ticularly younger men engaged in important investigations, gain the uncomfortable feeling that they are not doing their full duty when they plod along so far removed from the noise of the conflict. Such persons need encouragement at the present moment. They must not all be permitted to withdraw from the less conspicuous though highly important labor of productive investigation which may anticipate the needs of the hour. The war has already directed attention as never before to the intimate relations between science and industry, as well as to the vital necessity of fostering these relationships. Two generations ago, Dr. Lyon Playfair deplored the holding "to mere experience as the sheet anchor of the country, forgetful that the molds in which it was cast are of antique shape, and ignorant that new currents have swept away the sand which formerly held it fast, so that we are in imminent risk of being drifted ashore." Despite the brief period full of the enormous difficulties of organizing a great military campaign and instituting active defenses as well as naval warfare, substantial headway has already been made in the mobilization of scientific investigation. Researches can not be manufactured on command or completed over night. Nevertheless the National Research Council has already made a commendable beginning in a movement that will enlist some of the best scientific minds of the nation and encourage them to continue the work for which they are specially trained and best equipped. In our enthusiasm for the more apparent helps to success we must not forget these potent silent forces, nor allow the leaders of the nation to overlook the need of supporting and stimulating them. Even war thrives thrugh the fundamental discoveries of science. —The *Journal* of the American Medical Association.

SCIENTIFIC BOOKS

Tomorrow: Letters to a Friend in Germany. By Hugo Münsterberg. D. Appleton & Co. $1.

As soon as Columbia really sets her face toward peace, the war clouds will be dispelled and the age of our hopes will dawn. My mind is gleaming with radiant hopes. Peace must come soon, and who knows, my friend, when the roses bloom again in your beautiful garden, one of the German ships interned here in Boston may have brought me back to the Fatherland to you. I am sure in one wondrous hour at home I can tell you face to face so much more than I have told you in these letters. Yes, when the roses bloom. . . .

The roses will bloom, and perchance peace will come, but the author of these hopeful words has departed, leaving a message which will not soon be forgotten. Professor Münsterberg wrote his last book, well called "Tomorrow," in the form of letters to a friend in Germany. The professor of psychology has given us a study of extraordinary psychological interest; wherein, under a certain appearance of unity, we see the ferment of German and American ideals, and their influence on a scholarly mind. When he came to this country, Münsterberg stipulated that he would remain a German citizen. He did so remain, in a political sense; yet he could not escape Americanization, and his last wish, in the midst of war and of anti-Germanism, is for the union of Germany, England and the United States!

Nevertheless, the German point of view is never forgotten. The ideal is nationalism, combined with a not too insistent internationalism. Science, philosophy, art, must be international; the new nationalism of Germany, which "pleads for a kind of intellectual embargo," is petty and dangerous to real culture; yet "truth must be clothed in its national garb." What is nationalism? It is not the cult of race: "we have heard so often and with so much assurance the story of the omnipotence of race in human history. The true psychologist always knew that it was a legend, and the war has demonstrated it again." Yet, we are told, "in every nation we grasp a oneness of traditions and memories, of language and customs, of laws and literature, of arts and sciences, of commerce and politics, of morals and religion." Do we, indeed? In Switzerland or the British Empire, for example? Is

it not a fact that the nation, as nations go today, is an artificial alliance for economic purposes? The real groupings of mankind, in a spiritual, intellectual or even historical sense, are usually not coincident with national boundaries, and afford no support to the doctrine that nations are the most sacred of all human units. How far Münsterberg could be led astray by the ideal of nationalism is shown in his defense of the militant professors who, "uplifted by a healthy patriotism," proclaimed historic and political facts as they appeared from the angle of their hopes (p. 37); yet he hastened to add that "while our beliefs may clash, no hatred ought to darken our vision."

The new idealism, as interpreted by Münsterberg, is that of organization for public service. "Where individualism prevails, subordination is unwelcome; and that means that dilettantism flourishes and the expert is powerless. The dilettant is now ruled out and the triumph of the expert secured all over the world for the days to come; organization replaces haphazard performance; the self-conscious will of the group suppresses the individual whim. To have attained this is the most important victory of the German nation. If the war brought nothing else, this alone may make us feel that those who died on both sides did not give their lives in vain" (p. 137). With this interpretation, the new nationalism finds fresh meanings. The nation is now the cooperative unit. It is the machine, all parts of which work together in harmony. Why not extend this idea further, and let the unit be mankind?

The conception of universal cooperation, once we have grasped and appreciated the extraordinary coherence of such a strange conglomeration as the British Empire, is simple and attractive. Since nations, artificial as they are, are such workable units in time of stress, what is to prevent the extension of the national method until nations are no more? Münsterberg looked forward to something like that: "the world federation ought to be an ideal . . . but it must have ages to mature." It can not come through law, but must arise "out of the needs of the active nations," must be dynamic and constructive.

