NOTES ON BOOKS.

PROFESSOR M. R. DEENNAN of the University of Capetown has published a small book of forty pages entitled *A Short Course on Human Embryology* which will be found useful by teachers of that subject in this country and by students. It is the course which is given in the University to medical students, and may be taken as a good example of the kind of course which may be introduced into the already somewhat crowded syllabus of anatomy. It has the special merit of presenting the complicated subject of human development in a manner that is at once very concise and yet readable and interesting, and the material is arranged under headings following one another in a natural order of sequence which greatly facilitates the comprehension of the whole. The descriptions also are excellent—full of essential detail and free from redundancy. The student can use this small work as a stand-by and first textbook of the subject, giving him a good grounding from which he may proceed to the study of larger and more detailed works. As a companion to the short course the author has published a pamphlet of sixteen pages of *Illustrations for a Short Course on Human Embryology*. This consists of photographs and diagrams designed to illustrate the descriptions. Figures of this kind are usually incorporated in the text, but there is a certain advantage in having them separate and arranged in serial order, so that the stages of development can also be followed pictorially apart from the text. The two booklets are published by the author, from whom they may be obtained, the price for the two being 5s.

Antigénotherapie de la Tuberculose^{*} is an account by Drs. NÈGRE and BOQUET of their researches at the Institut Pasteur for the production of an antigen for tuberculosis, and of the results of its use in man and animals. The authors found that an extract in methyl alcohol of tubercle bacilli previously treated with acetone formed a very sensitive antigen of fixed stability. When freed from the methyl alcohol, suspended in normal saline solution, and injected into healthy animals, the extract produced antibodies, which were considerably increased if the extract was injected into animals infected with tuberculosis. In tuberculous guinea-pigs and rabbits the evolution of the disease was retarded—it did not tend to become generalized; often it remained localized in a single organ, and after a treatment of several months' duration a process of sclerosis set in. Similarly in man many mucous, glandular, osseous, articular, and peritoneal lesions retrogressed or disappeared entirely, though in some cases the extract failed to act. Drs. Nègre and Boquet are not able to write with so much certainty about pulmonary cases, but they state that several clinicians have observed improvement of the general health, a lowering of temperature, a diminution of sputum, and an improvement in auscultatory signs. There is a preface to the book by Professor Calmette, who is of opinion that antigenotherapy should take a place of greater and greater importance in the treatment of tuberculous diseases, especially if they are afebrile.

^{*} *Antigénotherapie de la Tuberculose*. Par L. Nègre et A. Boquet. Préface du Pr. A. Calmette. Paris: Masson et Cie. 1927. (52 × 74, pp. 158; 2 plates. 16 fr. sans majoration.)

PREPARATIONS AND APPLIANCES.

Maxillary Antrum Rasps.

MR. ALBAN EVANS, surgeon to the Ear, Nose, and Throat Department of the Swansea General Hospital, has devised two rasps,

forward and backward cutting respectively, which he has found most useful for opening up the maxillary antrum beneath the inferior turbinate bone in cases of empyema. The first is a modification of Dr. Watson-Williams's instrument for the intranasal operation on the frontal sinus. In both due consideration has been given to the angles between the inner wall of the

antrum and the anterior and posterior boundaries. The rasps, as shown in the illustration, were made by Messrs. Mayer and Phelps, 59, New Cavendish Street, W.1, several years ago, and Mr. Evans states that they have been used in a great number of cases with satisfactory results.

A MEDICAL REVIEW OF SOVIET RUSSIA.

VI.—WORK OF PAVLOV AND OTHER SCIENTISTS.*

BY

W. HORSLEY GANTT, B.Sc., M.D. VIRGINIA.
(Formerly Chief of the Medical Division of the American Relief Administration, Leningrad Unit.)

PART II.—ORBELI, SPERANSKY, AND OTHER INVESTIGATORS.

ORBELI'S WORK ON THE SYMPATHETIC NERVOUS SYSTEM.

