

of fact, there are no horses, dogs or cattle in the 'fly country.' In other protozoal diseases, such as the *Piroplasmata*, this acquired immunity seems to come about fairly readily.

To sum up, then, the increase in our knowledge of tsetse-fly disease during the last ten years, we may say that we have discovered the cause in the shape of the small blood parasite *Trypanosoma*: we have found that the reservoir of the disease exists in the wild animals, and that we can blot out this disease from any particular tract of country by the simple expedient of destroying or driving away the wild animals. We still have no means of preventive inoculation or successful medicinal treatment in this disease.

2. *Trypanosomiasis of Cattle.*

This disease seems to be widespread over all South Africa. It can not be said to be of much practical importance, as the cattle infected do not seem to be seriously affected by it. It is caused by a species of trypanosome remarkable for its large size, which was discovered by Dr. Theiler some years ago, and named *T. theileri*.

Dr. Theiler states that it is conveyed from animal to animal by the common horse-fly, *Hippobosca rufipes*.

This, then, is a short account of the trypanosome diseases which affect South Africa.

Of late years the tsetse-fly disease has become of less practical importance to the Transvaal, from which it has practically disappeared. This is due to the disappearance of the game, killed off by rinderpest; but with the preservation and restoration of the reserves with big game the disease is certain to reappear. Why the fly should disappear with the game is not known.

D. BRUCE.

(To be continued.)

EUROPEAN AND AMERICAN SCIENCE.

ONE of the important accomplishments, doubtless, of the International Congress of Arts and Science held in connection with the exposition at St. Louis was, simply, the bringing to this country of a large number of learned men from other nations. Some of these men had visited America before, but many of them crossed the Atlantic last autumn for the first time and viewed Americans and American institutions with, as it were, a virgin sense. A number of those who made the trip have recorded their impressions in addresses or journal-articles. It would be a worthy task, should these increase in number, to collect and to publish them together, for aside from the gratification of the curiosity of seeing ourselves as others see us, it could scarcely fail to be instructive for us to study the observations and comments of men of the high type of those who were invited to the congress.

Of the foreign scientists who attended the St. Louis meeting and have given public expression to their ideas of America, one of the most distinguished and discerning is the professor of anatomy in the University of Berlin. It was not Professor Waldeyer's first visit to America; fond of travel and widely-travelled as he is, it was not for a man such as he to have left so long America unvisited. Moreover, an omnivorous reader, Waldeyer is more or less familiar with American literature; he numbers, too, among his friends many American scientists and literary men; indeed, many young biologists and anatomists from America have, in part at least, received their training in his laboratory. By personal observation, by correspondence, by reading and by multiple contact with educated Americans, Professor Waldeyer has had, more than most foreigners, opportunities for familiarizing himself with American science and American thought.

It must, therefore, be of especial interest to people in this country to know that he has recently referred at some length to the subject of the relation of Europe (and especially Germany) to American science, and to learn, in brief at least, what are his views concerning it.

Waldeyer discussed the matter in a *Festrede* delivered at an open session of the Royal Prussian Academy of Sciences in Berlin early this year.¹ The occasion was the double celebration of the Kaiser's birthday and the anniversary of King Frederick II. The first part of the address dealt with the political relations of Germany and America, with especial reference to Frederick's attitude toward the American republic at its birth, a natural topic in view of the recent presentation of the statue of Frederick the Great to the American nation. It is the second part of the address which is of chief interest to the readers of SCIENCE, as it considers the special matter of the relation of Europe and of Germany to science in America. The whole address is characterized by a wish for harmonic relations, by a keen desire to foster and favor international scientific intercourse and by a plea for the avoidance of everything in the way of mutual misunderstanding and unseemly discord. It is a liberal and broad-minded statement, certainly as fully lenient to America as one could ask; it can scarcely fail to cement good feeling and to promote intercontinental harmony among scientific men. On adverting to this special topic Waldeyer points out that if two peoples are to cooperate in the work of the advancement of culture, the first necessity is mutual respect between them. Each must have something good, something self-achieved to offer, each must preserve its own indi-

viduality, not with obtrusive ostentation, but quietly and with that certainty which naturally accompanies the feeling of health and strength; for nations are like men—he who has not confidence in himself will also soon be given up by others. He urges the necessity of stilling those tendencies which arise from time to time in one nation to unjustly threaten or injure another, the desirability of getting rid of prejudices and of clearing up misunderstandings and unjust suspicions of the other, the importance of directing attention in each nation to the good in the other, of which it is often ignorant, owing to lack of knowledge of the nature of the people and of their civic and social institutions. This, he points out, is why Germans, in order to maintain a healthy and useful relation to American science, must, above all, know how the American thinks about culture and science, what the present position of science and scientific investigation in America really is, and how it is likely to shape itself in the near future.

