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AUGUST WILHELM VON HOFMANN.

ON May 6, 1892, the New York papers announced the death of this great chemist, in a brief despatch from Berlin; and the comments upon his life and works took an equally brief form. Yet there was probably no German professor whose name was dear to so many American pupils, no foreigner who viewed American science so sympathetically, no contemporary who had left so deep an impress upon one of the cardinal branches of human knowledge and industry. Chemical journals will bring to every laboratory eloquent tributes to the memory of the deceased master; but I am glad that this paper, which appeals to the general scientific public of the United States, opens its columns to a testimonial, however trifling and inadequate, from one of the departed master's pupils.

August Wilhelm Hofmann was born April 8, 1818, in the Hessian town of Giessen, in which his father lived as an architect. Giessen was an obscure town, harboring the equally insignificant University of the Grand Duchy of Hesse-Darmstadt. But six years after the birth of Hofmann an event occurred which was to have a curiously analogous effect upon his own career and that of his native town, the installation of Justus Liebig in the chair of chemistry. From a torpid mediæval village, Giessen became a centre of intellectual activity; its university achieved imperishable renown as the first to establish a laboratory devoted primarily to *instruction*. Equally beneficent was Liebig's influence upon young Hofmann: after devoting his attention successively to philology and to law, the example of Liebig drew him irresistibly toward chemistry, and he became one of his most enthusiastic and successful pupils. His first connection with Liebig was of a personal nature, since the erection of the University Laboratory, which was entrusted to the elder Hofmann, brought the two families into intimate relations. Later he married a niece of Liebig's wife.

His first apprenticeship as teacher, after the formal completion of his studies, was likewise passed under Liebig's eye; but in 1845 he established himself as *privat docent* in Bonn, although he was not destined to remain there long. Late in the same year he accepted an invitation to become the head of the Royal College of Chemistry, then newly established in London by Prince Albert, the Consort of the Queen. This institution was avowedly intended to be a reproduction, on British soil, of the Giessen Laboratory, and the choice of its director could not have been a happier one. The English pupils found in their teacher not the traditional German pedagogue, narrow, pedantic and awkward, visionary and incapable of adapting himself to his surroundings; but a brilliant lecturer, an energetic executive officer, a polite gentleman, a kind and encouraging teacher, and a sympathetic friend. During the seventeen years of his life in London he seemed to have completely assimilated himself to his surroundings, and the English world of science, ordinarily so nativistic, seems to have admitted him unreservedly within its fold. In fact, there was nothing upon which his energy and sagacity might be brought to bear, with which he was not entrusted. If there was a question to be solved in the manufactures, if the Treasury wanted advice in excise matters, if a competent judge were needed in international exhibitions of science and arts, if learned societies were in search of a representative head, recourse was always had to Hofmann. In fact, he received what was for many years the highest scientific reward in the bestowal of the Crown, the Mastership of the Mint. In England his greatest and most lasting work was doubtless accomplished. It was there that he and his pupils first investigated the organic compounds of phosphorus, the complicated ammonia bases, the cyanides, the isonitrils, and the mustard oils. In his laboratory the aniline dyes and the azo-dyes were discovered by himself and his pupils Perkin and Peter Griess. From all parts of the world pupils came to work under him, and I have heard him relate with pardonable pride how he was always sure in his extensive travels to find old pupils, be it in the extreme west and south of the United States or on the outskirts of European civilization in Egypt and Asia Minor. The Royal College of Chemistry became a place of pilgrimage for the young chemist, similar to Liebig's laboratory in Giessen, or to Berzelius's house in Stockholm, or Gay-Lussac's in Paris, in earlier times.

Nevertheless, he acceptod a call in 1862 to found a University Laboratory at Bonn, and actually planned and superintended the erection of the building. Before he could enter upon his duties as director, however, he received an invitation to a still larger field. He was to become the successor in Berlin of two recently deceased chemists of great renown, Mitscherlich and Heinrich Rose. A new University Laboratory was to be built in what was rapidly becoming the metropolis of Germany; the Royal Academy was anxious to provide additional facilities for private research. So it happened that Hofman really went straight from London to Berlin, in 1865; Kekulé filled the vacancy in Bonn, while Williamson assumed charge of the Royal College of Chemistry.

Until his death, Hofmann remained at the head of chemical affairs in Berlin. The laboratory was built in 1867, and at once was completely filled with students; in a short while it became rather uncomfortably crowded, and has remained so until now. It has always harbored numerous foreigners, especially Americans. As member of the Prussian Academy, he was entitled to a research laboratory and a dwelling, which were so connected with the Students' Laboratory that no time

was lost in passing from one to the other; even at times when he was not passing through the laboratory, a student requiring an answer to a serious question was always at liberty to seek him in his private laboratory or his library. He restricted his personal instruction, however, to a fourth of the students who were at work in the laboratory building, turning over the rest completely to his assistants. He lectured three to five times a week for two consecutive hours, always on elementary subjects. In winter the course was upon general inorganic chemistry; in summer upon organic chemistry. These lectures were profusely illustrated, very entertaining, and remarkably lucid. But their purpose was evidently much more to interest the beginner and to show him the beauties of the treasures within reach, than to present an actual key to these treasures, or, in other words, to deeply impress facts upon his mind. For eloquence and noble enthusiasm no speaker could surpass him.