THE work of Professor Orbeli is entirely independent of that of the Pavlov laboratory, but he is one of Pavlov's oldest pupils, and Professor Pavlov told me that he considered his work extremely important. A description of some of Orbeli's work was given in the *BRITISH MEDICAL JOURNAL* of September 20th, 1924 (p. 533). He has been kind enough to give me a summary of all he has done since and to demonstrate his new work to me. The following account is founded on what I have seen and the written account Professor Orbeli has given me. Part of this has been published in Russian and part is as yet unpublished.

Langley supposed that the autonomic nervous system has no influence on skeletal muscle. Orbeli, in an article in the jubilee volume presented to Pavlov, says:

"In the last twelve to fourteen years this point of view about the sympathetic nervous system has been subject to doubt and revision. On the one hand the histological findings in a series of motor end-plates, nerve endings of the second order, more delicate and finer plates connected with unmyelinated fibres, indicated on the basis of regeneration experiments that they were sympathetic; on the other hand, physiologists have recorded various experiments explaining the sympathetic innervation of skeletal muscle. . . . A few years ago, unaware of the anatomical experiments of Boeck and Aghdur and the accompanying physiological investigations, I, on the basis of a number of considerations, suggested that the sympathetic nervous system is truly universal, and must have a direct influence on skeletal muscle, as on all other systems in the organism, and that this effect might be expressed with such variations in the properties of muscle as first described by Pavlov and Gaskell for heart muscle, and later detailed by Englemann under the terms bathmotropic, inotropic, dromotropic, and tonotropic."

From experiments by Ginetzinsky on the frog, Orbeli is led to conclude that the sympathetic nervous system has two antagonistic influences, and that a certain relation exists between the functional disturbances produced by irritation of the sympathetic and the chemical processes which underlie muscular rigidity. In poisoning with chloral hydrate, following stimulation of the sympathetic tonic contractions supervene, beginning after a long latent period, and continuing as an after-effect. Apparently we have to do here with an easily reversible form of those changes which, if of greater intensity, lead to muscular rigor (Strelzoff).

The electrical conductivity of resting muscle and muscle fatigued by tetanizing was compared by Lebedinsky. The recovery of the tetanized muscle was hastened by stimulation of the sympathetic. Tetanization lessened the resistance of the muscle to the electric current, but in the majority of cases the stimulation of the sympathetic accelerated the return to the normal.

Orbeli and Fiedelholz have investigated the "pseudomotor" or "tonomotor" effect of the lingual nerve on the musculature of the tongue. Opposing explanations of this have been given by Van Rynberk and by Frank. The hypoglossal nerve was cut about two weeks previous to the experiment to give the fibres time to degenerate. By trying the effect of stimulation of the lingual nerve at various periods after its section, the pseudomotor and the vascular phenomena can be independently elicited. From this it may be concluded that the tonomotor and vasodilator effects are to be assigned to different nerve fibres. Adrenaline was injected intravenously to reinforce the action of the sympathetic on the tonomotor influence. In these experiments the effect of the lingual stimulation:

* Part I of Section VI of this series was published in the *JOURNAL* of June 11th, 1927, at page 1070.

was indisputably strengthened and was especially marked when the lingual fibres began to degenerate. The results obtained are in full agreement with the behaviour of the sympathetic in other forms of motor innervation.

Ginetsinsky, in Orbeli's laboratory, repeated the experiments of Else on the frog, with certain modifications designed to give more definite results. Ginetsinsky eliminated the influence of the afferent nerves, and showed that the sympathetic alone was responsible for the effect. Both suprarenals were removed and the sympathetic chain was cut on one side. The muscles which had been deprived of the sympathetic innervation were more quickly exhausted and the height of the contraction was less.