Waldeyer admits that in Germany the false opinion that the American turns predominantly toward material interests and that he has but little inclination for purely scientific things is still widespread. Those who hold it, he says, forget America's great universities—Harvard, nearly 300 years old, with its 5,000 students per year; Yale, more than 200 years old; Princeton; Brown; the University of Pennsylvania, contemporaneous in foundation with Göttingen; Columbia, established seven decades ago; and young institutions, like Johns Hopkins, Cornell, the University of Chicago and the University of California, already grown to powerful positions in the country. If Germany bore in mind the great public libraries which exist in America, with their magnificent equipment, their easy access and their prodigious use by all classes, in-

¹ Waldeyer, W., 'Festrede,' *Sitzber. d. kg. Preuss. Akad. d. Wissensch.*, 1905, IV., 105–121.

cluding the working people, such a wrong impression could not prevail. The American's recognition of the fact that culture brings freedom with it, and his realization that, in a country where every one has the choice of sinking or swimming, a good education is a necessity for him who will hold himself above water in the fierce struggle, have led to the expenditure of great sums for public schools, for advanced education of all sorts, for museums, collections, laboratories, and the like, with results as good or better than those attained in Germany. Waldeyer, impressed with American progress in this regard formerly, confesses himself surprised at the advances made in the last decade. They surpass, he says, all expectations. "One needs no special prophetic gift to predict that, in fifty years, the United States will, as regards good arrangement, ease of use and wealth of what is offered, far outdo Germany."

Before attempting to answer the question, 'With all this liberal provision in the way of making arrangements for scientific work, has anything already been achieved in America?' Waldeyer turns to an intermediate consideration, to a general discussion, namely, of the factors which permit and foster the development of unusual men. The relative potency of heredity and environment is considered. The basis for any special capacity, be it bodily or mental, is an inborn gift of nature; it can not be increased in a given organization beyond the limits permitted by that organization. A mathematician can not be made of a man whose brain has not the necessary endowment therefore, any more than a singer can be developed if the individual be too defective in temporal lobe, ear or larynx. Here and there such natural capacities appear hereditarily in families, but as often or oftener the reverse appears to be the case. And it is not wealth or social

position which produces these extraordinary capacities; on the contrary, capable heads of the first rank emerge just as often from among the masses; they come from those in poor circumstances as frequently as from families that have long enjoyed conditions of preferment—an illustration of the beneficent and compensative justice of nature! That certain races are preferred can not be denied—the history of science teaches it. They are those races whose individuals, along with a healthy and harmonic development of the body as a whole, possess the largest brains relative to the body-mass. Climate, using the word in its broadest sense, here, doubtless, plays a part. Neither the prevailing darkness of the poles nor the flood of sunlight at the equator is suitable; it is a temperate climate in countries manifoldly broken up into land and water, where the soil is fertile, and the whole gamut of seasons is run through, which must be designated as most favorable. In such a climate men must work, but the work rewards and strengthens. Not that this climatic factor works directly; rather its action is such that it gives rise to strong, healthy men with superior brains. On the other hand, it is just as true that culture already attained and institutions of favorable influence already established, such as superior schools, well-organized and liberally endowed libraries and provision for the interchange of mental products, often help to permit intellectually important men to appear. As of two equally well-organized muscles, that becomes more efficient which is given the opportunity to exercise and test itself; so of two equivalent brains, the one which is offered the more abundant and better intellectual nourishment and the greater opportunity for exercise will yield the higher product. Many a highly endowed head has failed to become fully active, owing to

the existence of barriers to its development. Great geniuses like Napoleon I., Shakespeare and Gauss may, it is true, overcome every obstacle; by virtue of their extraordinary creative power they can do without and still not be held back; but easily accessible aids will undoubtedly awaken to able performances men of capacity, who otherwise would slumber.

