of Energy," that the total energy of the universe will ultimately assume the form of uniformly-diffused heat of low temperature.

The attractions between the heavenly bodies must upon this theory be ascribed to their being electrically excited to different extents, and continually sucking up electrical energy from the ether. When, then, any one of them loses heat by radiation, it will take up electrical energy which may be transformed within it into other forms. The sun may thus receive compensation for the light and heat which it emits. In this way it seems quite possible that the universe may really be a conservative system. Indeed, the sun may receive a direct accession of light and heat from the electrical energy diffused throughout space, as this would take place if it receded from some other star with a velocity exceeding by a finite amount the velocity of light. This accession would take place when the relative velocity exceeded a certain value, and its effect would be to diminish this relative velocity until the accession of light or heat ceased, when the velocity would again increase, as in the phenomena of the vacuum tube.

The author considers that this might explain many hitherto unexplained changes going on in the sun, especially as it would necessarily involve the inequality in the intervals from maximum to minimum and from minimum to maximum, which is actually observed. It might also give an explanation of the phenomena of variable stars, as seems suggested by Secchi's observation that all red stars are variable.

The author states that he makes these suggestions with diffidence, as speculation upon cosmical phenomena based upon the limited data at our disposal is apt to be misleading; witness, for example, the limitation to which Weber's law was found to be subject.

He points out that, if Newton's law of gravitation be considered only as a first approximation to the law of attraction between the electrified bodies of the universe, then every case of gravitational attraction, including the weight of terrestrial substances, may be considered as due to electrification. The molecular attractive forces may also be due to the same cause. The differences in the electrical excitation of the molecules of various substances would then play an important part in the phenomena of chemical combination (see footnote to § 16).

The rigidity of a body would then be determined by the differences in the electrification of its molecules. These differences would naturally be determined by external circumstances, and would be greatest in the direction of the normals to the surface.[1]

G. W. DE TUNZELMANN.

LEARNED SOCIETIES IN RUSSIA.

AT a recent meeting of the French Geographical Society, M. M. Venukoff read a short paper on the learned Societies of Russia. Besides the Geographical Society, the Army Staff, the Academy of Sciences, and other Government institutions, there are in Russia several learned bodies engaged in the exploration of those countries which are still but little known. Though many of the explorers do not go for geographical purposes properly so called, yet these non-geographical explorers frequently obtain results of the greatest interest to geography. M. M. Venukoff is a member of many of these Societies, and at the outset of his paper he proceeds to name some of his colleagues who have in recent years rendered great service to geography; amongst the members of the Naturalist Society of St. Petersburg, MM. Korotneff, Nicolsky, Lidsky, Yaschenko, and Kouznétoff. The first-named has travelled in the Malay Archipelago, where he has studied chiefly the invertebrate animals, but has at the same time made scientific observations of every kind. In the month of June 1887, he visited the country around Krakatão, where already several little hamlets have sprung up on the site of the town of Anjer, which was destroyed by an earthquake in 1883. These poor huts were surrounded by a luxurious vegetation, while the neighbouring portions of the sea were still covered with pumice-stone and altogether deserted by fish. At Billiton Island the traveller met the interesting tribe of Secasses, the fishermen of their state, who, with rare exceptions, inhabit floating-houses—that is, their junks—and even those among them who possess huts build them on the sea on piles, and never on *terra firma*. They are distinguishable from the Malays by their tall figure, their curly hair, and projecting cheek-bones; finally, strange to say, they almost all stammer. They are a very honest race, gentle, kind, joyous, and hospitable, and it is said that robbery is unknown among them. M. Korotneff describes the tides of the Sunda Sea, which are very complicated, and several other interesting phenomena. M. Venukoff then passes to M. Nicolsky, a famous Russian zoologist, who has pursued his researches in Lake Balkash. He assigns as the cause for the remarkable difference between the fish faunæ of the two districts of Tchui and Ele that the basin of Lake Balkash is separated from the Tchui valley by plateaux and mountains of a very ancient formation. Besides, Balkash is 280 metres above the sea-level, the Sea of Aral is scarcely 50 metres, and the height of the plateaux between Balkash and Tchui is 370 metres at least, and so it is difficult to see how the two great lakes were formerly part of one sea. Balkash, Sassyk-Kul, Ala-Kul, and even Ebi-Nor probably formed, and within the modern epochs, a single vast basin of fresh or slightly brackish water, for their fish fauna is identical with that of our days. In spite of its great extent and its latitude, which is the same as that of Bordeaux and Venice, Lake Balkash freezes every year from the month of November up to the middle of April, and the ice sometimes is as thick as 80 centimetres. A fact worthy of observation is that the steppes which surround the lake vary very much according to their position. Those on the north-west are clayey, and completely bare during the summer, and covered with pools in the spring; those on the south-east are formed of beds of sand, in which there are no pools, but where water is to be found below a certain depth. Thus the desert in the latter case is not so dry as it is to the north and to the west. From the point of view of a zoologist, M. Nicolsky finds that the north and west of Lake Balkash are marked by the presence of jerboas and of larks, whilst at the south of the lake there are numerous reptiles and tortoises; some hares and mice dwell there also, but there are no birds. M. Venukoff does not follow M. Nicolsky into the remainder of his report, as it deals chiefly with the natural sciences; but he remarks that M. Nicolsky shows all the qualities of Humboldt and Mr. Wallace—abundance of well-established facts, and great breadth of view in explaining them. M. Lidsky travelled in Karateghin and in part of Bokhara. Having arrived in the month of June at Schabrisiabz, M. Lidsky wished to journey to Hissar by the Sangardak Hill, but this being prevented by the snows, he was forced to make a detour and enter the valley of the Sourkhan by another route. From this vast prairies stretch away as far as the Oxus, inhabited not by men, but by jackals, for the waters of the Sourkhan flood the plain each year. In rising from this valley, he soon arrived at Garma, and then at Karatag, the summer residence of the Bey of Garma, which is usually hidden from the heat and the fevers which prevail in Garma in the hot season. There, and at Fezabad, M. Lidsky saw fish the skin of which was of exactly the same shade as the water which holds them, and which abounds in clayey soils—that is, of a red colour. Beyond Fezabad the traveller pushed into the high valley of Dachti-Bidona, which is really a plateau separating the basin of the Sourkhâb from that of the Kiafirningan. M. Lidsky describes Karateghin, which is 150 kilometres in length and 50 in breadth, as a fertile country in its lower parts, and thickly covered with forests in the mountainous regions. Unfortunately this oasis is separated from all the neighbouring countries by high peaks, so that the journey from Garma to Samarkand, for example, passes over Mount Pakchif, which is at least 3850 metres above the sea-level. The cold is so great at the top of the mountain that beasts of burden and even men are frequently overcome by it; travellers are often compelled to throw before them long strips of felt, on which they walk—a singular and a very slow and painful mode of progression. In 1877, M. Yaschenko made a journey in Russian Lapland, between Kola and Kandalaschka. According to him the lakes of this region belong to the basin of the White Sea or to that of the Arctic Ocean, and have identical fauna; but the terrestrial animals are not everywhere the same. There are places where bears abound; there are others where the principal enemy of man is the glutton. In latter years the inhabitants have remarked that the reindeer are changing their habits, and are beginning to prefer the forests to the *tundras*, or spaces covered with lichens, which make their favourite food. The reason of this change is to seek a more favourable shelter from the hunters; in the open, whole herds may be taken, but in the forest it is only possible to hunt one or two at a time.