In June, 1925, Dr. Tonkich reported from the Orbeli laboratory the effect upon spinal reflexes of experiments on the sympathetic. By stimulation of the lower end of the sympathetic trunk an inhibition or augmentation of the spinal reflexes was produced and paralysis followed. This was analogous to the ascending paralyses which Professor Pavlov had at first described as an accidental result of the operations, but which he later attributed to the presence of trophic nerves. He stated in 1920 that the existence of such trophic nerves had been proved only in the case of the heart, but that they might be supposed to exist for other organs, to exert a definite and final control over the metabolism and the mechanical processes occurring in the various tissues. It thus appears that the experimental work of Orbeli may give an actual foundation to the hypothesis of Professor Pavlov in regard to trophic innervation. Orbeli summarizes his work as follows:

"The sympathetic nervous system exerts a profound influence over the chemico-physical changes occurring in skeletal muscle, accompanied by a modification of its functional ability. These changes influence, it seems, the conditions of the motor end-plate, call forth changes in the efficiency of the corresponding muscles, and form a sort of regulatory mechanism for the expenditure of muscle strength and govern the conduction of impulses by the motor nerves. From this point of view the sympathetic innervation of skeletal muscle is an adaptive innervation through which the functional ability of the muscle is determined."

OTHER NEW WORK OF ORBELI.

Further experiments from Orbeli's laboratory show that the efferent sympathetic fibres have a direct influence on the central part of the spinal reflex arc. The work was carried out on completely bled frogs from which all the viscera and the heart had been removed.

After demonstrating the direct effect of the efferent sympathetic fibres on the central part of the reflex arc of spinal reflexes, there arose the question of a possible influence of the central part of the sympathetic system on the spinal reflexes. To solve this problem Tonkich made an experiment by Setchinov's inhibition method—the stimulation of the optic thalamus with sodium chloride, on the assumption that the centre of the whole sympathetic system lies in the subthalamic region. Orbeli concludes from these experiments that in this case there is no direct reciprocity between different parts of the central nervous system, but that there is a regulating activity of one part of the central nervous system by others through the sympathetic.

Experiments of Ginetsinsky performed in an atmosphere of hydrogen prove that the effect provoked in skeletal muscle by stimulation of the sympathetic cannot be explained exclusively by the augmentation of the oxidation of the products of metabolism. Other experiments demonstrated that the effect of the sympathetic in skeletal muscle occurs in that place where the stimulus from the nervous tissue is transferred to the muscular—that is, in the peripheral apparatus of the motor nerve.

Experiments on dogs showed that when the left abdominal sympathetic trunk was resected the thresholds of stimulation on the two sides differed; this lends support to the hypothesis of Orbeli that the sympathetic contains regulating fibres for the motor as well as for the sensory end apparatus.*

* For details of these last experiments see W. H. Gantt, *Work of Pavlov's School, Arch. of Neurology and Psychiatry*, Chicago, April, 1927. For a full bibliography concerning the sympathetic and muscle tonus, consult Stanley Cobb, *Review on the Tonus of Skeletal Muscle, Physiological Reviews*, October, 1925, p. 519.

CEREBRAL PATHOLOGY.

Much interest has been aroused by the researches of Dr. A. D. Speransky, formerly a surgeon, conducted in his own laboratory, as well as in Pavlov's. He produced an auto-neurotoxin giving rise to epileptic convulsions and death in dogs by freezing a small part of the brain. Immunization against the symptoms of freezing has been partly successful by freezing the brain gradually in increasing doses. If the frozen brain emulsion from a dying animal was injected subdurally in a healthy dog it could resist larger doses of freezing. Recently he has been concerned with the pathology of the cerebro-spinal fluid in encephalitis. He says (personal communication):

"In local disease of the nervous system a destruction of the brain substance occurs in the affected parts. The products of destruction are transported into the cerebro-spinal fluid and through it poison the brain. In such a way local disease becomes general, and to this mechanism is due the development of diffuse encephalitis.

"The greatest quantity of the cerebro-spinal fluid comes into relation with the brain substance in the region of the ventricles. . . . This is why subcortical destruction often occurs earlier than cortical. The structural changes in the brain and the clinical symptoms in all toxic encephalitis, as tetanus, hydrophobia, diphtheria, epidemic encephalitis, toxic encephalitis from freezing the brain cortex, have many things in common. In all of these the parts of the brain lying in the vicinity of the ventricles are affected; in all are observed changes in the cornu ammonis; in all there is an infiltration of the shallow parts of the brain substance near the ependyma. The internal brain substance in nearly all of these cases has an infiltration in a circle of cells, not around the blood vessels as was formerly supposed, but around their adventitious sheaths filled with cerebro-spinal fluid."

