These are greatly at variance with the positions observed, which show that the companion was then in the following semi-circle, and by the estimates of distance had approached the primary between 1781 and 1802. Barclay's epoch 1871·4 assigns a distance less by 0″·35 than was observed at Leyton in 1866, which is confirmed by Dembowski's measures about the same time. There is in the case of this star a very unusual discordance between the distances of Struve and Dawes, which attains a maximum, 0″·45, about 1836-5; in deducing the above formulæ Struve's measures were employed. The rate of increase in the distance has been diminishing, until by Dembowski's measures, 1863-68, it was less than 0″·01 annually; the orbit is evidently inclined only a few degrees to the line of sight, so that the companion made a very close approach between 1802 and 1819.—If the angles of position, in the case of Σ 1819 between 1828 and 1870 are projected, it will appear that the velocity has been diminishing from about 2°·1 in 1840, to 0°·85 at the end of the period, which with the accompanying increase of distance confirms Struve's judgment as to orbital motion; there is already a diminution of angle of nearly 70° since the first Dorpat measures.—It may be hoped that Σ 2107 has not been forgotten this year.

M. LEVERRIER'S THEORY AND TABLES OF SATURN.—We learn that M. Leverrier has completed his long-continued and exhaustive investigations on the motion of Saturn, and that his theory is reduced into tables, which will of course speedily take the place of those of Bouvard, or of provisional tables which have been used in the preparation of one or two of our ephemerides, pending the publication of others founded upon a more complete theory and discussion of the observations from the time of Bradley. As in all Leverrier's previous researches of a similar nature, he has made use of the rich store of observations accumulated at the Royal Observatory, Greenwich during upwards of 120 years, and also of the long series which has been formed at the Observatory of Paris. The mathematical astronomer will await the publication of M. Leverrier's researches in detail with extreme interest. The Tables of Saturn are understood to be necessarily of considerable extent, with the view to their convenient application.

THE GREAT COMET OF 1819.—The parabolic orbits so far computed for this comet, which was observed from the beginning of July to the middle of October, do not represent the observations with sufficient precision, and it is probable that no parabola will be found to do so. The following may, perhaps, be closer than any yet published:—

Perihelion passage 1819, June 27·71547, Greenwich M. T.					
Longitude of perihelion	...	287°	8′	11″	Mean equinox July 0
Ascending node		273	41	57	
Inclination	...	80	44	38	
Log. perihelion distance	...	9·533233			
Heliocentric motion	... ...	direct.			

But this orbit exhibits differences from the observations of a kind that should probably be attributed to deviation from parabolic motion, and as we are in possession of many of the original observations, it would be desirable to discuss them with the view of determining the true character of the orbit in which the comet was moving. Its transit over the sun's disc, a nearly central transit, early on the morning of June 26, and the suspicion that it was actually observed upon the disc by Pastorff at Buchholz, or, as is even more probable, by Stark at Augsburg, give it a peculiar interest. The diagram of the comet's path across the sun, which appears in the "Berliner Astronomisches Jahrbuch," is erroneous; it would pass in greater longitude than that of the sun's centre, as indicated by the above elements, which in this respect are confirmed by the orbits of Nicolai, Dirksen, and Cacciatore. For the centre of the earth the ingress took place June 25 at 16h. 52m·9 mean time at Greenwich, 172° from the sun's north point towards the east (direct image), and the egress at 20h. 29m·9, about 9° from the same point to the east. For the time of transit the elements, no doubt, assign the comet's position within 15″ or 20″. The larger differences from observation are in August.

SCIENCE IN GERMANY

(*From a German Correspondent.*)

