were 100 times further distant than galactic novae.



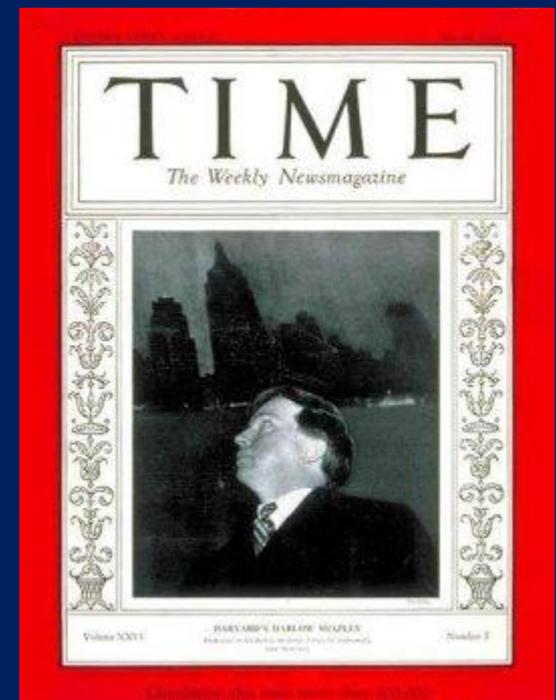
Problem: difference between Novae and Supernovae.....

Harlow Shapley (Nashville 1885-1972)

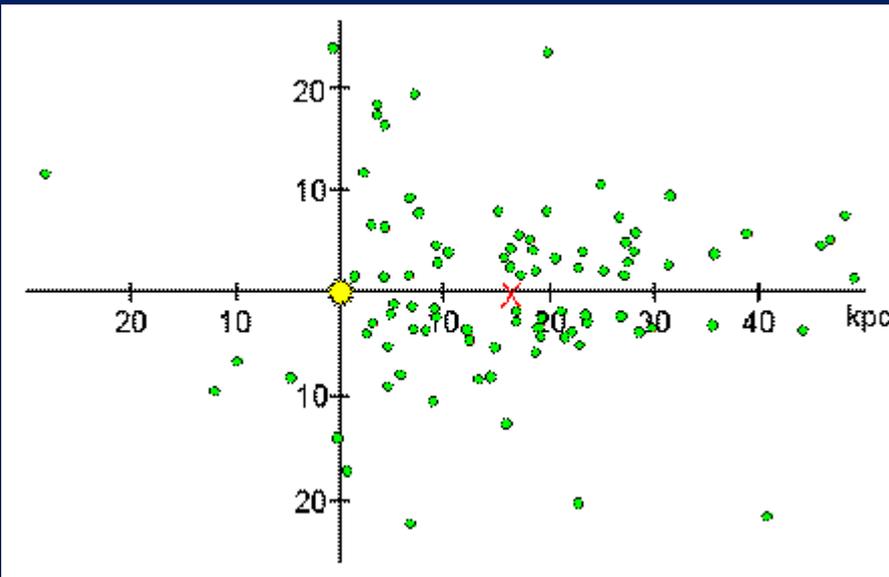
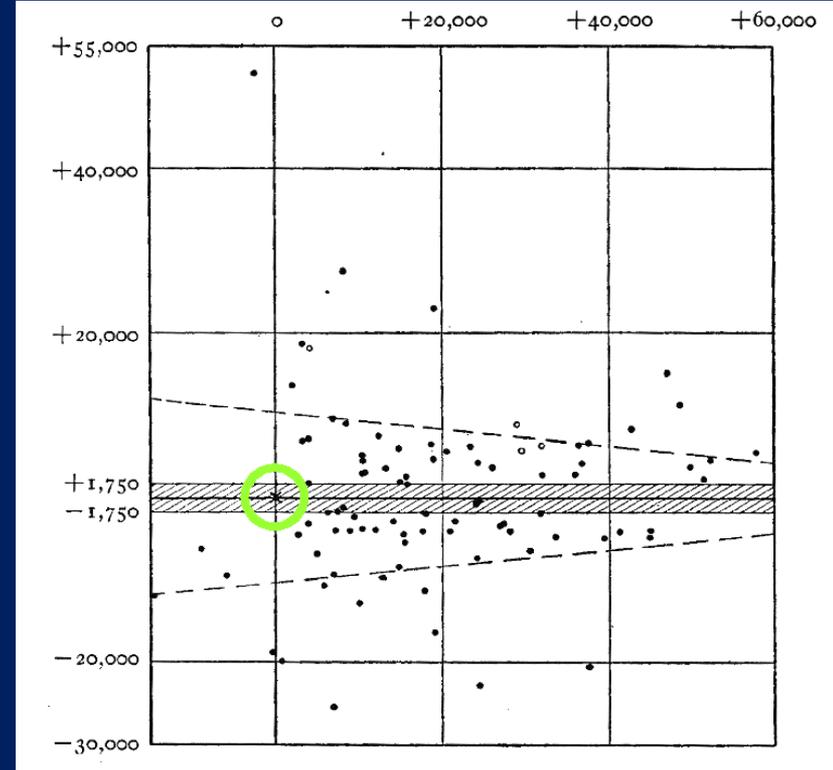
Dropped school after the fifth-grade to become a reporter covering crime stories

