# THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA

For the Promotion of the Mechanic Arts

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Hall of the Committee,

Philadelphia, December 13, 1944.

Committee on Science and

the Arts Case No. 3143.

Report of Standing Sub-Committee on the Franklin Medal.

Sub-Committee:  Dr. F. Palmer, Chairman

Dr. J. Barnes

Dr. H. J. Creighton

Mr. W. L. LePage

Mr. C. H. Masland, 2nd

To the Committee on Science and the Arts:

Your Sub-Committee, charged with the duty of selecting candidates for the Franklin Medal for the year 1945, begs to report that in this year of national stress it feels that it would be appropriate to recommend only one candidate for the award of a Franklin Medal. For this

1 honor the Committee has unanimously chosen -

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3 Harlow Shapley
Paine Professor of Astronomy
4 Harvard University
Cambridge, Massachusetts.

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6 When the Paine Professorship of Astronomy, at Harvard,

7 was vacated in 1921 by the death of Professor Pickering, the young astronomer

8 at Mount Wilson Observatory, California, was appointed to fill the vacancy.

9

10 Born at Nashville, Missouri, on November 2, 1885,

11 Harlow Shapley had already graduated from the University of Missouri and

12 published several papers in astronomical journals before obtaining his Ph.D.

13 degree, under Professor Russell at Princeton, in 1913. The following year

14 he was called to Mount Wilson where he spent seven fruitful years and laid

15 the foundation for most of his later work. There he began a study of the

16 Cepheid variables which is still going on. In searching for an explanation

17 of the nature of Cepheid variation he was led to discard the theory that stars

18 of this type represent binary systems in which the observed variation in

19 luminosity is due to orbital motion and to adopt the pulsation theory, in which

20 the assumption is made that the Cepheids are single stars which periodically

21 expand and contract with an accompanying change in luminosity.

22

23 At Mount Wilson, too, he began his studies of globular star

24 clusters which he has also continued since going to Harvard.

25

1 measured the dimensions of our own galaxy, represented by the Milky Way,

2 and roughly located our position in it, as well as plotting the distance and

3 dimensions of other galaxies external to our own, such as that of the greater

4 Magellanic Cloud and the Coma-Virgo super-galaxy.

5

6 Dr. Shapley's contributions to Astronomy have covered a

7 broad field as evidenced by his studies of eclipsing variables, the photo-

8 metric measurement of North Polar stars to the twentieth magnitude, the

9 nature and the cause of variation of the Cepheid type, the colors and magni-

10 tudes in stellar clusters, the measurement of great distances, globular

11 clusters, the dimensions of our own galaxy, the nature and distribution of

12 external galaxies, the density of matter in space, and the structure of the

13 universe. In addition, he is a great teacher and lecturer as well as a most

14 efficient executive, capable of making the most of the vast facilities provided

15 by Harvard and its allied observatories all over the world.

16

17 His books bear the following titles: "Starlight," "The

18 Stars," "A Source Book in Astronomy" (with Miss Howarth), "Flights

19 from Chaos," "Star Clusters," "Galaxies." He is now editing "A

20 Treasury of Science."

21

22 Advanced degrees have been bestowed upon him by the uni-

23 versities of Missouri, Ogelthorpe, Pittsburgh, Pennsylvania, Harvard,

24 Princeton, Brown, Toronto, Michocan (Mexico), and Bates College.

25 He has been Lecturer at the Lowell Institute, Boston;

1       Perhaps Doctor Shapley's greatest work has been in

2 plumbing the depths of the universe and in plotting the dimensions of globular

3 clusters, galaxies, and super-galaxies. For this purpose his principal

4 measuring rod has been the statistical relationship between luminosity and

5 period of variable stars, both Cepheids and other types. Thus when the

6 period of a variable has been determined its intrinsic luminosity can be

7 found. This together with the star's apparent luminosity yields a measure of

8 its distance.