The interplay of diverse ideas and ideals produces inconsistencies which alternately irritate and charm. It is irritating to find what seems to be a failure in the integrity of scientific reasoning, but one is charmed at the naïve sincerity of the utterances. After all, the road to salvation is not the straight and narrow path we have been led to imagine, but has many turns. Every promising path appears to have its obstacles and its dangers. Even the federation of the world might lead to an ossification of the springs of originality in mankind. State socialism may go the way of all organization carried to extremes, and lead to petrefaction.

History shows us that the causes of progress are largely individual. The new movement arises as a consequence of the breaking away of some personality from the fetters of the established order. He may be crucified, but his work permeates society, and fructifies through social cooperation. Thus individualistic and socialistic forces are alike indispensable for progress. Münsterberg seems not to have fully appreciated this; the Germans, as a nation, do not appreciate it, and that is why we dread the "Prussianization" of the world. On the other hand, we have not sufficiently appreciated the importance of organization; and here in America, in particular, the work of individuals fails for lack of adequate cooperation.

We grant with Münsterberg that a genuine idealism is at the base even of German warfare. He himself defines it exactly. "It is a belief in 'absolute' values. . . . Belief in absolute values means simply that the deed is valued independent from the pleasure it brings. . . . If we are filled with the belief that an action has value without any reference to pleasure or pain, then we credit it with absolute value. To be guided in life by such a belief is idealism." This conception is expanded quite fully, and as presented has its attractive side. Indeed, who can go through life sanely or usefully without some such idealism, some belief in unprovable axioms or "absolute values"? Yet modern science becomes more and more experimental, more and more inclined to test all things, and hold fast to that which is good,

as shown by the test. Pragmatism may be vicious when narrowly conceived, but the pragmatic attitude leads us away from dogmatic idealism toward intelligent action. The German army, in its conduct toward its own members as well as its treatment of the unfortunate peoples who come under its power, does indeed strive for "values" independently of pleasure or pain. Nationalistic idealism can be made the excuse for deeds which could find no justification in the presence of the simplest enquiries into consequences, as measured by those supposedly negligible phenomena, human pleasure and pain. Münsterberg, great-hearted and striving after good, would not have so far forgotten the relations between cause and effect; but we must combat any philosophy, any course of action, which does not incessantly seek justification by results measured in human welfare.

T. D. A. COCKERELL

SPECIAL ARTICLES

A RHYTHMICAL "HEAT PERIOD" IN THE GUINEA-PIG

DURING the past six years we have been using guinea-pigs in an extensive breeding experiment and it has become more and more evident as our work goes on that the existing notions of the ovulation periods in these animals are of no practical value, or are practically incorrect. In a number of the experiments it became important to know accurately when the females "came into heat" and when ovulation took place. We had concluded, from numerous observations as well as theoretically, that the female guinea-pig very probably had a definitely regular and periodic sexual cycle if it could be worked out exactly. On account of the need of this exact information, we have studied the œstrous cycle in these animals during the past eighteen months.

Most other attempts at a solution of this problem have centered in a study of the ovary, which necessitated either its removal by operation or the killing of the animal. In either case the procedure brought to a conclusion the observation or experiments on the ovulation cycles in that specimen. Recognizing, on the other hand, that no thorough investigation of the uterus and vagina in the living female had been made, it occurred to us that possibly œstrous changes might take place even though they are so feebly expressed as not to be noticeable on casual observation. The absence of an apparent œstrous or proœstrous flow from the vagina of the guinea-pig has, no doubt, been the chief reason for the general lack of knowledge of the œstrous cycle. It was, therefore, determined to make a minute examination of the contents of the vaginæ of a number of females every day for a long period of time to ascertain whether a feeble flow might exist, although insufficient in quantity to be noticed at the vaginal orifice or vulva.

The observations were made by using a small nasal speculum which was introduced into the vagina and the arms opened apart by means of the thumb screw. This instrument permits an examination of the entire surface of the vaginal canal. In this way the vaginæ of a number of virgin females have been examined daily and smears made from the substances that happened to be present in the lumen.

By the use of such a simple method, it was readily determined after examining the first lot of animals for a few months that a definite sexual period occurs lasting for about twenty-four hours and returning with a striking regularity every fifteen or sixteen days. During this twenty-four hour period the vagina contains an abundant fluid which is for about the first half of the time of a mucous consistency. The vaginal fluid then changes into a thick and cheese-like substance which finally becomes slowly liquefied and serous. This thin fluid exists for a few hours and then disappears. Occasionally toward the end of the process a slight trace of blood may be present, giving the fluid a bloody red appearance, otherwise it is milk-white or cream color.

According to the changes in appearance and consistency of the vaginal fluid, one may distinguish four different stages. The first stage having a mucous secretion, a second stage the cheese-like secretion, a third stage with the fluid becoming serous and a fourth stage, not always recognized, during which a bloody dis-