Re enters school and finishes college in only two years (with honor) and in 1907 enters the University of Missouri to study journalism but, ***when he learned that the opening of the School of Journalism had been postponed for a year, he decided to study the first subject he came across in the course directory. Rejecting Archaeology, which Harlow later explained he couldn't pronounce, Harlow chose the next subject, Astronomy.***

Ph.D. fellowship at Princeton to measure the distance to Globular Clusters using the Period-Luminosity relationship....



Measures apparent brightness of cepheids in many GCs and uses these as calibrators for the others



26 April 1920

the Baird auditorium of the Smithsonian Museum of Natural History hosts the William Hallery Hale Lecture on “the distance Scale”

“THE GREAT DEBATE”

Harlow Shapley (Mt. Wilson)
against
Heber Curtis (Lick)

Starts at 8:15 p.m. with a “Conversazione” timed to follow at 9:30

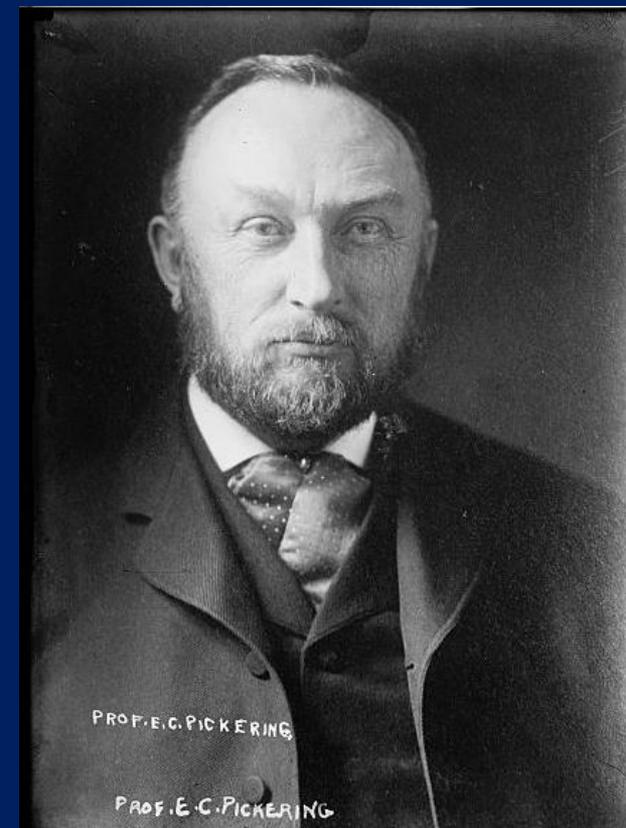


What was it ?

- It was not a scientific meeting but rather a high level popular lecture
- It was not a «debate» but rather a discussion between two scientists
- The scientific arguments presented at the «debate» were quite reduced in size and complexity (the two papers usually presented as the transcription were written more than 1 year later and very different in content)
- The main concern was «to avoid troubles»....

In February 1919 Edward C. Pickering (HCO Director) died after 42 years of “dictatorship”

Obvious choice as successor would have been Henry Norris Russell, Shapley's teacher and mentor (very bad at management)



Kapteyn, writing to Hale from Groningen, proposed Shapley

Shapley promptly wrote to both Russell and Hale to candidate himself.

Russell's reply

"To tell the naked truth, I would be very glad to see you in a good position at Harvard, free from executive cares. . . . But I would not recommend you for Pickering's place; and I believe that you would make the mistake of your life if you tried to fill it."

