at which this step was taken the United States has risen from a place well down the line among the nations in productivity, in both pure and applied science (certainly in physics, chemistry, biology and medicine) to a place of world leadership in all these fields.

I attribute that change largely to the National Research Fellowship plan. Not only that, but those National Research Council fellows also were found in key positions in World War II. They certainly did their full share in the winning of that war. Though specifically trained in so-called fundamental science, they actually came strikingly into leadership in the practical problems of the war—that is, in radar, in rockets and other phases of jet propulsion, in atomic energy developments, in meteorology, etc.—problems which the exigencies of war brought forth.

This well-tested National Research Council Fellowship plan could be and should be greatly expanded **now,** and without essential change. It is a highly competitive plan of proved effectiveness for picking and training the ablest research material among the nation's coming leadership in science and its applications. In my judgment, this is a responsibility that should be assumed by **industry** in the interests of its own progress, but the results would be available for national defense as well, as was the case in World War II.

If the foregoing move is made in a large way by industry—in the interests of picking and training its most effective personnel for its own use—the movement will be entirely removed from the corrupting influence of politics, and from all the trends toward totalitarianism or stateism, in which lies the greatest menace to the future of a free America. The need is great and the time is critical—no less critical than when the immortal Lincoln raised the question whether this nation or any nation conceived in liberty and so dedicated could long endure. Never in our history have the forces tending to destroy the free American way of life bequeathed to us by the founding fathers, been so strong the world over as at this moment. Here is, I think, one of the most effective ways of preserving our freedom.

COMET 1948 I by EDISON PETTIT

COMET 1 (1 for the twelfth letter of the alphabet; this being the twelfth comet seen this year) is reported to have been first seen and photographed in Africa during the solar eclipse of November 1. It was first reported by Dr. Harley Wood in Australia on November 6, and by Dr. John Paraskevopoulos in Africa on the 7th. It was then south and somewhat east of the star Spica (Alpha Virginis), rising just before the sun. When first seen in the northern hemisphere in the morning of November 9 it was 12° south of Spica and 12° east of Corvus. The head was of about the brightness of the pole star, 2nd magnitude, with a tail extending westward some 20°.

The orbit of this comet passes the sun within one eighth the earth's distance, or 12 million miles. The comet reached this nearest solar distance (perihelion) on October 27, coming toward the earth from behind the sun, so that its approach could not be observed. In fact, it has been inside the earth's orbit since the last days of September, but the sun has always been in the way. By the end of November it was leaving the earth's orbit and, already faded to magnitude 5, with a tail only 6° long, would soon become a telescopic object.

Whether a comet is a remarkable object depends on (1) the amount of matter in it, (2) the closeness of its approach to the sun, (3) the position of the orbit with relation to the earth's, and (4) the relative places of the earth and comet during its appearance.

Brilliant comets with long tails streaming across the sky are rather rare. One of the finest comets of the last century was that of 1882, discovered in broad daylight on September 3. It was one of the "Sun Grazers" and actually passed through the solar corona. Seen in the autumn sky, this comet exhibited a brilliant tail and sheath at the head extending toward the sun.

In the present century the comet of 1907, visible in the morning sky, was a bright object—much better situated and brighter than the present comet. Comet 1910 a, in the winter evening sky, had a tail more than 30°long, and Halley's comet of that year was a wonderful sight. No comet can be compared with Halley's. It passed through all the phases of comet formation, from a faint fuzzy spot to its appearance on that spring morning when the earth actually passed through its tail—which could be seen streaming from horizon to horizon. The great comet of 1914, which passed over the northern sky, was the last of the great brilliant comets which everyone in the northern hemisphere could see. Compared with these, the present comet is second rate, and about the same as comet 1947 n, another southern comet.

Comets are probably a dense cluster of small meteorites mixed with gaseous material, which is driven away by the action of the sun—we suppose, by light pressure —to form the tail. The sheath of the head in great comets cannot be explained by light pressure. The light of the tail and head consists of reflected sunlight and light emitted by the gases **per se.** This emitted light consists largely of the hydro-carbon and cyanogin bands. A study of the intensities in the spectral lines of these bands by Dr. Pol Swings has shown that this light is emitted by a process of fluorescence. The nuclei of the heads of great comets sometimes also show light emitted by sodium and other metals near the time of perihelion passage.