9

10       He has worked out a similar relationship between distance,

11 intrinsic brightness and color, or spectral type, in star clusters. The

12 intrinsic brightness of a star may be thousands of times greater than our sun,

13 from which the star's distance may be inferred on the assumption that

14 there is no absorption of light in interstellar space; but if distance is known

15 from other data, a comparison between a star's apparent brightness and its

16 intrinsic brightness leads to a determination of the absorption by inter-

17 stellar matter. In a region where such absorption is small, so that we can

18 penetrate to greater distances, Doctor Shapley finds that there are visible

19 unusually large numbers of galaxies. Having located such a direction his

20 many assistants then make a comparison between hundreds of plates in the

21 Harvard catalogue which cover the same region until a large number of

22 variable stars has been discovered, from which an estimate of their mean

23 distance in this particular direction is made. By such means he has

1 Exchange Lecturer to theBelgian Universities; Halley Lecturer, Oxford;

2 Harry Todd Lecturer for the State of Massachusetts; Lecturer on the Jayne

3 Foundation, Philadelphia; Darwin Lecturer of the Royal Astronomical

4 Society; and Lecturer on the Norman Wait Harris Foundation.

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6 He has either active or honorary membership in six sci-

7 entific organizations in this country as well as one in each of the following:

8 Italy, Norway, Austria, Belgium, England, Mexico, and two in Sweden.

9 He is the recipient of the Draper Medal of the National

10 Academy of Sciences; the University Medal, Brussels; the Medal of the

11 Society of Arts and Sciences; the Janssen Prix of the Astronomical Society,

12 France; the Rumford Medal of the American Academy of Arts and Sciences;

13 the Gold Medal of the Royal Astronomical Society; the Bruce Medal of the

14 Astronomical Society of the Pacific; the Pope Pius XI Prize; and the Aguila

15 Azteca, Mexico.

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In consideration of his many valuable contributions to the science of astronomy, and especially of his work in the measurement of the vast distances necessary for the determination of the nature and extent of our galaxy, as well as those of other galaxies external to ours, it is recommended that the award of a Franklin Medal be made to

Harlow Shapley
Paine Professor of Astronomy
Harvard University.

Respectfully submitted,

*Andrew Palmer*
Chairman

*James Barnes*

*H. Nasland Jr.*

*H. Germain Compton*

*L. Laura Petaps*

Adopted at Stated Meeting
of Jan. 10, 1945

*W. B. Coleman*
Chairman

*John Nagle*
Secretary

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Harlow Shapley

# THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA

### FOR THE PROMOTION OF THE MECHANIC ARTS

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Hall of the Institute,

Philadelphia, January 17, 1945.

Report No. **3143.**

Investigating _____ The Work of _____

Harlow Shapley

of Cambridge, Massachusetts.

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# THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA

## For the Promotion of the Mechanic Arts

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Hall of the Institute,

Philadelphia, January 17, 1945.

Committee on Science and

the Arts Case No. 3143.

The Franklin Institute of the State of Pennsylvania, acting through its Committee on Science and the Arts, has considered carefully the work of those who have contributed greatly to the advancement of science and the application of physical science to industry, and has selected as the recipient of the award of the Franklin Medal for 1945 –

### HARLOW SHAPLEY,
of Cambridge, Massachusetts,

In consideration of his many valuable contributions
to the science of astronomy, and especially of his work in the
measurement of the vast distances necessary for the deter-
mination of the nature and extent of our galaxy, as well as
those of other galaxies external to ours.

Harlow Shapley
Paine Professor of Astronomy
Harvard University
Cambridge, Massachusetts.

When the Paine Professorship of Astronomy, at Harvard, was vacated in 1921 by the death of Professor Pickering, the young astronomer at Mount Wilson Observatory, California, was appointed to fill the vacancy.