To Hale, Russell remarked that Shapley:

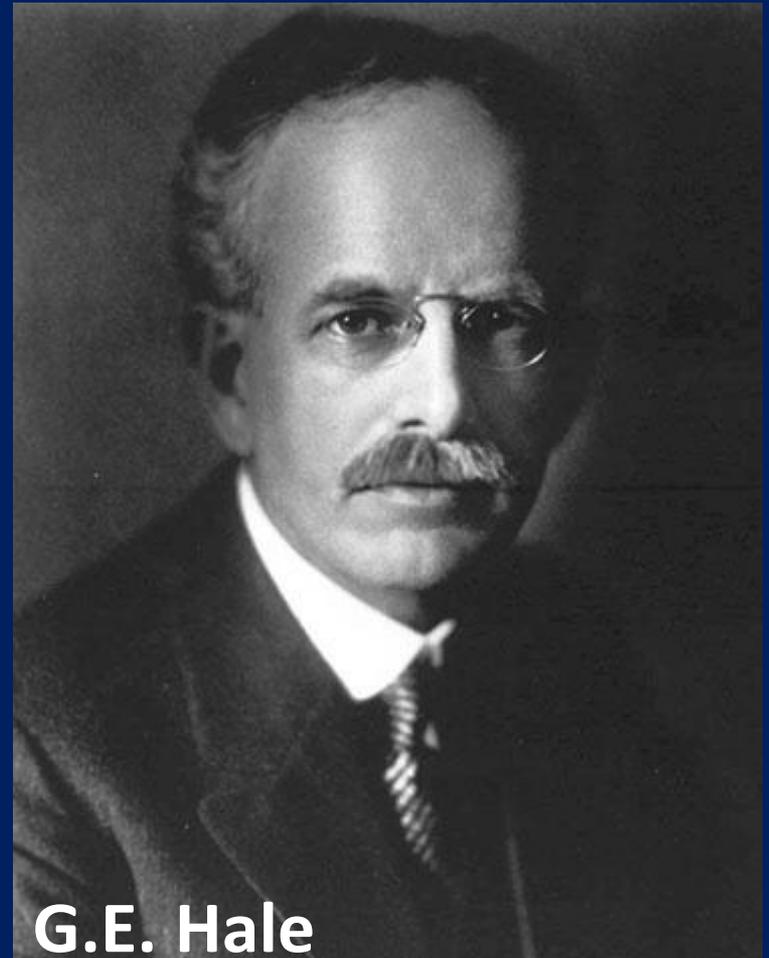
"would not suffer if he pondered the old fairy tale about the man who got all sorts of good things from a magic fish whose life he had saved-until his wife wanted to be Pope!"



H.N. Russell

Hale to Shapley:

"My advice to any candidate for a position would be never to attempt to take an active part in securing it, as this is the surest way to defeat one's end..."



G.E. Hale

Shapley wrote to both men to declare himself no longer a candidate... but he was just acting !!

THE CONFUSION STARTS

On 20 December, A. Lawrence Lowell, President of Harvard, telegraphed to Mount Wilson: *“ Is Shapley coming East Xmas time for some scientific meeting? If so could he visit Cambridge? If not when could he come here?”*

Then a mysterious visit to Shapley from a Regent of Harvard followed.

Shapley to Russell (Jan 6, 1920):

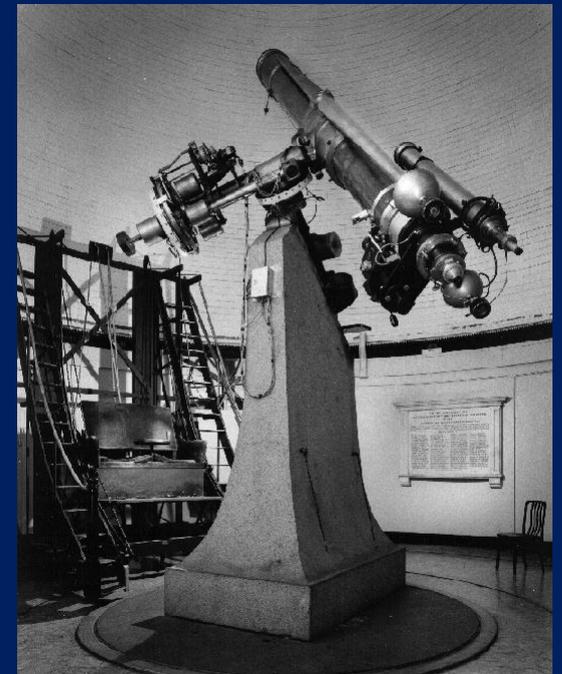
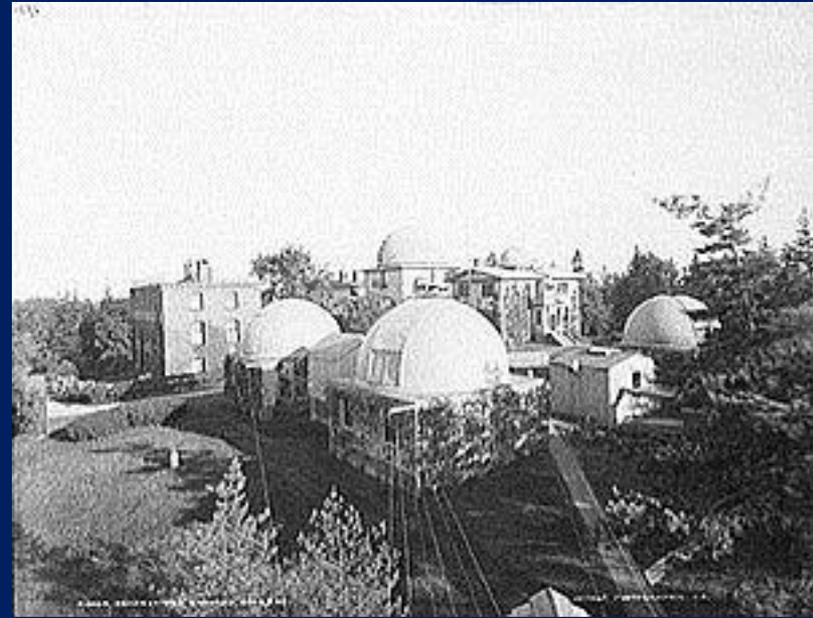
“He evidently sailed under sealed and secret and telegraphic orders, ... for he knew nothing of astronomy or physics or science, or me or anyone here. He asked about the scientific meetings here last June-that A.A.A.S. convention that I managed. . . . I might say that I am naturally very confident that Harvard is not too big for me and that the things I could and would do there would be a credit to American astronomy.”