On comparing 'old Europe' with the United States Waldeyer points out that the 'climatic' factor is in both instances all that can be desired. Though in western North America there are wide areas less favorably situated, a vast proportion of the country is as favorably located and formed as any part of Europe. The type of man is the same, indeed the whole of Europe has sent, in large part, of its best to contribute to the population of the United States. The means of culture are the same; in many respects America has the advantage, especially as regards ease of use and multiplicity of institutions. There can be no doubt, then, that in America effective men and women must develop in all spheres. Waldeyer calls the attention of his countrymen to the fact that it is by no means, as some think, in the natural sciences and technical subjects that Americans have already distinguished themselves; he cites, in evidence, a list of naturalists, economists, jurists, philologists, philosophers and historians of the first rank.

Some of the reasons for German failure to comprehend Americans are made clear. To understand the people of the United States properly, one must, he emphasizes, keep in view the fact that even their oldest towns never had walls, that there have never been feuds between cities, nor struggles between lords and men, that compulsory service and burdens other than those self-imposed are unheard of, and that the

state does not trouble itself about religious creeds, nor these about the state. All this affords a wide horizon and creates a feeling of personal independence—a feeling which Americans inherit from the founders of the republic and which is traditionally maintained in their bringing-up.

The magnificent equipment of America's scientific institutions reflects the national character. High praise is accorded by Waldeyer to the Smithsonian Institution, from which so many foreigners have received favors; to the Washington Academy of Sciences, with its various subdivisions; to the American Association for the Advancement of Science, and to the National Educational Association. But as a biologist, the Berlin anatomist is best able to judge of the state of the biological sciences here. After referring to his personally repeated conviction of the advances making in America he says: "I find that over there they stand equal to us in all essential points, in the kind and method of scientific work, in the value of the same, in the equipment and arrangement of laboratories, in materials for instruction and in the form and mode of imparting knowledge. Visit the great workshop of Alexander Agassiz in Cambridge; the anatomical institutes of Huntington in New York, at Columbia University, and of Mall in Baltimore; the Peabody Museum, so brilliantly filled by Marsh, at Yale; the anthropological museum in New York, etc., and you will say that I am right. J. Orth has recently made a similar statement. In a few years the new buildings of the Medical School at Harvard will be ready; * * * it may be prophesied that in them we shall have the best to be seen anywhere."

In view of the present standing and promise for the future of science in America, Waldeyer, proceeding with his address, urges the maintenance and strengthening

of the ties which now knit together the scientific interests of Europe and America. A comparison of the scientific 'capital' of the two countries, the climatic prerequisites and the creative and thinking human material, reveals an equivalence. If Europe is still ahead in antiquity of culture material and historical substrata, it will not be so long before America catches up. While European scientific institutions are good, care must be taken lest the freedom of their management be restricted, and Waldeyer warns his colleagues that otherwise Europe will soon fall behind America, for science and art flourish only in the open air!

In one large feature Europe is still, Waldeyer declares, ahead of America, and that is in the making of great scientific discoveries and the formation of those theories which have opened up wholly new domains of knowledge. To Europe, he says, belongs the credit of a surprisingly large number of new chemical elements, spectral analysis and, with it, astrophysics, the great discoveries in the chemistry of dyes and sugars, the physical chemistry of solutions, the liquefaction and condensation of gases, especially liquid air, the Röntgen and Becquerel rays, radium and its rays, color-photography, the dynamo-machine, electric light, indeed, most, he asserts, of the investigations and applications of electricity as a source of power, the electric furnace and its fruitful application; in the field of biology almost the whole doctrines of the protozoa and bacteria with their explanations of epidemics, the toxins and anti-toxines, the working-out of the doctrine of immunity, the discovery of the finer processes of fertilization and of karyokinesis, the doctrine of descent and Darwinism, and above all, crowning all, the conception and foundation of the great idea of the conservation of energy. These he lists as

the discoveries and theories of European investigators during the past fifty years; many of them belong to the immediate past. It would be possible to enumerate a series of men and researches in the domain of the historical and philosophical sciences also, which would easily demonstrate that, in them, too, the main weight of achievement still rests in Europe. He rejoices that Europe, with Germany in the heart of it, has retained up to the present its freshness in intellectual work and its youthful vigor. As long as the climatic factors remain as favorable as they now are there will be no lack of intellectual accomplishment.