As a teacher in the laboratory he was painstaking to the last degree. Restricting himself to a favored few and practically limiting the range of their instruction to organic synthesis, he endeavored to visit each at his desk once or twice a day, and would give him all the time he needed. Each new comer was put, for a longer or shorter period, at the preparation of well-known compounds, merely for the sake of practice. It was delightful to see the interest which he took in this routine work, the manner in which he made each tyro feel as if something depended upon the careful completion of these tasks. He would hail each carefully prepared specimen as if it were the most novel thing in the world to himself, and if it happened to be a substance upon which he had worked in former years, he would take especial pleasure in exhibiting all its properties. After a certain time, the student would be put upon an "original" investigation. As a general thing, it must be confessed, the results of these investigations did not show too much originality. He generally assigned subjects closely allied to work that was being done or had been done in his own private laboratory, the work of his students generally presenting corroborative evidence to results already obtained. But he always encouraged original thought, and was very ready to give credit for it. Whether the student was dull or bright, whether his investigation proved interesting or not, Hofmann was always helpful and encouraging; the only thing he could not stand was laziness. As a matter of fact, in spite of the freedom from disciplinary control in German universities, few American college laboratories could show so constant an attendance at all hours. He always took the greatest interest in the personal welfare of his students, and, especially if they were foreigners, would treat them as if they were instrusted to his personal care.

In his own work, he was indefatigable, and his private assistants, of whom there were four or more, certainly had arduous duties to perform; he would frequently work with them from 8 A.M. until 11 P.M. When he was a younger man, there were times when work was continued in relays, without any intermission, until it was completed. But there was never a lack of volunteers to fill any vacancy on his staff of assistants, even though the pay was very moderate. In return, he was kindness itself in looking out for their future and in providing for their relaxation in vacation time, so that they were always his enthusiastic followers.

As to his scientific achievements, the present writer is not sufficiently presumptuous to even hint a personal opinion; he believes, however, that it is the general judgment among those best qualified to speak, that Hofmann's great success was due to his great energy, his marvelous dexterity of manipulation and observation, and careful deductive reasoning, rather than to any startling brilliancy of invention, such as that of his master, Liebig. Hofmann's contributions both to pure and to industrial chemistry are those of the investigator, not of the inventor. He neither invented the "type" theory of Laurent and Gerhardt; nor did he first discover the production of coloring matter from aniline; in the various discussions of the fundamental structural formulæ, he rarely took part. But, the type theory once given, it was he who did the most to elucidate the "ammonia-type;" when rosaniline had been produced, it was his privilege to clearly explain the reasons that had brought about this happy accident and to show how the whole gamut of colors could be produced in a similar manner. The complicated ureides, the innumerable benzol derivatives, the natural and artificial alkaloids were all manipulated by him in a manner to make them more accessible to further study and more useful to mankind. Generalizations and metaphysical speculations were entirely foreign to his nature.

A peculiarly apt illustration of this bent of his mind may be found in the manifold apparatus he invented for the purposes of demonstration or investigation. While it never involved the application of new principles, as did those of Lavoisier, Gay-Lussac, Davy, Faraday, or Victor Mayer, it always showed the most thorough knowledge and most ingenious applications of all established methods of physics and of chemistry. For elegance and for the unfailing certainty of success in working, the apparatus invented by him will always stand pre-eminent.

To illustrate his energy and power of self-sacrifice, I would instance the occurrences after a serious illness which befell him at the age of 68, in the spring of 1886. He had been confined to his room for several weeks, and was not allowed to see anyone; barely recovered, he sent for his assistants, to hear their reports and sketch out new work; before he was allowed to leave his own house he sent for his students, day by day, to talk over their progress. As soon as the physician grudgingly assented, he resumed his lectures, not only speaking for two hours a day, at the regular hours, but actually striving to make up for lost time by giving an additional lecture three times a week from 6 to 8 A.M.! Such a tax upon the strength of an old man, weakened by sickness, seems tremendous. But he seemed not to mind it in the least.

As a traveller, too, he was untiring: fatigue which completely overcame younger men, did not seem to exist for him; as a matter of fact, the extreme Orient and Australia were the only civilized regions which he did not visit, and these he would surely have sought to reach, if his conscientiousness had not prevented his seeking a sufficiently protracted leave of absence.

He always spoke with special pleasure of his visit to the United States in 1883, and seemed greatly to appreciate the cordiality of his reception here. Probably he had a better understanding of the limitation imposed upon scientific research in America than do most foreigners; for he has always praised what has been done, without churlishly demanding the perfection reached at older and more firmly established centres of knowledge.