[1] The foregoing paper in the original form is itself a very condensed abstract of an extensive research, the author only having a limited amount of space placed at his disposal in the journal in which it was published. This may account for the reasoning, in some parts of the paper, appearing somewhat general and difficult to follow.—G. W. DE T.

M. Kouznétoff has pursued zoological and physical geography researches on the Sea of Azov. This little basin, of which the length does not exceed 350 kilometres, and its breadth 170 kilometres, and its depth scarcely 14 metres, abounds in fish, and attracts continually to its shores crowds of fishermen. Its water is brackish rather than salt, for its percentage of salt is only 1·19, while that of the Black Sea is 1·75, and the Mediterranean more than 2·3 per cent. ; and consequently the real sea-fish are not to be found in the Sea of Azov. *Gourmets*, however, would find that the sturgeon is very numerous here, and has delicious flesh. We can see by this short account that the study of geography is making great strides in Russia. Three years ago, General Tillo, in drawing up his magnetic charts of Eastern Europe, discovered certain anomalies in the distribution of the magnetic elements around Koursk and Kharkov. During the summer of 1887, M. Piltchikoff, Professor at Kharkov, made inquiries into these anomalies, and he has just published a book in which the theory of terrestrial magnetism started by Gauss is developed.

RESEARCH LABORATORY OF THE ROYAL COLLEGE OF PHYSICIANS, EDINBURGH.

FOR some years the question of equipping a research laboratory occupied a very prominent position in the discussions of the Royal College of Physicians, Edinburgh, and last year the Committee appointed by the College was able to throw the plans into a feasible and at the same time thoroughly acceptable shape. Within a very short time suitable premises were acquired, the necessary structural alterations were at once commenced, a Superintendent was appointed, and apparatus was orde.ed and fittings were put in hand to be ready for use as soon as the building should be prepared for their reception. The premises are well adapted for the purpose for which they were acquired. They consist of a three-storied house, No. 7 Lauriston Lane, near the Royal Infirmary, to which had been added a large detached room in the back court. There are also commodious out-houses and a plot of ground of considerable size at the rear of the building.

