arguments were good, "subsequent research has shown that the center of the galaxy is in the Sagittarius, almost diametrically opposite to the place where it was put by Maedler. The distance is not a few hundred light years but more than 30,000 light years."

Dr. Shapley went on to say that the motion of the sun that was recognized a hundred years ago is not a motion of rotation around a galactic center, but is the sun's own private random motion with respect to neighboring stars. The rotation around the Milky Way center is some 200 miles a second and takes with it all the neighboring stars. The central nucleus of the Milky Way galaxy is for the most part invisible and immeasurable.

Dr. Shapley referred to various dynamic, photometric and spectroscopic ways in which astronomers now "explore the half-seen central nucleus of our galaxy. The researches on stars in the direction of the Pleiades are used to find the distance to the anti-center, that is, the distance to the rim of our wheel-shaped galaxy."

The speaker reported on the progress of Harvard researches on the galactic nucleus and the galactic anti-center, as well as on the diameter and thickness of the Milky Way. Illustrative slides were shown.

But the center of our galaxy is not the center of the universe. The identification of the spiral nebulae as external galaxies has completely changed the concept of a universal center. Our own galaxy is found to be a few hundred thousand light years from the center of the local supergalaxy, or group of galaxies.

But far beyond the bounds of our own local group of galaxies, we have mapped the positions of 500,000 other great stellar systems, and the questions before us now are: Is there a boundary to this overall system, the metagalaxy? Is there at the present time a great central dominating galaxy or group of galaxies? Is our galaxy or some other recognizable system at or near a center from which the other galaxies are receding in the expanding universe?

Dr. Shapley said that "nowhere do we find one king of all galaxies, enormous in mass and superlative in brightness. In fact, we seek in vain for a metagalactic center." He concluded that "there is no very good evidence that the universe is infinite or that it is finite."

There follow biographical sketches of the founder and first director of the Cincinnati Observatory and of its third director, Cleveland Abbe, under whom the observatory initiated a system of daily weather reports and storm predictions which led to the establishment of the United States Government Weather Bureau.

ORMSBY MacKNIGHT MITCHEL
1809–1862

THE energy and perseverance of Ormsby MacKnight Mitchel accomplished the task of building and equipping an observatory by popular contributions, a century ago in Cincinnati. Mitchel was born in 1809 in Kentucky of pioneer stock. When he was seven years of age, his father died and his mother moved to Lebanon, Ohio. He was taught at home, and then entered a school conducted by his brother. On account of limited finances, he started to support himself at the age of thirteen. An appointment to West Point gave him the desired opportunity to study, and after graduation, he taught mathematics for two years. Assigned to duty at St. Augustine, Florida, he soon grew tired of the tedium of garrison duty, resigned his commission and went to Cincinnati. First he tried the law, but without success; then he became professor of mathematics and natural philosophy at the old Cincinnati College.

In 1842, Mitchel delivered a course of lectures on astronomy that aroused great interest; at the last lecture he proposed a plan to build an observatory. He would solicit subscriptions of stock at $25.00 a share, and when 300 shares were subscribed, he would call a meeting of stockholders and organize a society. This he did; a constitution was adopted, and officers elected, including Judge Jacob Burnet as president and O. M. Mitchel as astronomer. Mitchel was sent to Europe to buy a telescope; finding nothing suitable in London or Paris, he went on to Munich, where he found a 12-inch glass, equal to Lamont's and inferior to the Pulkova telescope alone. Its price exceeded the funds in the treasury, but he ordered it and went home to raise the balance.

The building of an observatory was the next difficulty: Judge Nicholas Longworth donated four acres of ground on a hill east of the city, on condition that the building should be finished in two years; various citizens became stockholders, paying in cash or material or labor. The venerable John Quincy Adams was invited to lay the corner-stone—his interest in science was well known and, when President, he had recommended to Congress the founding of a national observatory. Though 77 years old, he accepted the invitation and traveled to Cincinnati by rail, by lake boat, by canal and finally by stage-coach. The city council met him at the city limits and escorted him to his hotel; the next day a parade, composed of military and civilian groups, conducted him to the hill, where he laid the corner-stone and delivered his address in spite of pouring rain. The city council named the hill Mt. Adams in his honor.