Particularly noteworthy is a comment made by Waldeyer on the importance of the retention of individual character in men and institutions. The schooling of German youth has, he thinks, hitherto been good, and he values highly the independence of the German university. Too great a similarity should, he urges, be opposed. The strength of an investigator, of a scholar or of a teacher lies in the development of his peculiar powers. In Germany individuality in investigating and teaching is usually well marked; this, he lays stress on, should be left undisturbed, and, all the more, because in America there is a marked tendency toward making things uniform (*um so mehr, als in der Union alles zu einer gewissen Uniformierung drängt*).

While western Europe still occupies the first place in the field of science, the lecturer warns European workers that they dare not rock themselves to sleep in the pleasant certainty that this will continue to be true. "America's scientific capital is equal to ours; she is well in the way toward preceding us in the culture of the sciences. She has already produced men and performances of the first rank in considerable numbers; over night there may

be more of them. Above all, then, let us seek to keep company with America in the nurture of science. Let us unhesitatingly allow to the Americans what they have which is as good or better than ours; let us receive it from them gladly. And if we, through unceasing vigorous performance, can preserve for ourselves their respect and their attention, we shall, in the field of the sciences, help to knit closer the natural bond which exists between Germany and America."

Young Americans have, up to now, gone to Germany to learn from her teachers, but the time has arrived, Waldeyer continues, when German and European students should also go to America to widen their culture. This scientific intercourse between person and person, university and university, academy and academy should be favored in every way possible. "Let us be as liberal to them as they are toward us in the reception of those who seek knowledge, in offering to them all that they need. Let their published researches be found in our libraries also, at least in the great Royal Library of the capital of the empire. Let us show them in all things that on coming to Germany they come to a people of intellectual affinity, under whose political and social institutions even they, with their free views, may have a feeling of well-being. That they do the same for us can be said, to their praise, by all who have been their guests."

Germans should act toward America, he believes, as Americans do toward Germany; they should try to form a correct judgment of the scientific work of Americans by personal knowledge; more than hitherto, Germans must instruct themselves by visiting the country itself. It would do no harm if every year a number of German students went to America to widen their horizon. The plan of exchanging univer-

sity professors, already introduced, is highly commendable and should be further realized. While he does not feel called upon to give advice to Americans as to their future relations to Germany, Waldeyer says that he knows that, if Germans can remain at the high scientific level they have hitherto occupied, Americans will need no advice; they will gladly maintain their old relations as regards science, and will extend them. "And thus, aside from all else, looking purely at science and its service, will not, in such intercourse, the noblest and highest mission be fulfilled: the advancement and elevation of culture from people to people?"

It is difficult in an abstract to do anything like justice to such an address. All who are familiar with the beauty of Waldeyer's literary expression will desire to read the report in the original.

LEWELLYS F. BARKER.

SCIENTIFIC BOOKS.

A Select Bibliography of Chemistry 1492-1902. By HENRY CARRINGTON BOLTON. Second Supplement. City of Washington, published by the Smithsonian Institution. (Smithsonian Miscellaneous Collections, Part of Vol. XLIV.) 462 pp.

The first volume of Dr. Bolton's 'Select Bibliography of Chemistry' brought the literature down to 1892. The first supplement continued the work down to the close of 1897. In 1901, Section VIII., 'Academic Dissertations,' was published separately. The present work continues the whole work down to the close of 1902, and adds many titles, especially of academic dissertations, which had been overlooked in the earlier volumes. The following table will give an idea of the space occupied by the different portions of the book: Section I., 'Bibliography,' 5 pages; Section II., 'Dictionaries and Tables,' 6 pages; Section III., 'History of Chemistry,' 11 pages; Section IV., 'Biography,' 15 pages; Section V., 'Chemistry, Pure and Applied,' 162 pages; Section VI., 'Alchemical Literature of the