In June Russell would have been offered the Directorship with "a second astronomer, younger, and with modern ideas, to be called, to act as the Director's right hand man"

(Shapley was to Russell the obvious choice), and a third person to act as administrator

even when Russell eventually declined, Shapley was merely offered the post of Assistant Professor and Astronomer

but at the time the DEBATE Took place, Shapley still believed he would have been offered the directorship.



Washington was close to Harvard ...

Shapley began to fear the proposed encounter with Curtis who was an experienced public speaker.

Fearing “defeat”, he began to try to underscope the meeting by trying to substitute Curtis and to undermine the seriousness and length of the proposed encounter.

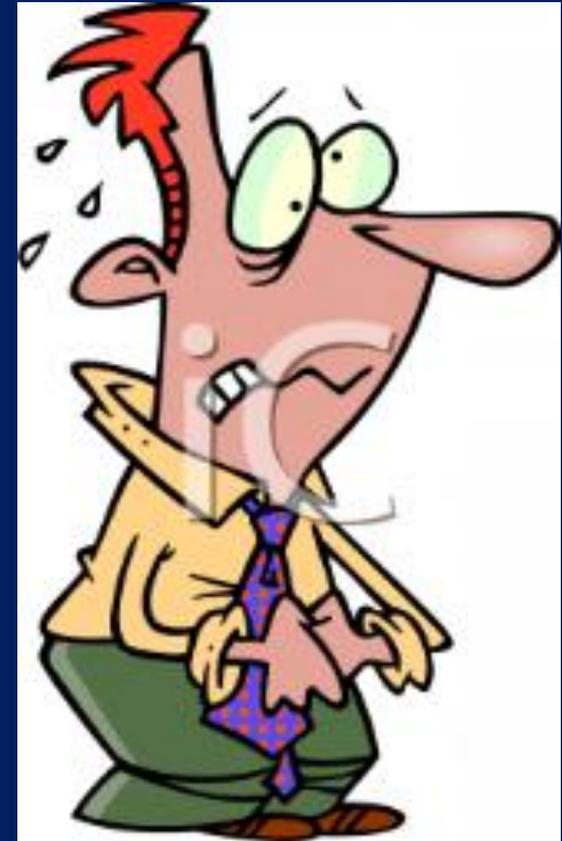
A. Debate or Discussion

Four distinguished and busy men repeatedly discussed whether it should be a 'debate' as originally proposed, or a 'discussion'-"two talks on the same subject from our different standpoints", as Shapley wished .

Curtis to Shapley (copy to Hale)

"I agree with you that it should not be made a formal "debate", but I am sure that we could be just as good friends if we did go at each other "hammer and tongs". . . .