Mitchel promised to conduct the observatory for ten years without remuneration; when the college burned

down he was forced to earn his living by other means; yet his courage never failed, even though very little observing could be done. He made surveys for the Little Miami Railroad, now a part of the Pennsylvania system; later he made surveys for the Ohio and Mississippi Railroad, now called the Baltimore and Ohio Southwestern.

He tried lecturing on astronomy and was remarkably successful; his audiences were large and enthusiastic. In the spread of astronomical knowledge, in drawing the attention of thinking people to the beauties of astronomy and inspiring them with enthusiasm he paved the way for the founding of other observatories, the endowment of other institutions, and attracted to the subject young men of ability whose later work was creditable to American astronomy.

Another venture of Mitchel's was the publication of a popular journal on astronomy called the *Siderial Messenger;* two complete volumes were published, but it expired after a few numbers of the third volume appeared.

Mitchel worked on the problem of applying the electric current to record observations; his disk chronograph worked but was not as good as the cylindrical one developed by the Bonds.

In 1859 Mitchel was appointed director of Dudley Observatory and went to Albany in the following spring. But already the war drums were beating and on the outbreak of war, he resigned and was appointed a brigadier general in the U. S. Army. He conducted a successful campaign in the west, going as far south as Huntsville, Ala. He was transferred to the Carolinas and succumbed to yellow fever at Beaufort, S. C., on October 30, 1862. Professor Holden, first director of the Lick Observatory, speaks thus of his work:

> His direct service to practical observing astronomy is small, but his lectures, the conduct of the Cincinnati Observatory and the publication of the *Siderial Messenger,* together with his popular books, excited an intense and wide-spread public interest in the science and indirectly led to the founding of many observatories. He was early concerned in the matter of utilizing the electric current for longitude determinations, and his apparatus was only displaced because of the superior excellence of the chronograph devised by the Bonds. His work was done under immense disadvantages, in a new community, but the endowment of astronomical research in America owes a large debt to his energy and efforts.

CLEVELAND ABBE
1838–1916

CLEVELAND ABBE, the third director of the Cincinnati Observatory, was born in New York in 1838. He graduated from the College of the City of New York in 1857, studied under Brünnow at Ann Arbor for two years and worked with Gould at Cambridge during the period 1860–64. Then he spent two years as student and assistant under Otto Struve at Poulkova. Returning home, he served in the United States Naval Observatory for a short time and was called to Cincinnati in 1868 to rehabilitate the Cincinnati Observatory.

Abbe's interest in meteorology was early developed and continued all his life. He said:

> The popular articles in the New York papers by Merriam, Espy, Joseph Henry and others—notably Redfield and Loomis—had by 1857 convinced me that man should and must overcome our ignorance of destructive winds and rains.

The opportunity to investigate weather conditions came to him in Cincinnati. Thus he described it:

> In my inaugural Cincinnati address of May 1, 1868, I stated that with a proper system of weather reports the public need of forecasts could be met and that astronomy could also be benefited.
>
> The suggestion was taken up by Mr. John A Gano, president of the local chamber of commerce: a committee met me, approved my plans, and promised the expenses of a first trial.

The Western Union Telegraph Company cooperated with Abbe and the Chamber of Commerce: observers in other places made the meteorological observations at a specified time and telegraphed them to Cincinnati. The Chamber of Commerce paid the expenses for the first three months; Abbe analyzed the data and made the predictions. He made a map on which were located the places sending the data, the temperature, direction of wind and weather. These were manifolded and sent to the various subscribers; and the predictions were also published in the daily papers. On September 1, 1869, the first *Cincinnati Weather Bulletin* appeared; at the end of three months, the Western Union assumed charge of the *Bulletins* and Abbe continued to make the predictions. He was nicknamed "Old Probs" by the employees of the Western Union, a name that clung to him, but has sometimes been applied to other weather men.

Abbe resigned in 1870 to accept a position as assistant in the office of the Chief Signal Officer. By a law, passed by Congress in 1870, the creation of a weather service was authorized and placed under the direction of the Signal Service of the Army.

Abbe organized the forecast work and began preparing the tri-daily synopses and probabilities of the weather. He also inaugurated the *Monthly Weather Review* and contributed a great many articles to this publication; he took a leading part in all the activities of the national weather service. In virtue of his having started a weather service here in Cincinnati and having published his "probabilities," we consider