SCIENCE:

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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THE SITE OF KARAKORUM.

AT the meeting of the Geographical Society of Paris held on the 23d of May last, M. N. Yadrintzef, the well-known Siberian traveller, read a paper upon the archæological mission in North Mongolia, with which he was intrusted by the Irkutsk section of the Imperial Geographical Society of Russia. The special object of the expedition, as we learn from the "Proceedings of the Royal Geographical Society," was to determine the exact site of the city of Karakorum, the ancient capital of the Khans of Mongolia, — a question which has long been in dispute ever since the visit of Marco Polo. M. Yadrintzef started from Kiakhta on the 10th of June, 1889, and followed the course of the Selenga to the point where it debouches into the Orkhon. The first ruins were met with on the river Tula; viz., those of the ancient abode of Irkhe-Merghan, son of Altai Khan, which dates back from the thirteenth century. Several parts of the ruins were in a very fair state of preservation. On June 23 the expedition visited the remains of an ancient Buddhist temple on the river Kharukha, the walls of which are still from twenty to forty feet high, and nine days later arrived at the celebrated ruins of Kara-Balgassun, situated on the left bank of the Orkhon, about thirty miles south of its confluence with the Urtu-Tamir. A close examination of these ruins convinced the traveller that they formed the remains of an ancient city, which must have covered an area six miles in circumference, and the centre of which, the Kara-Balgassun of to-day, was occupied by the principal palace of the Khan. Canals connected this city with the river Djirmanta. In the vicinity of the hot springs, near the latter river, the remains of baths were found. The position of the ancient capital of the Mongolian Empire can thus be accurately fixed, thanks to the recent astronomical determination of the situation of Lake Ughei-Nor, made by Col. Pievtzof. The lake lies in latitude 47° 47′ 23″ north, and longitude 102° 45′ 25″ east of Greenwich; and the position of Karakorum is, according to M. Yadrintzef, thirty miles to the south-east, or in latitude 47° 15′ north, and longitude 102° 20′ 15″ east of Greenwich. Another result of this expedition is the discovery of remains of the ancient habitations of the Mongols along the whole valley of the Orkhon. Several burial-grounds visited by the expedition were full of stones covered with inscriptions, bas reliefs, and obelisks. Most of the latter have Runic inscriptions and Chinese hieroglyphics. The tombs bear evidence of great antiquity, and apparently belonged to the ancient nobles of the country. A visit was also paid to the Buddhist convent of Erdenitzan, where an important religious festival was witnessed, in which more than two thousand lamas took part.

A DRILL TO CUT SQUARE HOLES.

THERE have been attempts at various times to devise a drill which would produce square holes as economically as round holes are drilled. The idea has been a favorite one with inventors, but hitherto no great amount of success has attended their efforts. Recently, however, machines for the purpose have been devised that work with some degree of success. Two of them are now on exhibition in London. As described in *Engineering*, they bear a general resemblance to drilling-machines; but the spindle, instead of revolving in close-fitting bearings, has a peculiar motion which causes it to cut out a square hole. In the earlier type of machine the spindle is fed down through a long rotating sleeve. This sleeve is made to follow a path of peculiar form by means of a cam at each end running in a square hole. The method of setting out the cams is thus explained: "A square hole is described equal to the hole to be drilled. From any point in one side of the square an arc of a circle is described with a radius equal to the side of the square. From the points where this arc intersects the sides of the square, other equal arcs are described, completing the curve triangle. The square in which the cam is to revolve is now drawn, and from each of the vertices of the curve triangle two arcs are described, which complete the figure shown. The point of the tool, which cuts with one edge only, must be situated beneath one of the angles of the triangle." There are a separate pair of cams and a separate tool for each size of hole to be drilled. Five sets of cams are fixed on the spindle, and any set of them can be placed opposite the bearing-plates. The later form of machine is simpler in its construction, and will drill any sized hole within the range which it covers. In the upper bearing there is a short hollow spindle which is driven by gearing. Through this spindle there passes a long hollow spindle, carried near its lower end in a ball-bearing which allows considerable freedom. At the upper end of the spindle there is a roller which runs in a fixed cam path, and is held up to it by springs, which connect the spindle with the hollow driving-spindle. The effect of this arrangement is, that while the spindle rotates, it also rolls round in the ball-bearing, and its lower end describes a geometrical figure. The drill-spindle proper is within the second spindle, and carries a cutter, the cutting edge of which terminates on the centre line of the spindle. As the central spindle is raised or lowered, it decreases or enlarges the size of the hole drilled, while the whole drill-head is lowered to give the feed.