Speransky, during the summer of 1926, devised an operation to isolate for study small sections of the sub-arachnoid and subdural spaces without disturbing the rest, in a way somewhat analogous to that by which Pavlov isolated a miniature stomach for collection of the gastric secretion. His recent work with the cerebro-spinal fluid has led Speransky to form the following conclusions as to the haemato-encephalic barrier: its site is uncertain, but it is known that substances in the blood do not occur in the cerebro-spinal fluid. Although ordinarily it has a defensive action, in pathological conditions it may have an undesirable action. Thus some toxins, as that of tetanus, are not arrested by this barrier, but the antibodies and specific serums are. The toxins which reach the brain are fixed there and are not eliminated, but the antitoxins are quickly destroyed, and their return to the blood is prevented by this barrier. The introduction of specific antibodies in the subdural and subarachnoid spaces does not ensure penetration into the brain. His results with rabies, diphtheria, tetanus, dysentery, scarlatina, measles, and meningitis are as follows.

Rabies.—Speransky says that rabies is a disease of the brain only, and can be treated by passive or active immunization.* Ordinarily antirabic serum injected into the subarachnoid space cannot penetrate to the interior of the brain, but if hyperaemia is produced artificially by removing all the cerebro-spinal fluid penetration begins. Under such conditions the action of the antirabic serum is specific—the same *in vivo* as *in vitro*, because it comes into contact with the virus. Subdural injection is efficacious clinically, whereas intravenous is not, because of the haemato-encephalic barrier. Speransky has overcome this obstacle by withdrawing cerebro-spinal fluid at the same time as the injection is made. He considers that the veins of the cranium and of the brain substance are complementary, and that the pressure in the latter is dependent upon the pressure of the surroundings. He was led to this view by observing that there was no bleeding during trephining if the cerebro-spinal fluid had been withdrawn, and that after removing a large amount of cerebro-spinal fluid the next portion, instead of being colourless, was yellow. Antirabic serum was injected into the ear veins of twenty rabbits, and then in ten of them 1 to 1.6 c.cm. of cerebro-spinal fluid was removed by aspiration and reinjected several times before final removal. After one to two hours the brains of all twenty were inoculated with

* *Annales de l'Institut Pasteur*, 1927.

the virus of rabies. Those in which the cerebro-spinal fluid had been removed remained healthy, while all the others developed rabies. This process of aspiration and reinjection I shall refer to as re-aspiration.

Diphtheria.—Eighteen pairs of rabbits were injected with diphtheria toxin, and, after an hour, with antitoxin. The 18 controls died on the third day. In the other 18 the cerebro-spinal fluid was aspirated and reinjected five to ten minutes after the antitoxin. Five of these remained healthy, 11 outlived the controls by three to five days, and 2 died at the same time as the controls; but when the re-aspiration was done, not one hour, but forty-five minutes after the injection, all the animals survived.

Tetanus.—Re-aspiration lengthened the life of the animals, but did not prevent death, owing, as Speransky believes, to the early fixation of the tetanus toxin in the brain. Six clinical cases of tetanus have been treated by re-aspiration. The antitetanus serum was introduced in five cases intraspinally after withdrawal of 40 to 110 c.cm. of cerebro-spinal fluid, which amount can be aspirated under narcosis without unfavourable results. The operation was repeated after one to two hours and was done four or five times. Five of the cases recovered gradually, but in the sixth no fluid was obtained, and owing to this failure to produce hyperaemia by aspiration death occurred.

Dysentery also was treated by this method. In animals which had already developed diarrhoea and paralysis the best results were obtained by simultaneous injection in the blood and in the cerebro-spinal canal; in no case did intravenous injection alone produce a cure. Although the union of the dysenteric toxin with the brain substance does not appear to be so stable as that of other toxins, Speransky concludes that the penetration of the specific antibodies into the central nervous system is necessary for the serum to produce its curative action. He suggests also that the difference between the action *in vitro* and *in vivo* of many other serums (anticholera, etc.) is due to the failure of contact between virus and serum. Anti-diphtherial serum has nearly the same effect, whether it is introduced subcutaneously, intramuscularly, or intravenously, because diphtherial toxin can destroy the barrier; it "leaves the gate open," while all other toxins which pass this barrier "close the gate behind them," so that antibodies cannot enter.