***A good friendly "scrap" is an excellent thing once in a while;** sort of clears up the atmosphere. It might be far more interesting both for us and our **jury**, to shake hands, metaphorically speaking, at the beginning and conclusion of our talks, **but use our skills in the interim to the best of our ability.**"*



On the 3-rd March after having been “discussed to death” by Shapley Hale answers:

"I do not think that the discussion should be called a 'debate', or that Shapley, who is perfectly willing to speak first, should have time allotted him for 'rebuttal'. If you or he wish to answer points made by the other, you can do so in the general discussion. .. Each should be manifestly a seeker after truth, willing to point out the weak places in his argument and the need for more results."

B. The duration

Shapley had persuaded Hale away from the original concept of a debate and convinced him that the proposed 45 minutes for each speaker was too long (on the grounds that this would tax the patience of the audience), and that 35 would be even better.

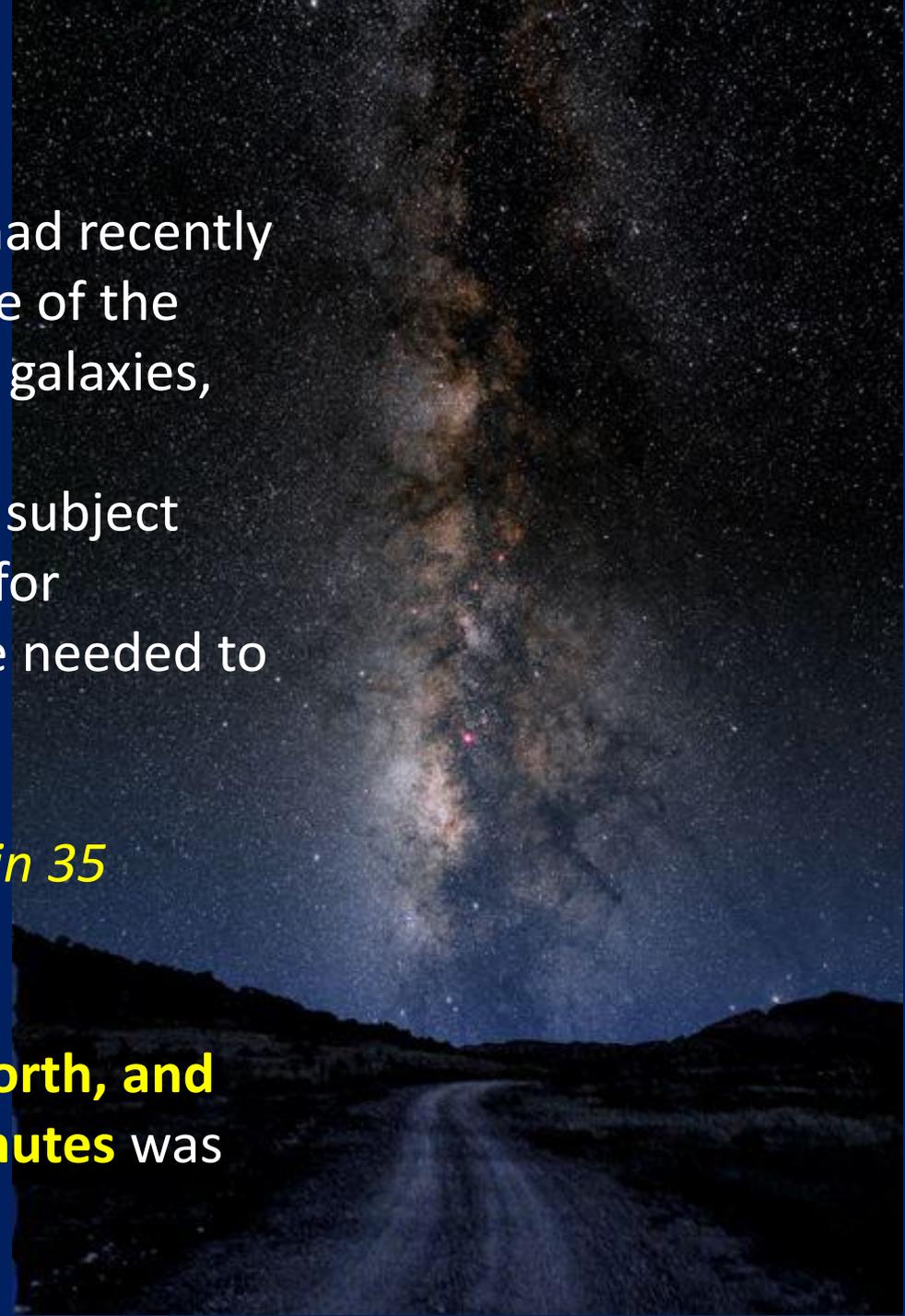
Curtis is aghast.