Born at Nashville, Missouri, on November 2, 1885, Harlow Shapley had already graduated from the University of Missouri and published several papers in astronomical journals before obtaining his Ph.D. degree, under Professor Russell at Princeton, in 1913. The following year he was called to Mount Wilson where he spent seven fruitful years and laid the foundation for most of his later work. There he began a study of the Cepheid variables which is still going on. In searching for an explanation of the nature of Cepheid variation he was led to discard the theory that stars of this type represent binary systems in which the observed variation in luminosity is due to orbital motion and to adopt the pulsation theory, in which the assumption is made that the Cepheids are single stars which periodically expand and contract with an accompanying change in luminosity.

At Mount Wilson, too, he began his studies of globular star clusters which he has also continued since going to Harvard.

Perhaps Doctor Shapley's greatest work has been in plumbing the depths of the universe and in plotting the dimensions of globular

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clusters, galaxies, and super-galaxies. For this purpose his principal measuring rod has been the statistical relationship between luminosity and period of variable stars, both Cepheids and other types. Thus when the period of a variable has been determined its intrinsic luminosity can be found. This together with the star's apparent luminosity yields a measure of its distance.

He has worked out a similar relationship between distance, intrinsic brightness and color, or spectral type, in star clusters. The intrinsic brightness of a star may be thousands of times greater than our sun, from which the star's distance may be inferred on the assumption that there is no absorption of light in interstellar space; but if distance is known from other data, a comparison between a star's apparent brightness and its intrinsic brightness leads to a determination of the absorption by interstellar matter. In a region where such absorption is small, so that we can penetrate to greater distances, Doctor Shapley finds that there are visible unusually large numbers of galaxies. Having located such a direction his many assistants then make a comparison between hundreds of plates in the Harvard catalogue which cover the same region until a large number of variable stars has been discovered, from which an estimate of their mean distance in this particular direction is made. By such means he has measured the dimensions of our own galaxy, represented by the Milky Way, and roughly located our position in it, as well as plotting the distance and dimensions of other galaxies external to our own, such as that of the greater

Magellanic Cloud and the Coma-Virgo super-galaxy.

Dr. Shapley's contributions to Astronomy have covered a broad field as evidenced by his studies of eclipsing variables, the photometric measurement of North Polar stars to the twentieth magnitude, the nature and the cause of variation of the Cepheid type, the colors and magnitudes in stellar clusters, the measurement of great distances, globular clusters, the dimensions of our own galaxy, the nature and distribution of external galaxies, the density of matter in space, and the structure of the universe. In addition, he is a great teacher and lecturer as well as a most efficient executive, capable of making the most of the vast facilities provided by Harvard and its allied observatories all over the world.

His books bear the following titled: "Starlight;" "The Stars;" "A Source Book in Astronomy" (with Miss Howarth); "Flights from Chaos;" "Star Clusters;" "Galaxies." He is now editing "A Treasury of Science."

Advanced degrees have been bestowed upon him by the universities of Missouri, Oglethorpe, Pittsburgh, Pennsylvania, Harvard, Princeton, Brown, Toronto, Michoacan (Mexico), and Bates College.

He has been Lecturer at the Lowell Institute, Boston; Exchange Lecturer to the Belgian Universities; Halley Lecturer, Oxford; Harry Todd Lecturer for the State of Massachusetts; Lecturer on the Jayne Foundation, Philadelphia; Darwin Lecturer of the Royal Astronomical Society; and Lecturer on the Norman Wait Harris Foundation.

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He has either active or honorary membership in six scientific organizations in this country as well as one in each of the following: Italy, Norway, Austria, Belgium, England, Mexico, and two in Sweden.

He is the recipient of the Draper Medal of the National Academy of Sciences; the University Medal, Brussels; the Medal of the Society of Arts and Sciences; the Janssen Prix of the Astronomical Society, France; the Rumford Medal of the American Academy of Arts and Sciences; the Gold Medal of the Royal Astronomical Society; the Bruce Medal of the Astronomical Society of the Pacific; the Pope Pius XI Prize; and the Aguila Azteca, Mexico.

_Chas Lessing_
President.

_Harry Butler Allen_
Secretary.

_William B. Coleman_
Chairman of the Committee on Science
and the Arts.