Scarlatina.—Eight grave cases were treated by aspirating 15 to 20 c.cm. of cerebro-spinal fluid and injecting 4 to 10 c.cm. of serum;* five of these completely recovered (disappearance of fever, exanthem, and symptoms); in two there was an incomplete effect, and in one there was no effect. Injection of the same amount subcutaneously into the blood or muscles was without effect, although the use of 100 to 200 c.cm. by these routes is effective. The best results were obtained by simultaneous introduction on both sides of the barrier.

Meningitis.—Speransky's method of re-aspiration led, in four grave clinical cases of acute epidemic meningitis, to recovery commencing simultaneously with the procedure. Re-aspiration was repeated every two to four hours, and 10 to 20 c.cm. of fluid was withdrawn.

Speransky holds that the appearance of "general" symptoms of a disease indicates penetration into the central nervous system, and that many local lesions are due to an affection of the corresponding parts of the central nervous system. The rapid oscillation of pressure caused by re-aspiration changes the circulation in the blood vessels of the brain to such an extent as to permit antibodies in the blood to pass through. Although Speransky has never seen any disastrous effects from the use of this method, he says that his clinical material is too small to draw a conclusion, and he cautions against its indiscriminate use, since it may be very dangerous to remove too much cerebro-spinal fluid in some cases.

PREVENTION OF NEURO-MUSCULAR FATIGUE.

Professor A. A. Bogomoletz of the Second University of Moscow, who has made many contributions to contemporary

* The Russian serum is considerably weaker than the product of Parke Davis.

Russian pathology, recently called attention to the importance of the mesenchyme in determining constitutional types; a healthy reticulo-endothelial system is, he states, the best protection against cancer; and this he has substantiated by preventing the development of experimental cancer through the use of a cyto-stimulant of the reticulo-endothelial system.

In 1925 he reported that neuro-muscular fatigue in horses can be lessened by the administration of sugar. This received practical confirmation during the Moscow races of 1926, when a horse which had always lagged behind was treated by Professor Bogomoletz, with the result that it won first place and the professor the prize of 30,000 roubles given by the Government for scientific research.

Chemical examinations of the blood of race-horses showed that the variations were constant in each individual. Three groups were distinguished: (1) those with normal content of blood sugar; (2) those with hyperglycaemia; (3) those with hypoglycaemia. The latter were found quickly to become fatigued, and to show slight hyperglycaemia after the race. The administration of 500 to 1,000 grams of sucrose daily increased the blood sugar, and simultaneously bettered the horses' racing time and diminished the subsequent fatigue. Professor Bogomoletz has informed me that in some horses which could not even finish the course he succeeded, by changing the diet on the basis of the blood analyses, in improving their general condition to such an extent that they often won first place. On the other hand, the administration of sugar to those of the first group often caused a reduction of the blood sugar, which is explained by Professor Bogomoletz as due to a probable interference with the function of the islands of Langerhans.

The amount of phosphorus in the blood after racing showed an increase parallel with the hyperglycaemia. It is possible, according to Bogomoletz, that we have here an automatic chemical regulation of the production and destruction of lactacidogen, and that phosphoric acid (H_3PO_4) quickens the breaking up of glycogen. It was found in large quantities in fatigued isolated muscle.

The increase in the concentration of K-ions and the reduction of those of Ca formerly observed in athletes was found also in horses during the races. Bogomoletz considers this to be an important factor in fatigue. The prevention of fatigue should have regard not only to the above facts, but also to the aeration of the blood before exercise by thorough ventilation and the administration of oxygen.

CANCER.