The Lick Observatory Journal Club had recently devoted several meetings to the size of the Galaxy and the problem of external galaxies,

Curtis had prepared a paper on the subject which he was circulating to friends for comment and he knew how long he needed to make a serious scientific case.

"We could scarcely get warmed up in 35 minutes", he protested to Hale.

Again the letters passed **back and forth, and eventually a compromise of 40 minutes** was imposed.



C. THE TITLE

Curtis, who was mainly interested in Nebulae proposed "The Scale of the Universe"

Shapley on the size of the Galaxy and therefore offered scope for a partnership instead of the dreaded confrontation:

"I shall not be able to get as far as details of nebulae in my half of the talk, but I shall get some of the explanatory, introductory, illustrative requisites out of the way so that you can probably go farther into the details."



.... **AND** tried also to gain supporters:

First of all Russell:

"I lead off (with pictures), then Curtis presents his views, and then follows general discussion. . . . Curtis swears by Newcomb and other patriarchs, and will show that my distances are some ten times too big. Now that ten times, as Mr. Hale realizes, is as bad on **your hypotheses** as on mine; it **is a violation of nearly all recent astrophysical theory**. So unless Curtis actually bowls us over with the only true truth in these celestial matters, you will be interested in this general assault from the **self-styled conservatives**.

"I write you this because you may be interested in knowing what the situation is, and so that you may be ready **to defend your own views** if they are imposed upon by either of us. To make matters worse for me, Mr. Agassiz of the Harvard Obs. Visiting Committee is coming down to the lecture...

On the 26-th of January the «Debate – Discussion – friendly or useless talk» finally took place

PART I: BY HARLOW SHAPLEY Mount Wilson Observatory, Carnegie Institution of Washington

- Evolution of the idea of galactic size
- Surveying the solar neighborhood
- On the distances of globular clusters
- The dimensions and arrangement of the galactic system

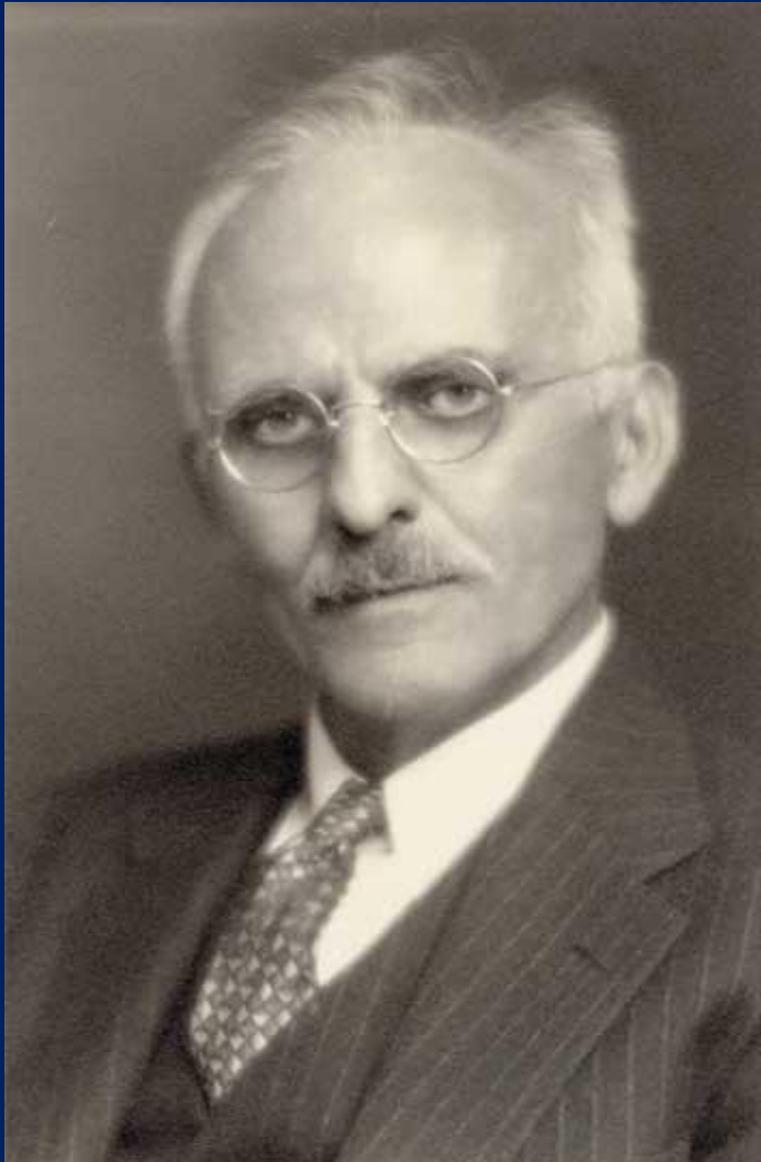
PART II: BY HEBER D. CURTIS - Director, Allegheny Observatory