HEALTH MATTERS.

Microbes in Hail-Stones.

BACTERIA of various kinds have been found in ice and snow; and Dr. Fontin, a Russian observer, has now proved that hail-stones are not free from them. He has found, says the *British Medical Journal*, that the water produced by the melting of hail-stones contains, on an average, 729 bacteria per cubic centimetre. Neither yeast fungus nor mould was present, but nine different kinds of

bacteria were found, five of which (*B. mycoides, liquefaciens, luteus, sarcina lutea*, and *aurantiaca*) are already known. As the ordinary dwelling-place of the *Bacillus mycoides* is the earth, we are confronted with the fact that microbes of terrestrial origin may be carried up into the air, and thus rain, snow, and hail may be the direct means of conveying infection.

Mechanism of Respiration in the New-Born.

Dohen, from a study of this subject at the clinic of Königsberg, reaches the following conclusions, as we learn from *The Brooklyn Medical Journal:* 1. The respiration of the new-born is thoracic. 2. The elevation of the thorax begins at the summit, and descends progressively. 3. The tidal air averages 35 cubic centimetres, and reaches a maximum of 120. 4. The exchange of air is feeble in the first days after birth; at the end of the first week is a third larger than the first day. 5. Generally at the first inspiration the lungs are not filled with air, the alveoli unfolding only on the second day (a fact of medico-legal importance). 6. The respiratory curves of the new-born present no stationary points.

The Art of Medicine *vs.* the Science.

What Emerson said of the poet is applicable in its degree to the true physician: "As the eyes of Lynceus were said to see through the earth, so the poet turns the world to glass, and shows us all things in their right series and procession: for through that better perception he stands one step nearer to things, and sees the flowing or metamorphosis. . . . The poet alone knows astronomy, chemistry, vegetation, and animation; for he does not stop at these facts, but employs them as signs." It is not enough for the physician to know anatomy, physiology, chemistry, and pharmacology: he must not stop at knowing these, but must put them into the alembic of his brain, and transmute them into medical science. It is stated in the *British Medical Journal* that Professor Huxley said that it would be simply manslaughter for a doctor to treat his patients on the raw and undigested principles of physiology. Medicine must therefore never be looked upon as a mere science, because it is much more than that, it is wisdom sublimated from many sciences; and this is why the Gulls, the Jenners, and the Clarks can never be as common as the mere scientists who work by rule and scale. When Coleridge was accused of plagiarizing, in his "Hymn to Chamouni," from the poem of Frederica Brun on the same subject, it was easily explained, that, though he had taken her framework and used certain of her ideas, he had done so simply to glorify and endow them with life. With her they were dead phrases: Coleridge created the "Hymn to Chamouni" out of them. Just in proportion as the physician can create diagnosis and treatment for the cases which come before him as living and as various as the patients which are the subjects of the different diseases, just by so much is he a true physician. The inferior mind may see the same things as the superior, but the latter alone "sees their flowing and metamorphosis." This is why patients would go and talk to Sir William Gull, and derive benefit from the conversation, though they came away with no prescription, and took no drugs from his hands. The vulgar mind cannot understand the reason of this, and the hard scientist smiles a little superiorly at the idea.

Heredity of Tuberculosis in Comparison with its Propagation.