Several methods of treating cancer have been tried in Russia since the revolution. Besides the Molotkov method, which has been published, and which consists in cutting the sympathetic nerves in the cancerous area, Dr. Spasokukotzsky, professor of surgery in the University of Moscow, is trying a procedure based on the researches of Lintvarev of Saratov. Spasokukotzsky has not published his results, as he does not wish to be swamped with useless requests from patients, but he has given me the following verbal account for this JOURNAL:

"Lintvarev has shown that in disease the red blood cells contain a larger percentage of toxins than the blood serum. We have treated three cases of inoperable cancer by reinjecting them with their own blood cells. About 40 c.cm. of blood are withdrawn from the patient; the red blood cells are separated and washed and then injected subcutaneously. There is no reaction (rise of temperature, chill, or convulsion) whatever, although severe symptoms are observed if the blood serum is injected. The first case was an inoperable cancer of the breast. A year ago we gave her ten injections of her own red blood cells, and she is still living, and even better, although untreated she would surely have been dead; she now has freer use of her arm and the cancer is smaller. The second patient, who had cancer of the oesophagus, a condition usually rapidly progressive and fatal, received three injections; the course of the disease has apparently been arrested as the patient is no worse. The third case (inoperable cancer of the breast) was almost cured by our injections, but when we endeavoured to hasten the treatment by using for injection the red blood cells of another cachectic cancer patient she became rapidly worse. This method of treatment, the auto-injection of washed erythrocytes, has given excellent results in

cases of surgical tuberculosis, especially in tuberculous peritonitis. Rapid improvement has followed in every case in which we have tried it."

A. A. Bogomoletz has retarded the growth of cancer in mice in the following way: The spleen, bone marrow, and omentum (tissues rich in reticulo-endothelial cells) of mice were macerated and made into an emulsion. This was then injected into a number of rabbits, four or five injections at intervals of five days. After a month the blood of the rabbits might be expected to contain antibodies for the reticulo-endothelial cells of the mouse—haemolysins, agglutinins, etc. To see which rabbits had actually developed these anticytotoxic bodies they were tested by the Bordet-Gengou method. Small doses of this rabbit serum were found to stimulate, and large doses to depress or "block," the reticulo-endothelial system of the mouse. A batch of over 500 mice was divided into three groups. All the groups were subcutaneously injected with cancer cells from other mice. Group I was used for control; 50 per cent. of them developed cancer. Group II was injected with *small* (therefore stimulatory) doses of the rabbit serum containing the anticytotoxic bodies for the reticulo-endothelial cells of the mouse; only 10 per cent. developed cancer. Group III was injected with *large* (therefore depressing) doses of the same rabbit serum, and 70 per cent. developed cancer. These data support Bogomoletz's theory that the growth of cancer is dependent upon the health of the reticulo-endothelial system.*

WORK OF CHALATOV.

By transplantation of the testicles of young cats to very old ones and ligating the vas deferens at the same time, Chalatov obtained a growth of new incisor teeth in three cats, 12 to 14 years old. His further studies with cholesterol show that in starvation the blood cholesterol is diminished, but that it rises again just before death. Removal of the thyroids caused a diminution, but extirpation of the kidneys or parathyroids a great increase of blood cholesterol (Nekludov). Resistance of the red blood cells was found (Frankel) to be less in the hepatic than in the peripheral veins, a fact which he considers in favour of the view that haemoclastic function resides in the liver rather than in the spleen, as formerly thought.

DIGESTION.

Effect of Mineral Waters on the Gastro-intestinal Tract.

The Caucasian mineral waters, taken with food, markedly augment the secretion of gastric juice and shorten the whole period of digestion. The same waters taken half an hour to an hour and a half after food have an inhibitory effect on the secretion of the stomach, due to the water having passed into the duodenum, where it acts when food is taken into the stomach. These waters do not increase the secretion of the bile, but it seems that they hasten its expulsion from the gall bladder into the duodenum (Fursikov, Martinson, et al.). All these waters contain calcium, magnesium, iron, sodium, and free carbon dioxide; some are radio-active.

Effect of Vegetable Juices on Gastric Secretion.

