

except by sliding one sheet over the other, when the motion of some of the dots with respect to the others immediately betrays its situation. R. S. CAPON.
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MR. M. E. J. GHEURY concludes a note in the issue of NATURE of March 27, relating to the gain of definition obtained by moving a telescope, with the words: "Perhaps some of your readers have noticed something similar and could throw a little light on this mysterious phenomenon."

By a curious coincidence "something similar" did come to my notice just one day previous to my reading of Mr. Gheury's note. I do not propose to throw any light on the question, nor do I wish to imply that there is anything more than an accidental and external similarity between the two cases in question. But it may not be out of place to direct attention to a peculiar observation recorded in *The Mechanic's Magazine* of the year 1829, and rescued from oblivion in a recent number of the German periodical *Prometheus*. The experiment is extremely simple, and can be repeated by anyone with the very simplest materials.

Take a piece of paper of such thickness that when it is laid over a sheet of printed matter the characters just show through but cannot be read. Place this over a page of printed characters, move it about with a circular motion, and you will no doubt be surprised to find that now the print shows through and can be read with comparative ease. It is, of course, necessary to adjust the thickness of the paper and the size of the type, but two or three trials are sufficient to determine the right conditions for the experiment.

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THE NEW SEISMOLOGY.

FOR very many years past in Italy, and to a lesser extent in other countries, earthquakes had been recorded, while a few private individuals collected and analysed earthquake statistics. These, however, were the days of seismoscopes and the old seismology. The new seismology did not come until macroseisms had been measured and teleseisms had been discovered. With their arrival new lines of physical, and particularly geophysical, research were opened for exploitation. Commencing in Japan, the desire to record and discuss the felt and unfelt palpitations of our earth spread like an epidemic round the world. In 1880 the Seismological Society of that country was founded, and the twenty volumes which it issued contain initiatives for very many of the investigations carried out since that date. When this society ceased to exist the Japanese Government established an Earthquake Investigation Committee, which up to date has published more than eighty quarto volumes.

In the early days attention was first directed towards obtaining instruments which would give actual measurements of earthquake motion. Steady-point instruments were devised, and, for earthquakes we feel, are now in use throughout the world. From a knowledge of the actual nature of earthquake motion derived from these instruments, new rules and formulæ for the use of engineers and builders were established. To test

the suggested new departures in building and engineering practice, structures in brick and other materials were fixed upon platforms actuated by powerful machinery and subjected to movements closely corresponding to those of heavy earthquakes. The results of these investigations in Japan and other countries have been extensively applied in the construction of piers for bridges, tall chimneys, walls, ordinary dwellings, embankments, reservoirs, &c. Inasmuch as the new types of structure have for very many years withstood violent shakings, while ordinary types in their neighbourhood have failed, it may be inferred that much has already been accomplished to minimise the loss of life and property.

The application of seismology to the working of railways, particularly in Japan, led to the localisation of faults on lines, and alterations in the balancing of locomotives. The result of the latter has been to decrease the consumption of fuel.

Later, instruments were devised to record earthquake motion which cannot be felt, with the result that a person living in any one part of the world can record and obtain definite information about any *large* earthquake originating even so far off as his antipodes. These records of the unfelt movements of earthquakes have from time to time indicated the position, the time of occurrence, and, what is of more importance, also the cause of certain cable interruptions. The practical importance of this latter information, especially to communities which may by cable failures be suddenly isolated from the rest of the world, is evident.

The many occasions on which earthquake records have furnished definite information respecting disasters which have taken place in distant countries, corrected and extended telegraphic reports relating to the same, is another illustration of the practical utility of seismic observations. Seismograms have frequently apprised us of sea waves and violent earthquakes in districts from which it is impossible to receive telegrams, while the absence of such records has frequently indicated that information in newspapers has been without foundation or at least exaggerated. Localisation of the origin of these world-shaking earthquakes, besides indicating sub-oceanic sites of geological activity, indicates positions where the hydrographer may expect to find unusual depths. They have also shown routes to be avoided by those who lay cables.

Seismograms of unfelt movements throw light upon what have but recently been regarded as unaccountable deflections in the photograms from magnetographs, barographs and other instruments sensible to slight displacements. They have also explained unusual rates in certain time-keepers.

Among the very many scientific results which the new seismology has contributed to science is that it has given us the velocities at which motion is propagated in various directions through the world. Until these observations had been made our knowledge respecting the interior of the earth

chiefly related to its density and temperature. Now we know much respecting its rigidity.