Attention is called, in the *Lancet* of June 14, to a pamphlet on the above subject by Dr. A. Haupt, in which it is stated that among the 1,500 inhabitants of Soden there are 101 who let lodgings. In most of the houses the wives, with sisters or daughters, serve and tend the tuberculous patients who come for treatment. In many houses servant-girls from the neighboring villages, hired for the summer, help, making the patients' beds, cleaning their rooms, beating the carpets, removing the sputum. These occupations, so closely connected with the danger of infection, are, among others, the tasks of these persons; and it must be added that they prefer the severest cases, because, as more help is required, the remuneration is higher. In winter the members of the landlords' families occupy the rooms in which generally the most severely affected patients have lain, — the rooms on the ground floor. Between 1855 and 1888, 48 of the 233 members of such families died, 10 of them of tuberculosis. In 6 of these 10 cases, heredity was demonstrable, and the remaining 4 were due to colds and external causes. Of the 415 servant-girls, 17 died, 5 of them of tuberculosis, also demonstrably due to other causes than infection. Within 30 years, then, among 653 persons, most of whom were for several summers with and in attendance on the patients, there were 15 deaths from tuberculosis, none caused by infection. The same proportion prevails among other persons in close contact with consumptive patients, attendants, washerwomen, etc. As to the general mortality of Soden, the following data are interesting: 76 persons died during the last three years, 10 aged from 80 to 85, 11 from 70 to 80, 9 from 60 to 70. Of these 76 deaths, 7 were due to tuberculosis, including 2 cases of tuberculosis meningitis in children, and 1 of tuberculosis of the bones, also in a child. Of the 4 other cases, only 1 was that of a person who came in contact with patients, and this was a case of alcoholism, ending in phthisis.

The Transmission of Typhoid-Fever by the Air.

Dr. Bordas, as we learn from a contemporary medical journal, has instituted experiments to determine the relation between the humidity of the atmosphere and the transmission of the typhoid bacillus. A current of dry air completely devoid of germs was conducted through a vessel containing a beef-broth culture of the bacillus, and into a second vessel containing sterilized beef-broth. The second vessel remained sterile. The result was the same when a dry atmospheric current was passed over pumice-stone saturated with a culture of the typhoid bacillus. When moist air was passed through the same vessels, a very different result was obtained. The sterile beef-broth culture was found, after the lapse of a quarter of an hour, to be thickly planted with the bacilli.

In nature this state of humidity is supplied by mist or fog, and statistics show an increase of typhoid-fever in Paris during the months of October, November, December, and January. The most general mode of propagation of typhoid-fever is by the contamination of the soil or water, but there are cases in which it is manifested by pulmonary localization. The germ may penetrate into the bronchial system, in spite of every means of defence possessed by the organism. Metchnikoff's studies prove that the lungs are a phagocyte battle-ground. In typhoid infection, due primarily to pulmonary lesion, it would seem that the phagocytes of the lungs are ordinarily sufficient to prevent the development of the infectious germ, and that contagion by means of the air can take place only when the macrophagic cells cease to offer an obstacle to the invasion of the microbe.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Temperature in Storms, and High Areas.

IT is an axiom, that, in making any special investigation as to the relation of cause and effect, we must separate out all influences tending to confuse and mask the special cause or force which we are studying. We may form an abstract conception beforehand of what effect we may expect to follow a certain cause, but we shall be seriously misled if we allow this hypothesis to take the place of a careful analysis step by step in our investigation. For example: suppose we reason, regarding the deposition of dew, that a fleece of wool suspended horizontally six feet above grass ground will collect more dew than one on the ground, because the warm ground will give up its heat rapidly, and prevent the lower fleece from cooling as much as the other. If we try the experiment, we shall find our reasoning entirely disproved by the facts. We have ignored the fact that the air near the upper fleece is in constant motion, and also that the heat of the earth cannot communicate itself to the tips of the wool fibres. Again: if we wish to find the pressure of the air at Mount Washington, for example, we may reason that since the pressure at