In 1917 it was shown in Pavlov's laboratory by Volborth and others that vegetable juices have a great effect on the secretory action of the stomach. K. M. Bykoff found that vegetable juices taken with meat and other proteins greatly increase the flow of gastric fluid. This was held to afford a scientific basis for the use of the soups made of meat and vegetables which are so popular in Russia. When vegetable juices were taken with carbohydrates the flow was also greatly increased. Bykoff found also that during the first hour fatty foods inhibit the action of the gastric glands, but that if given with vegetable juices the inhibitory phase of the fat completely disappears, and the total quantity of the stomach juice for the whole period is much greater than with fat alone. This experiment explains the use of fatty foods and vegetables together—

for example, butter and cooked apples together give a great flow of stomach juice. From the secretory effect and from the composition of their ferments, vegetable juices must be considered as energetic stimulators. The work was done on dogs with pouches isolated according to the method of Heidenhain and Pavlov.

Later studies showed that tomato juice was the strongest of all known natural stimulators of the gastric secretion, including even meat extracts. During the two and a half hours after giving 250 c.cm., 16.3 c.cm. of gastric secretion were obtained from the little stomach of the dog; 200 c.cm. of distilled water gave during the same time only 1½ c.cm., and 250 c.cm. of cabbage juice 8 c.cm. The juice of cauliflower caused a secretion somewhat larger than that of cabbage; watermelon juice, two or three times greater than distilled water; the juice of cherries and grapes produced the same amount of secretion as distilled water. The simultaneous administration of 250 c.cm. of tomato juice and 250 c.cm. of warm mineral water ("narzan," similar to apollinaris) called forth a much larger secretion than even the tomato juice alone. When mineral water was added to watermelon juice the secretion was greatly increased. When vegetables and mineral water were given together the combination produced more secretion than either alone.

CONCLUSION OF THE SERIES.

In concluding this series of articles I desire to reiterate my point of view—that is, I have had no political end to serve, and I have had nothing to prove. My original idea was to present the general medical and scientific facts that I had collected in Russia, in order to give information on an important subject, and at the same time to balance these facts so that the whole series of articles would convey to the careful reader an accurate conception of the situation. The perusal of isolated passages will not, I think, produce a correct impression of the events.

The following conclusions can, I think, be safely drawn. There has been in Russia, from the medical point of view, a truly appalling calamity—intense suffering, indescribable horrors of severe famine, wholesale ravages of disease, extreme general poverty, and bestial conditions of living. Although the effects of this will continue for a long time, the acute stage is passed, and is being followed by one of slow but gradual reconstruction. The disaster was probably due in the main to the accompanying disorder and prolonged deprivations of continued war and revolutions in an already demoralized country. The sweeping political changes came at a time unfavourable for the experiment, and it is therefore more difficult to judge accurately of their effects than of those of the war on disease during this destructive period; but it can be seen that they have already initiated profound general mutations, the full force of which will not be manifested perhaps for a generation—such as, for example, the difference in moral standards and education, the substitution of community and club life for that of the family, and so on.

As the period of destruction has been the most prominent and has had its acute crisis I have devoted more space to it than to that of the subsequent reconstruction, which is only just beginning and is occurring along various lines. Although I have included some recent scientific achievements, these, though given official encouragement, have been mostly in the nature of individual efforts. I intend to treat in more detail later on this stage of reconstruction.

I desire to express my gratitude to Sir Dawson Williams for his consideration in having first helped me with the outline of the material I had collected. To Dr. J. W. McNee I am indebted for suggestions about the present article; and to S. G. Kiryanova and I. Guerbatch for assistance in the preparation of material from the Russian.

Note.—In order to avoid any confusion that might arise from the reference to Pavlov's two books in the footnote to my article published in the BRITISH MEDICAL JOURNAL of June 11th, 1927 (p. 1070) I desire to say that the volume there mentioned as *Activity of the Cerebral Hemispheres* is that published by the Oxford Press in July, 1927, under the title *Conditioned Reflexes*, while the one called *Conditioned Reflexes* in my article is another book, which has not yet appeared in English.

* Personal communication of unpublished work.