doubt true this is only a suggestion, but is the suggestion in the right direction and does it naturally lead to Berkeley's Subjective Idealism? To Berkeley the objects of every-day observation on examination turn out to be ideas in the perceiver's mind. For an object to exist is to be perceived. In order to account for the sameness of the objects perceived by a number of observers Berkeley introduced the hypothesis of God in whose mind all objects exist as ideas and our ideas are replicas, so to speak, of the ideas in the mind of God. If we take away God whose existence Berkeley assumed, the difficulty that all of us see the same sun and moon remains unexplained. Moreover to Berkeley individual personalities were not indistinguishable ingredients of a stream of life, as is the case with the electrons in an electron current. In fact, no satisfactory answer to the fundamental difficulty which one encounters in all forms of extreme subjective idealism, has yet been offered by any philosopher; neither does modern Physics indicate a satisfactory way of meeting it. To Sankara, the famous Indian philosopher, both our perceptions and the things perceived are illusory appearances spread over an unchanging underlying reality. Our perceptions have no higher degree of reality than the things perceived. So in his system the idea that all persons see the same objects is in the mind and therefore is itself illusory.

'The old physics,' says Jeans, 'imagined it was studying an objective nature which had its own existence independently of the mind which perceived it which indeed had existed from all eternity whether it was perceived or not.' One would infer from this that there is no objective world existing independently of the perceiving mind. How different from this attitude is the view of Max Planck--one of the most prominent among the makers of modern physics! Says Planck: "A science that starts off by predicting the denial of objectivity has already passed sentence on itself." According to Planck one of the fundamental theorems of physical science is that there is a real world which exists independently of our act of knowing. So the reader of Jeans' fascinating address must not forget that there are prominent physicists who differ fundamentally from him on the philosophical implications of the revolutionary changes that have taken place in the domain of Physical Science.

The Stratosphere Balloon and its Use in Scientific Research.

THE investigation of the free atmosphere by means of sounding balloons carrying self-registering instruments has established that the mixing of the atmosphere due to convective processes extends on the average to a height of about 17 km. near the tropics and to about 9 km. near the poles. Above these levels, the atmosphere is extremely stable for vertical movements, the temperature increasing with height near the tropics and remaining more or less stationary up to 25 km. in temperate and polar regions. The upper stably layered region of the atmosphere is called the stratosphere. The temperature at the base of the stratosphere is about −80°C. near the equator and about −50°C. near the poles.

Among the great scientific achievements of the present decade must be included the stratosphere balloon ascents of the Belgian scientist Professor Piccard and his collaborators. The principal motive for Professor Piccard's adventure was the study of cosmic radiation more thoroughly and precisely than was considered possible by other methods. The repetition of these ascents in other lands with similar balloons and technique and extended programmes shows that voyages into the stratosphere for scientific research have come to stay and that it is only a question of time before power-driven commercial machines will fly through the clear, cloudless air of the stratosphere with speeds not far short of that of sound.

Piccard's own account of the bold and successful flights carried out by himself and his colleagues is contained in his very interesting book *Auf 16,000 Meter-Meine Fahrten in die Stratosphäre* (Schweizer Aero-Revue, Zürich). The essential new feature of Piccard's flying equipment was the substitution in place of an open cabin of an air-tight gondola for the accommodation of the aviators and their measuring instruments. The gondola was spherical in shape, made of aluminium and had a diameter of 2·1 metres. It was provided

with two man-holes and eight small windows through which the balloonists could obtain a view of the outside world. For the regeneration of the used-up air inside the cabin, arrangements were made to let into the cabin out of a compressed oxygen cylinder two litres of gas per minute and to remove, by absorption in alkali, the carbon dioxide produced by the respiration of the passengers. The aviators could thus practically carry their own atmosphere with them and avoid all physiological difficulties due to the low pressure at the higher altitudes. With a view to regulating the temperature of the air inside the cabin, Piccard painted one half-side of the gondola black, leaving the other half bright. By means of a propeller actuated by an electric motor, he planned to turn the balloon round a vertical axis so as to expose either side of the gondola towards the sun. Unfortunately, during the first flight, the arrangement did not work and the gondola had its dark half facing the sun throughout the morning so that the temperature inside got uncomfortably high 25-34°C., although the outside temperature was −55°C. In the second ascent, the gondola was painted white and the result was that the temperature did not rise above 0°C!

The volume of Piccard's balloon, when fully inflated, was about 14,000 cubic metres and when full of hydrogen at a height of 16 km. (where the pressure is about 1/10 of that at the earth's surface) could sustain a total weight of 2100 kg. At starting, it was filled only to a fifth of its capacity.

Piccard and his collaborators carried in their balloons experimental equipment for measuring the intensity of cosmic rays both from the current produced in an ionisation chamber and from the enumeration of discharges in a Geiger counter. They also carried apparatus for measuring the effect of screening on ionisation and for determining whether there was any directional variation of the intensity of radiation. The intensity measurements confirmed in general the results obtained by Regener from his sounding balloon experiments carried out a few days before Piccard's second flight. Both investigations showed that above 13—14 km. the rate of increase of intensity of cosmic radiation decreases with height and the intensity tends to reach a constant value at the outer limits of our atmosphere or even to show a decrease. The experiments with the Geiger counter showed that there was no appreciable variation of the intensity with direction. It would take us too far to discuss the significance of the cosmic ray measurements here.

Piccard's ascents were followed by the ascents of "Stratostat U.S.S.R." from Moscow in September 1933. This reached a height of 18,500 metres. Another remarkable ascent was organised in the United States of America in connection with the *Century of Progress* Exposition in November 1933. Professor Piccard collaborated in it. The balloon reached a height of 18,665 metres. Besides experiments on cosmic rays, measurements were also attempted with varying degrees of success on the transmission of the atmosphere for the solar spectrum with a quartz spectrograph, on the colour and polarisation of sky-light, on the photographic visibility of the earth using ordinary and infra-red light, on the intensity, range and freedom from static of radio signals transmitted from great heights, on the viability of spores exposed to conditions prevailing in the stratosphere, etc. The detailed scientific results of the ascents will be awaited with eagerness by workers all over the world.*

K. R. R.

* A. H. Compton, "Scientific Work in the *Century of Progress*: Stratosphere Balloon," *Proc. Nat. Acad. Sci.*, 1934, **20**, 79.