IN continuation of the previously reported investigations of the formation of cells in the ovum, we may mention some observations of Kupffer, which relate to a hitherto rather unknown yet doubtless very widely spread structure of the animal cell. ("On the differentiation of protoplasm in the cells of animal tissues," from "Schriften des naturwissenschaftlichen Vereins für Schleswig Holstein," Heft. iii.; and "The salivary glands of *Periplaneta orientalis* and its nervous system," from "Beiträge zur Anatomie und Physiologie, als Festgabe Carl Ludwig zum 15 Oct. 1874, gewidmet von seinen Schülern.") Kupffer first discovered that the body of the cells from the liver of a frog, which coat the biliary vessels, consists of two substances which chemically and physically are widely different, while hitherto it had been considered homogeneous throughout and had been called protoplasm. A hyaline ground substance (Paraplasm) gives to the body of the cell its relatively firm exterior shape, while in its interior a moveable, grained protoplasm is found in varying arrangement. It appears as a central mass round the nucleus, from which ramified or reticular threads radiate to the exterior side of the liver-cells which is turned towards the blood-vessels, or to that which borders the biliary vessels. From this arrangement of the protoplasm, which slowly flows in the well-known manner, Kupffer surmised that these were the ways in which certain matters were conveyed from the blood into the biliary vessels; and he found his opinion confirmed when he introduced soluble colouring matter into the blood of the living animals. As the colour entered through the liver-cells into the biliary vessels, it indicated its course through the cells in most cases in exactly the same way in which formerly the protoplasm proper had been found arranged. Similar facts were found in respect to the liver and kidneys of other Vertebrata, in the young back-teeth of calves, in certain glands of insects (Malpighian bodies). In the salivary glands of the well-known "black beetle" (*Periplaneta*), Kupffer not only found a very soft net of protoplasm-threads inside the ground-substance of the cells, but he also proved their connection with nerve ends. This likewise supports the view that the substance of the animal cell is differentiated in a manner similar to that of the vegetable cell, viz., that it consists of an active material which remains moveable and fulfils the special physiological functions of the single cell (protoplasm), and of a more passive material which forms a sort of protecting receptacle, as it were, for the tender protoplasm (Kupffer's paraplasm).

The "Archiv für mikroskopische Anatomie," edited by La Valette St. George and Waldeyer, has produced the following papers in its eleventh volume, up to this date:—Part I. On Radiolaria and fresh-water Radiolaria-Rhizopoda, by Greeff.—On bone growth, by Strelzow.—Researches on the physiology of the kidneys, by Wittich.—Studies on Rhizopoda, by F. E. Schulze.—Researches on the ganglion globules of the spinal ganglia, by Arndt.—On Heitzmann's hæmatoblasts, by Neumann.—On tissue cells by Waldeyer. Part II. The Ventriculus terminalis of the spinal marrow, by Krause.—Remarks on the nerves of dura mater, by Alexander.—Studies on the development of bones and of bone-tissue, by Stieda.—On the peripherical part of vertebræ, by Ehrlich.—The perivascular lymph-spaces in the central nervous system, and in the retina, by Riedel.—On cement layers in the tissues

of vessels, by Adam-Kiewicz.—Hyalonema Siebold, Gray, by Küstermann.—Researches on the development of spermatozoa, by Neumann.—On amœboid motions of the little nucleus-body, by Eimer. Part III. Studies on Rhizopoda, by F. E. Schulze.—The relation of ciliated epithelium of the abdominal cavity to the epithelium of the ovary, by Neumann.—Researches on the first signs of the eye-lens, by Mihalkowics.—Vertebral side and cerebral appendage, by the same.—Researches on the development of cross-striped muscles and nerves of Reptilia and Amphibia, by Calberla.—On the reproduction of Arcella vulgaris, by Bütschli.—Researches on the epithelium of the nose, by Brunn.—On the nerves of the gullet, by Goniaew.—Researches on the anatomy of the human throat, by Disse.—On the structure of the Najadeuxieme, by Posner.—Supplement: On the dental system of Reptilia, and its significance with regard to the genesis of the skeleton of the oral cavity, by O. Hertwig.—The above-mentioned researches of Greeff and Schulze, which are in close relation with those made in England by Archer and Carter, treat of a class of the lower animals which only lately has attracted great attention; we therefore can hardly be astonished that in such treatises, descriptions and determinations of the different forms are in the majority, and that the particular course of life of single species remains at present still wrapped in considerable darkness. These neat little organisms consist of a very simple substance, which supports their existence (sarcode) and of a siliceous skeleton, which in some instances radiates outwardly in all directions, while in others it appears as a bag- or bottle-shaped shell, and is often adorned with relief-work well worthy of admiration. As indications seem to become more and more numerous that not only within the range of one species, but even in the development of one and the same individual animal, different forms occur, it is evident that the propagation and development of these organisms must remain difficult to understand, so long as these relative connections are not investigated. But thus much is already known, that even in the most distant localities the same forms may occur, and that the marine Radiolaria and Rhizopoda have near relations, or even identical forms, in fresh water. Besides division, the following phenomena seem to be connected with propagation: the phenomenon of conjugation (temporary union of two animals), of "encystifaction" (enclosing by a shell of the animal which is contracted into the shape of a ball), and of the formation of spores (production of interior germs, according to Bütschli).