- Dimensions and structure of the galaxy
- Evidence furnished by the magnitude of stars
- The spirals as external galaxies

Shapley goes on the safe side by saying almost nothing

(better to act like you have misunderstood the significance of the event than to take the risk of being defeated in front of the HCO members)

- More than 15 min on an useless summary of how Man has measured the cosmos (from the Greeks to Newcomb!!!!)
- 10 min discussing his own measurements of the distances of globular clusters
- 5 minutes to the description of a device to measure the light of faint stars (absolutely irrelevant!!!)
- A short summary of points of common agreement



Curtis was instead on the scientific side and gave a rather technical report on his own research about the nature and distance of «island universes»

His presentation, based on slides, tables and figures, matched very closely what was published one year later in the transactions.

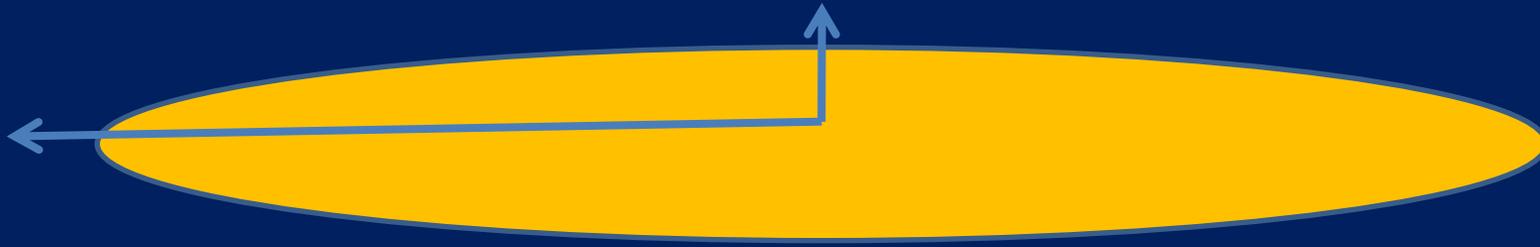
Curtis, writing to his family on 15 May, reported "*Debate went off fine in Washington, and I have been assured that I came out considerably in front*".



John P. Gleason

M i l k y W a y G a l a x y

Reason: at the time no one knew about the existence of interstellar dust and therefore no one could take into account interstellar absorption of background light



WITHOUT absorption introduced by Interstellar Dust



WITH the absorption introduced by Interstellar Dust

Immediately after the event Shapley tried to restore his credibility

Shapley's letter to Curtis on 9 June, telling him that Hale thought that

"in a slightly different form the papers would go to the Proceedings - he favors that, in fact, even if the papers are long, providing the material is suitable in being not too popular (like mine?) or too tabular or technical (like yours?)".

Curtis modestly accepted the criticism:

"Yes, I guess mine was too technical. I thought yours would be along the same line, but you surprised me by making it far more general in character than I had expected. Had some thoughts of changing entire character of my presentation about five minutes before close of your part, but decided at last minute to go ahead with program as planned."

A referee might have declared 'no contest', but insofar as there was a contest,

Curtis was the winner.

Russell, writing to Hale in June about his invitation to become Director at Harvard, declared:

"Shapley couldn't swing the thing alone. I am convinced of this after trying to measure myself with the job, and observing Shapley at Washington" but if Shapley joined Russell there as his 'second' he ought to offer a lecture course for this *"cultivates the gift of the gab, which he needs."*

After the Great Debate: H. Curtis

In 1930 accepted the Directorship of the Astronomical Observatories of the University of Michigan.

Curtis came to Michigan prepared to design a large reflecting telescope for the University Observatory at Ann Arbor. By the time he completed design of the telescope, the 1932 depression was at its "lowest," and funds were no longer available for its construction.

"... When Professor Curtis came to Michigan, the development of the McMath-Hulbert Observatory as a private institution was well under way. He immediately took a great interest in the Lake Angelus project, and was in almost daily touch with the writer until the day of his death. His contributions to the McMath-Hulbert Observatory cannot be measured..."

After the debate, Shapley was hired as director of the Harvard College Observatory (from 1921 to 1952).

From 1941 to death he served on many committees (Foundation for the Study of Cycles, board of trustees of Science Service - now known as Society for Science & the Public, UNESCO, etc...). He was responsible for the addition of the "S" in UNESCO (United Nations Educational, **Scientific** & Cultural Organization).

