

vance what velocity we assign to some one particular point of the moving bodies.

It appears too that the acceleration of a moving point has a relative magnitude, and so we find that the ratio of the force on a small charged body to the acceleration produced in it, is also a quantity which depends on the particular frame of reference used; the directions of the force and the acceleration cannot even be taken to be the same in all systems of measurement; that is, the acceptance of our fundamental hypothesis makes it impossible to maintain the Newtonian conception of "constant mass." The modifications required in the dynamical laws are, however, borne out by the results of the well-known experiments on the variable inertia of the negative electrons which constitute the cathode rays and the β rays, particles the velocities of which are so great that the deviation from the ordinary laws are considerable.

A more important question even than that of the mass of the electron is that as to whether this modification in dynamical laws is allowable in the light of the enormous mass of support which the older theory receives from its agreement with the facts of planetary motion. All that can be said here is that with the modified conception of mass, and a modification of the law of gravitation which attributes to it the velocity of light and a deviation from the inverse square rule of such a kind as to make it consistent with the relativity of forces, de Sitter has shown that there is complete accord between existing observations and the demands of the hypothesis of relativity.

The Aether.

It was emphasised above that the stationary æther as it is commonly conceived is in reality nothing more than a mathematical frame of reference. Now we have seen that this frame of reference is not unique. Does the æther, therefore, not exist? We can certainly say that, if it exists, it is not to be identified with the frame of reference. What we want is to be able to reconcile the idea of a unique medium, which is the mechanism by which electrical effects are transmitted, with the mathematical equations which do not determine a unique frame of reference. This cannot be done except by attaching some concrete significance to the electrical magnitudes in terms of the constitution, motion, or distortion of this medium. As we at present know them, the terms "electric intensity," "magnetic force," "motion of the æther," have only a relative significance. If we contemplate an objective æther it might be possible to construct out of relative quantities depending on the motion of the æther a quantity which would have exactly the same kind of relativity as the electric intensity for example; that is, the electric intensity might be put into unique definition in terms of the æther, though both are only expressed relatively in terms of the frame of reference.

NO. 2329, VOL. 93]

The principle of relativity then does not deny the existence of an æthereal medium; that is only the interpretation of an individual. What it does do is to emphasise the insufficiency of the existing conceptions of the æther, and to set up a criterion by means of which suggestions as to the nature of the æther may be examined.

E. CUNNINGHAM.

PROF. HUGO KRONECKER, FOR.MEM.R.S.

ON Saturday, June 6, Hugo Kronecker, one of the first rank of living physiologists, died suddenly of apoplexy. Although he was seventy-five years of age, his intellect was as keen, his energy as great, and his unselfishness as unbounded as at any time in his life. This is saying much, for these characters had been his in no ordinary measure. His life's work consisted chiefly of investigations into the contractility of muscle, the movements of the heart, and the effect upon it of rarefied air. He discovered almost simultaneously with Marey the curious fact that during one period of its cycle the ventricle will not respond to stimuli. To this time Marey gave the name of refractory period. He found also that there is a point generally known as Kronecker's point in the heart, puncture of which causes the heart to stop at once and permanently. His investigations on the effect of rarefied air upon the circulation convinced him that the ascent even to considerable altitudes if unaccompanied by muscular strain is without danger, and on his report to this effect the building of the well-known Jungfrau Tunnel was begun and is now nearly completed.

Kronecker was at one time private assistant to the great physician, L. Traube, and thus possessed a knowledge of medicine quite unusual amongst mere physiologists. He was one of C. Ludwig's most esteemed pupils and dearest friends, and was at one time his assistant. At Leipzig and elsewhere he became acquainted with almost every physiologist of note, and his linguistic powers, his extensive knowledge of an encyclopædic character, his geniality, kindness, and trustworthiness converted every acquaintance he made into a friend.

Like Ludwig, Kronecker published a great deal of his work under the names of his pupils, amongst whom may be mentioned Dr. Gustav Hamel, father of the aeronaut, whose untimely death the world has recently had to deplore, and Prof. Meltzer, of the Rockefeller Institute. His influence in stimulating others was enormous, and as director of the Marey Institute in Paris, as professor in Berne, and as an actual participator in most of the physiological congresses, he put at the service of everyone who was willing to work his knowledge, his time, and his energy without stint.

The esteem in which Kronecker was held is shown by the Universities of Glasgow, Aberdeen, St. Andrews, and Edinburgh having conferred upon him the degree of LL.D., and Cambridge that of D.Sc. The number of distinctions conferred upon him by foreign universities and learned bodies is

too great to mention. He served during the campaign of 1866 and the war of 1870-71, and obtained the decoration of the iron cross. His death is a great loss to physiology, and will be felt as a personal sorrow by physiologists throughout the world.