ZOOLOGICAL STATIONS ABROAD

THE following letters from Dr. Mikluho-Maclay to Dr. Anton Dohrn, Director of the Zoological Station at Naples, have been forwarded to us for publication by Prof. Huxley. The first relates to a zoological station which Dr. Maclay has established in the Malay Archipelago, and the second to the general subject of zoological stations abroad.

"Dear Dohrn,—You are well aware that I share your views as to the great value of zoological stations to science, and you will not doubt that the account of the excellent results of the great establishment founded by you at Naples, which reached me by accident at Ternate in 1873 on my return from my first expedition to New Guinea, gave me great pleasure.

"It is now my turn to surprise you with the news of the establishment of a third (?)[1] *zoological station at the southernmost point of Asia*, on 'Selat-Tebrau,' the strait which divides the island of Singapore from the Malay Peninsula.

"This new 'station' cannot, it is true, be so called in the same sense as yours at Naples. I have taken my own requirements and customary mode of life as the standard, and have arranged the building and its fittings in accordance with it.

"It will serve in the first place as a station and *Tampât Senang* (or place of rest) for *myself*; in my absence, and after my death, I wish to place it at the disposal of any student of nature who feels himself suited for my mode of life.

"My 'Tampat Senang' has the following advantages to offer:—

"A house consisting of two fairly large rooms, each provided with two verandahs (besides the necessary offices), surrounded on three sides by the waters of the straits, and on the fourth by the primeval forest.

"The house will be simply furnished, and will contain a small library, together with the most necessary articles for housekeeping.

"It possesses, moreover, two advantages which I consider to be of no small importance, namely, the command of a fine view, and very complete isolation.

"The use of this 'Tampat Senang' is open to *any* student of nature, without the slightest regard to nationality, provided only he be of the male sex (for I confess to a decided repugnance to all stages of development and differentiation of the genus 'blue stocking.') The presence of a woman as visitor, or as supplement of the one student of nature for whom the place affords room—for in this case a wife must be so regarded—is not forbidden; but since 'Tampat Senang' must remain true to its name and to my idea, no children can possibly be allowed there.

"I have purchased the piece of land on which the house is to stand, from H.H. the Maharajah of Johore. It is a small hill which forms a cape projecting into the Selat Tebrau. In my will I have made such provisions that my family, into whose hands it will pass, will be precluded from *ever* selling it, or allowing it to be used for *any other* purpose than as a station for scientific research; or from cutting down, or even thinning the primeval woods standing upon it; the utmost that will be allowed is the clearance of one or two footpaths through the wood, which is always to remain as a specimen of the untouched primeval forest. And although 'Tampat Senang' may be hereafter rebuilt in stone, and made more elegant or convenient, it is *never* to be enlarged, lest it should lose its character of an isolated abode for *one* student of nature.

"I lose no time in writing to you, although the ground is only just purchased and the house is not yet built, because I think the plan of establishing such outposts for students of nature in these parts of the world (the East Indian Archipelago, Australia, the islands in the Pacific Ocean, Japan, &c., &c.) likely to be *very useful*, and also because, on account of my present ailment (an injured foot), I have more leisure than usual.

"Hotels can never afford suitable places of study on account of the noise and confusion inseparable from them; nor can the hospitality of friends, however kindly it may be offered, supply all that the student of nature needs. Such unpretending stations as my future 'Tampat Senang,' where he can work in absolute quiet, neither disturbing others, nor suffering interruptions, without the need of asking favours or incurring obligations, will I think commend themselves to many persons interested in the advancement of science.

"A principal reason for my choice of Johore is the neighbourhood of Singapore, from which place 'Tampat Senang' can be reached in three or four hours. The advantages of this position are that all products of European industry can be easily procured; that by means of the frequent mails communication can be maintained with

[1] I have not heard whether the station which you and I began at Messina in 1867-68 arrived at any high degree of development, or whether it shrank into a mere rudiment. My nomad life has prevented news of any other than yours at Naples from reaching me; for example, I do not know whether the station on the Black Sea, which I advocated at the meeting of Russian naturalists at Moscow in 1868, ever came into existence.