With the object of increasing our knowledge of teleseismic disturbances, in 1896 the British Association, with the assistance of the British Government, communicated with many foreign States and Colonies suggesting that they should establish a certain type of seismograph. The result has been that the British Association now enjoys the cooperation of fifty-nine similarly equipped stations which are fairly evenly distributed over the world. The general outcome from this and the work carried out in Japan is that nearly every civilised country in the world has had its attention directed to this new departure in geophysics and has established seismographs.

In the last-mentioned country observers are to be found in most towns, and many instruments have been installed to record macroseisms and teleseisms. The annual outlay for earthquake work in that country is about 5000*l.* Russia, for the support of a system extending over its vast territories, expends a similar amount. Italy, which is the oldest country for recording earthquake phenomena, is covered with stations. Austria, France, Switzerland, Chile, the United States of America, the Balkan States and the small States of Central America each have their organised systems, while in Germany we find the headquarters of the International Seismological Association. This is supported by yearly contributions of about 1600*l.* from twenty-two countries. The headquarters of this body is in Strassburg, but it also controls stations in Beirut and Reykjavik. In Great Britain teleseisms are now recorded in thirteen different places. Three of these stations are owned by private persons, but the one in the Isle of Wight is largely supported by grants from the Royal Society, the British Association and Mr. M. H. Gray. The remaining nine are attached to existing observatories or other institutions.

J. MILNE.

THE PROBLEM OF TUBERCULOSIS.

THE final report of the Departmental Committee on Tuberculosis was recently published. Since the interim report of 1912 (April) was issued the committee has been engaged in devising methods for dealing with the general problem of tuberculosis as it affects the community. This introduces at once the difficulty as to the policy to be followed with those cases occurring among the non-assured under the National Insurance Act. The funds for this purpose are now promised by the Government up to one half of the estimated cost, and whilst giving the ratepayers control of the local administration the funds mentioned are to be drawn from national sources.

Dr. Newsholme has shown how largely the improvement recorded in respect of this disease is really due, not so much to successful treatment, but more to the segregation of the advanced cases in special institutions, chief among these being

those wards of the Poor Law infirmaries set apart as sanatoria. But the law has till now left (and still leaves) the patient the right to "claim his discharge" when he pleases, and this is frequently exercised to his own detriment; but the committee now realises that, in addition, he is a source of danger to others in his environment. On this ground it is proposed to withdraw this liberty from the class of infective "ins and outs." It is a noteworthy point that the tuberculosis of children is now accepted by the committee as mainly of bovine origin.

The outstanding feature of the report is that of the provision for research, and its recognition in a fuller sense than has yet found its way to the statute book. The committee computes that an income for this purpose will accrue under the Insurance Act of about 57,000*l.* a year, and it proposes the establishment of various grades of research workers, to include the appointment of full-time men, who shall entirely devote themselves to research "at an adequate salary," with a subsequent pension.

The outline of a detailed scheme is given which includes the use of existing agencies, but contemplates also the formation of a central bureau with an expert secretary director at the head. This is primarily designed for the reduction of statistics to comparable form, and may comprise a research institution as well.

In view of the scattered distribution of the workers some such arrangement is clearly necessary; and, further, the committee indicates the need, in its opinion, of keeping the workers in touch with the work done abroad.

The creation of scholarships is recommended, but a department of foreign inquiry, either by scholarship or commission, would enhance the knowledge of the whole body, and prove a constant stimulus to the highest effort.

A point of considerable importance is raised by the reference to laboratory facilities. "Access" to these by various local centres of work must always give way in effectiveness to work done by small equipments for diagnosis at these centres. The Commissioners consider that not merely tuberculosis, but any disease from which the assured may suffer may come under similar review.

On taking the figures from the 1909 census report, tuberculosis claims 10.5 per cent. of all causes of mortality, and that of the "respiratory" group following—pneumonia and bronchitis—it will be noted that thus combined this figure exceeds the former. It must not be forgotten, however, that the latter includes cases of non-diagnosed tubercle, and others the essential feature of which is old age.

Tuberculosis, therefore, would claim the fullest, if not the sole, attention at first. This is confirmed by the figures just to hand of the results of the first year's working of the compulsory notification of infective diseases, including tubercle. Tuberculosis heads the list with 110,551 cases, which amount to 3.06 per 1000