LAUDER BRUNTON.

NOTES.

WE regret to announce the death on June 6, at seventy-eight years of age, of Prof. Adolph Lieben, emeritus professor of general and pharmaceutical chemistry in the University of Vienna, and foreign member of the Chemical Society.

THE death is announced, in his seventy-first year, of Dr. Barclay V. Head, correspondant of the Institute of France, corresponding member of the Royal Prussian Academy of Sciences, and keeper of the Department of Coins and Medals at the British Museum in 1893-1906.

PORTSMOUTH has been selected as the place of meeting for the autumn conference of the Institute of Metals. The conference, which will be presided over by the president, Sir Henry J. Oram, K.C.B., F.R.S., will be held on Thursday, September 10, and Friday, September 11, in the Municipal College, a number of important papers being read each morning.

THE annual June conversazione of the Royal Society was held at Burlington House on Tuesday. Most of the exhibits of apparatus and specimens were the same as were shown at the May conversazione, of which an account was given in NATURE of May 21 (p. 304), and others have been described in our reports of the proceedings of societies and academies, so that no further reference need be made to them here.

THE Aero Club of America has appointed a committee of seventy, with Admiral Peary as its chairman, to supervise the preparation of a map of the permanent air currents over the United States. The committee will begin by formulating rules for making aerial observations at points to be agreed upon in various parts of the country. Local aero clubs will then make the observations by means of balloons and aeroplane flights. The committee will also prepare a topographical map indicating convenient landing places for airmen.

A SERIES of severe thunderstorms passed over the southern area of the metropolis on Sunday afternoon, June 14. The lightning was exceptionally severe and prolonged, and torrents of rain fell with much hail at times. Six persons, of whom four were children, were killed at about one o'clock, whilst sheltered under two different trees on Wandsworth Common, and several persons were injured, one of whom has since died. Many buildings were struck by lightning, and immense damage was sustained by flooding due to the heavy rain. The damage was almost wholly limited to an area stretching from east to west, from Blackheath and Lewisham through Streatham and Wandsworth to Wimbledon and Kingston. At Streatham Hill thunder was first heard at 12.30 p.m., and the

storms continued with more or less intensity until after 5 p.m. There were four distinct disturbances moving from east to west, and apparently subsidiary to the low-pressure area over France and Germany. The heaviest downpour of rain and hail occurred at Streatham Hill for a quarter of an hour, from 1.30 p.m.; at 2 p.m. the rainfall measured 1.10 in., at 4 p.m. an additional 0.45 in., and at 6 p.m. 0.05 in., giving an aggregate 1.60 in. At Wandsworth Common the rainfall by 3 p.m. measured 1.23 in., and at 4.30 p.m. an additional 0.65 in. was measured, giving an aggregate 1.88 in. At Kew the rainfall was 1.34 in., at Greenwich 0.32 in., South Kensington 0.23 in., Westminster 0.16 in., Camden Square, 0.04 in., at Hampstead nil.

THE address upon the relation of science to the modern State, and the inadequate encouragement given to the scientific discoverer, delivered by Sir Ronald Ross at the annual meeting of the British Science Guild on May 22 has produced a valuable and interesting correspondence in the *Morning Post* during the past few weeks. Sir Ronald Ross's main thesis was that however good the educational and laboratory opportunities may be, discoveries are not likely to be made so frequently if they impoverish the workers, or at least confer no benefits upon them, as is the case in Great Britain at present. He also pointed to the injustice of the treatment of scientific men by the State in accepting great services with little or no compensation, whereas for far less valuable services from other professional men high fees are paid. Readers of NATURE know how persistently the claims of scientific investigation to adequate recognition have been urged in these columns, and that an article upon the subject appeared in our issue of June 4. The letters published in the *Morning Post*, most of them by well-known men of science, should be the means of making a large section of the general public acquainted with the poor prospects, measured by monetary standards or worldly success, offered by a career devoted to scientific research in comparison with those of professions which do not demand exceptional qualities of originality and genius. The State may not be able to select and endow a race of discoverers, and it cannot assess the ultimate value of a discovery, but what it can and should do is to see that the men and women who are contributing to the advancement of knowledge are given the most generous encouragement and the fullest opportunities of carrying on their work.

AMONGST the terrible loss of life in the *Empress of Ireland* disaster in the St. Lawrence River recently there comes as a shock to all geologists and mining men interested in the occurrence of ore-deposits in the Archæan crystalline rocks of Canada the loss of one who, for the past thirty years, took a most active part in the deciphering of the structure of the earth's crust in the great crystalline areas of North America. In Dr. Barlow, Canada had the last court of appeal on the genesis of its ore-deposits. Trained first at home in Montreal, Barlow studied at McGill University under Sir William Dawson, Dr. Harrington, and other geologists, and was asked to join the