He wrote many books on astronomy and the sciences. Among these were *Galaxies & Source Book in Astronomy*.

In addition to astronomy, Shapley held a life long interest in **myrmecology**, the study of ants and in the relation between **Science and Religion**.





corbis.

SCIENCEPHOTO LIBRARY



THE FRANKLIN INSTITUTE

Franklin Shapley

Memorandum

Philadelphia, October 19, 1944.

Dr. Marshall

From Dr. Fraser

At a meeting of one of the Sub-Committees of the Science and Arts Committee held last evening, several questions arose concerning the work of Harlow Shapley. I have been requested to pass these questions on to you in hopes that you might be good enough to prepare for us a memorandum answering these questions and explaining the scope and effect of Shapley's accomplishments.

1. Did Dr. Shapley's work (Major work) in scientific investigation cease in 1920? The Sub-Committee has no reference to any major accomplishments since that time.
2. Has his work on Cepheids been confirmed?

There is to be another meeting in the fairly near future and if you could let us have something to clarify the importance of Shapley's accomplishments in comparison to those of others in the minds of the Sub-Committee it would be deeply appreciated.

Shapley was a shrewd politician.

Over the next decades, after the issues behind the “great debate” had been settled down by Hubble , Barnard and Trumpler, Shapley advertised (in almost every place) the correctness of his measurements of the size of the galaxy minimizing his mistakes.

If a “*so-so discussion*” became a **Great Debate** is mainly due to his continuous advertisement efforts

Even in very old age, Shapley recalled:

"Now I would know how to dodge things a little better. . . . As I remember it, I read my paper and Curtis presented his paper, probably not reading much because he was an articulate person and was not scared.

Shapley's statement of common arguments

1. Stars in clusters and in distant parts of the Milky Way are not peculiar - that is, uniformity of conditions and of stellar phenomena naturally prevails throughout the galactic system
2. **The stellar universe** appears to be a very oblate spheroid or ellipsoid.
3. The solar system is not far from the middle plane of the galactic system.
4. loosely organized star clusters, such as the Pleiades, diffuse nebulae, appear to be a part of the great galactic system, and they lie almost exclusively along the plane of the Milky Way.
5. The globular clusters, though not in the Milky Way, are also affiliated with the galactic system
6. The spiral nebulae appear to be distant objects mainly if not entirely outside the most populous parts of the galactic region.
7. **a serious difficulty at once arises for the theory that spirals are galaxies of stars comparable in size with our own: it would be necessary to ascribe impossibly great magnitudes to the new stars that have appeared in the spiral nebulae.**

Shapley's arguments in the written paper

Proposition A: the globular clusters form a part of our galaxy; therefore the size of the galactic system proper is most probably not less than the size of subordinate system of globular clusters.

Proposition B: the distances derived at Mount Wilson for globular clusters relative to one another are essentially correct.

HENCE: Curtis does not believe that the numerical value of the distance I derive for any globular cluster is or the right order of magnitude and the problem may be narrowly restricted as follows:

Show that any globular cluster is approximately as distant as derived at Mount Wilson ... then the system of clusters and the galactic system will have dimensions of the order assigned, and the "comparable galaxy" theory of spirals will have met with a serious, though perhaps not insuperable difficulty

Before closing, some personal considerations

- We should stop describing great scientists as «perfect beings» with high ethical standards, uncompromising principles, etc...
- Such «self declared perfection» prevents many young people from entering a career in science (*I'll never be of that kind....*) and renders the Scientific enterprise a sort of super-human endeavour
- Great (and small scientists) should be depicted with all their HUMAN weaknesses: ambition, lack of perspective, social limits, etc...

	Scientific value	
Copernicus	Lonely genius, far ahead of his time	
Brahe	Founder of modern observational astronomy	
Kepler	Greatest genius of his century	
Galileo	Founder of modern science	
Einstein	Greatest genius ever existed, ethical	

	Scientific value	But also
Copernicus	Lonely genius, far ahead of his time	Unsecure, coward, opportunist
Brahe	Founder of modern observational astronomy	Arrogant to an extreme, slave keeper, violent, etc.
Kepler	Greatest genius of his century	Psychopath, flatterer, always on the side of whom had power,
Galileo	Founder of modern science	Lier, womanizer,
Einstein	Greatest genius ever existed, ethical	Co-responsible for atomic bomb, selfish, etc...

A blue-tinted image of a starry night sky. The upper portion is filled with a dense field of stars, with a bright, concentrated cluster of stars in the center. The lower portion shows a dark, undulating horizon line, possibly representing a landscape or a celestial body's surface. The overall color palette is dominated by various shades of blue and black.

The end