

In the above table are given the monthly and annual rainfall figures for the three rain-gauges in Cherrapunji along with its co-ordinates, height above sea-level and the length of record. The same figures for Waialeale in Kauai Island (as far as available) and Debundja in Nigeria are also tabulated.

Waialeale, Kauai Island, Hawaii territory, according to data in *Climate and Man*, a publication of the United States Department of Agriculture, has an average annual total rainfall

MT. WAIALEALE (Hawaii Territory)

Year	Rainfall in inches
1912	414.00
1913	451.00
1914	—
1915	—
1916	521.00
1917	—
1918	—
1919	204.00
1920	549.00
1921	367.00
1922	452.00
1923	360.00
1924†	228.00
1924-25*	362.40
1925-26*	219.60
1926-27*	403.24
1927-28*	—
1928-29*	354.22
1929-30*	301.96

* From July 1 to July 1.

† Records of six months.

of 460 inches. No monthly figures are available and the average is based on data of 20 years only. This average, however, is not supported by the data of annual rainfall for the years 1912 to 1930, given in *Heavy Rainfall Records*, by Jean R. Thomson. The figures for Waialeale are reproduced in the table in the previous column.

In view of the foregoing and also the much longer period of 38 years on which the average of the rainfall at the Welsh Mission House, Cherrapunji, is based, it may be taken that the rainfall of Cherrapunji is higher than that of Waialeale.

With regard to other places having high rainfall it may be noted that Mawsynram, a station near Cherrapunji, has records of a few years which show that it has a rainfall of well over 400 inches. No average is given as the period of data is short.

The only other station known, which has an annual rainfall of 400 inches or over is Debundja in Nigeria. Its average annual rainfall based on data of fourteen years only is 400 inches.

From the above it appears that Cherrapunji receives the heaviest rainfall in the world. Next to Cherrapunji and Mawsynram, the places of heaviest rainfall seem to be Waialeale and Debundja.

I wish to express my great indebtedness to the Deputy Director General of Observatories, India Meteorological Department, for kindly helping in elucidating this important matter.

1. Blandford, H. F., *A Practical Guide to the Climate and Weather of India, Ceylon and Burma* (MacMillan), 1889. 2. Kendrew, W. G., *The Climate of the Continent* (Oxford University Press), Third Edition, 1941. 3. Kendrew, W. G., *Climate* (Oxford University Press), 1942. 4. Miller, A. Austin, *Climatology* (McGraw-Hill), Fourth Edition, 1940.

NEW METHODS OF PRODUCING HIGH ENERGY PARTICLES

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THE extension of our knowledge in respect of the meson and the short-range forces inside the atomic nucleus awaits the development of laboratory techniques accelerating charged particles to cosmic-ray energies. The relativistic increase in mass leading to a change in frequency sets an upper limit to the energy of a well-defined beam of ions in the cyclotron. Devices which give promise of attaining energies in excess of 200 Mev. are the (1) betatron, (2) synchrotron, (3) relativistic cyclotron, (4) microtron, (5) linear resonance accelerator and (6) linear wave guide accelerator. The first four bring about resonance acceleration in a steady or varying magnetic field and the last two make use of micro-waves.

The induction electron accelerator called the *betatron* was perfected by Kerst.¹ A stream of electrons shot tangentially into a toroidal vacuum chamber placed between the pole-pieces of an A.C.-fed electromagnet gets accelerated in the electric field induced by the changing magnetic field. Decrease of the field with the radius

gives rise to magnetic focusing, resulting in a fine output beam. The magnet of the 100 Mev. betatron built by the G.E. Co. at Schenectady weighs 130 tons, has a pole-face of 16 inch diam., and is fed by a 60 cycle A.C. at a full load of 200 KW. Although it may be possible to raise the energy to 500 Mev. by proper adjustment of the time dependence of the field, the loss of energy by radiation will be considerable at the higher energies.

The *synchrotron* due to Veksler² and McMillan³ uses a time-varying magnetic field across the betatron and a split thin-walled dee system connected to a high voltage generator as in the cyclotron. The inherent phase stability of the orbits brings about automatic synchronisation and makes up for moderate energy losses. When accelerating heavy particles, the damping of the phase oscillation set up by the radial displacement of the orbit may be compensated by motor-driven tuning devices. If the radiation loss per turn can be reduced in respect of the amplitude of the dee voltage,