The room in the back court is set apart for experimental physiology. It is 32 feet in length, 18 feet in breadth, and 14 feet high, and is well lighted by seven windows, three of which, facing to the west, are fitted with tables for microscopic work.

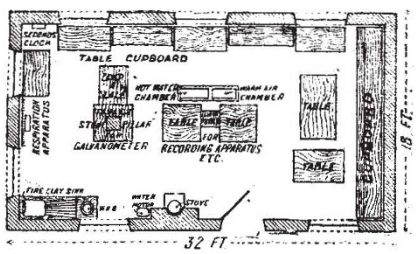

FIG. 1.

Near the south end of this room is a stone pillar bedded in the ground, so arranged as not to be affected by movements in the room. (There being no thoroughfare in the lane, no disturbance can arise from wheel traffic.) Around it is fixed a table to which the galvanometer wires are attached. The galvanometer is placed on the stone pillar in a glass case with a hinged door, and is always kept ready for use, short wires being carried from the table to the instrument. A hinged lamp table and brass rods over which curtains are hung complete the galvanometer fittings. Work-tables occupy the remainder of the centre of the room. Electrical, time-marking, and other apparatus, tuning-forks, perfusion apparatus, shunts, compensators, constitute the greater part of the instruments in this room. The sink and drainage apparatus in the room may be taken as a type of those throughout the whole house. It consists of a large earthenware sink, on one side of which is a grooved draining-board covered with lead, the grooves all leading to the sink. A swan neck tap supplies the water ; to this tap are two nozzles, to one of which is wired a piece of india-rubber tubing, used to connect the Geissler exhaust-pump, and similar apparatus ; the other nozzle gives a steady unbroken jet of water three-eighths of an inch in diameter. The wall behind the sink is leaded for about 3 feet up ; at the upper part of this are a couple of shelves, the upper one perforated, for draining flasks and bottles, the lower one grooved, and with a gentle slope to carry all moisture to the sink. Below these shelves are a couple of rows of wooden pegs fixed into the wall at an angle of 45 . These are very useful for draining all kinds of glass vessels. In the main building in the lower flat is a large entrance lobby, to the left of which is a part of the laboratory assistant's quarters.

A large room on the first floor, set apart for Committee meetings, is used as a library and museum. On the second floor is the chemical room, fitted with a good supply of water and gas. On the top floor are three splendidly-lighted rooms, all of which are devoted to microscopic work. In the south room the apparatus necessary for bacteriological research is collected. Two large projecting roof or dormer windows face east and west respectively. Each is fitted with a table covered with a sheet of plate-glass, on the under surface of which are painted three strips, the first, 4 inches broad, black ; then a similar white band, and then a

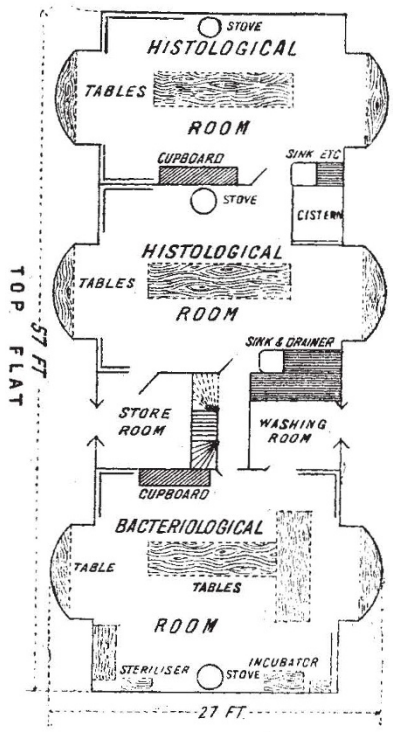

FIG. 2.

broad black band extending to the back of the table. On each side are shelves from the floor for about 5 feet up. These are within reach of anyone sitting at the table. On each side is a drawer 3½ inches deep ; but the remainder of the space under the table is left quite open, in order that earthenware jars for the reception of chemicals, washings, and *débris* may be accommodated. On the left side is fitted a rack for test-tubes, and in front and to the right are stands for ordinary histological reagents. Above the level of the table in front are four small shelves, on which are placed covered vessels for clean and dirty slides and cover-glasses. A syphon arrangement for distilled water, a bell-jar with counterpoise running on a brass rod, a Bunsen burner, and a lamp, complete the fittings at this table. One of Browning's microspectroscopes has also been fitted up in this room. Racks, for series of Hesse's tubes, and shelving complete the fittings here ; but opening out from it is a small room with a sink and large sloping drainer, at which most of the glass apparatus is washed. The other two rooms in this flat are fitted up for histological work, with window tables, sinks, cupboards, spirit vessels, and shelving, each for two workers. In connection with the histological department, apparatus for micro-photography has been fitted up by Mr. Forgan.