In his private life, he was greatly beloved by all who knew him, and he certainly was able to make and maintain the warmest friendships. In his later years, he devoted much of his time and ability to the bitter-sweet task of sealing this intimacy with an eloquent testimonial to the worth

and renown of the "Friends who had gone before." For such memorial biographies the world owes him additional gratitude; for the lives of Liebig, Wöhler, Dumas, and Graham, as described by him, will surely arouse the latent enthusiasm in many a youthful mind, and thus serve to pass on the torch of learning to new bearers.

His personal magnetism had much to do with the unprecedented success of the German Chemical Society, which was founded by him in 1868, and which is now in point of membership and influence the most important scientific body of the world. A society embracing men of every nation could only have been founded by a man who had no petty narrowness himself, who could impartially recognize and assimilate what was good wherever he found it. As a cosmopolitan, Hofmann could bring to London the thoroughness of the German schools of learning and imbue his surroundings with it, bringing back in return to Berlin the breadth of political views, the openness of social intercourse, the tolerance for opposing views, which existed in the English capital. While Hofmann shunned every form of altercation and was rarely drawn into political or social discussions, it was well known that his views were always democratic and for toleration of every sort. The only time he ever incurred the enmity of a class was during his rectorate at the Berlin University, when he took stern measures to prevent the introduction of political and religious intolerance in the student circles. I do not doubt that he was a patriotic German in every respect, but no other German has ever written words so appreciative of the French character, as it showed itself during the terrible siege of Paris, so hearty in deprecation of the fact that political jealousies have strained scientific relations—as are to be found in Hofmann's eulogies on Dumas and Wurtz.

In Hofmann the world has lost the model of a scientific man: a lover of science, both for its own beauties and for the benefits it confers upon mankind, a devoted teacher, a shining example of the rewards to be obtained by industry, integrity, and singleness of purpose. Those who have enjoyed the privilege of his personal contact will always be grateful for the view he opened to them of the beautiful and the true.

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CURRENT NOTES ON ANTHROPOLOGY. — VII.

[*Edited by D. G. Brinton, M.D., LL.D.*]

Laws of Variation and Fixity in Species.

IT is well observed by Dr. C. Dareste, in a recent lecture, that the fundamental question in anthropology is the origin of the differences in the human species. These differences begin with those visible in every individual, and extend up to those broad and permanent traits which distinguish the subspecies of man from each other. Beyond this they nowhere go; that is to say, no "missing link" exists which connects in an uninterrupted chain the human with any other vertebrate.

In explanation of this phenomenon of indefinite variation within fixed limits, M. Ch. du Pasquier has published an ingenious theory in the *Bulletin de la Société d'Anthropologie de Paris* (1891). He suggests that the fixity of the species, instead of being an argument against the theory of evolution, is the natural corollary of its two great factors, 1. The law of constant variation, and 2. The law of fixed heredity. These act with like mechanical inflexibility as the motions of a pendulum, always moving but unfailingly self-limiting, and thus determining the invariability of the specific type, while leaving a wide range for racial and individual variability. His argument is lengthy and ingenious, and well worth close reading.

In such a study, where especially the characteristics of races are the chief topics of investigation, the anthropologist will act wisely if he follows closely the track of the general zoologist. With a few easily explained exceptions, the areas of characterization of the species man are identical with those of the higher living vertebrates; and it is very significant that zoologists acknowledge that no two of these regions are of equal rank in their capacity for the development of organic forms. This has direct bearing on the deep-seated differences between races, and explains how they can be radically diverse and yet members of the same species.

The Criminal Anthropology of Woman.

It is a fact that in all countries there are fewer convictions for crimes of women than of men. European statistics vary from the highest, 37 per cent, in Scotland, to the lowest, rather less than 6 per cent, in Italy. It is also noted that there is a very wide difference between city and country. The proportion of female criminals is always higher in rural districts, sometimes reaching nearly to that of the males.

Various explanations of these facts have been suggested. Some are complimentary to the sex, as that women are not given to intoxicants, nor to gambling, nor to roving; they are more timid, more religious, more tender-hearted, and their sexuality is more passive. There is something in all these reasons, but they do not satisfy Dr. G. Ferrero, who discusses the subject in the *Revue Scientifique*, March 26. He points out that the females of the ants, bees, and spiders are particularly cruel because they are particularly intelligent, and he reaches the ungallant conclusion that the woman of to-day is less criminal because less intelligent than the man. This difference is less in country districts than in cities; and, moreover, in cities a woman can obtain a living at less risk than by criminal acts, *par complaisance vers l'homme*. Her struggle for life is less desperate; she is less an egotist because she is protected more than men; she is less disturbed by new ideas because she is slow to perceive them. When she is bad, however, she is "very, very bad," surpassing men in callous cruelty and absence of pity or remorse. In support of these assertions he cites instances both from history and the courts of criminal procedure.

Buddhism in the Occident.

The position of the anthropologist in the study of religions should be altogether a judicial one, and not that of a disciple. One cannot regard it other than a mistake, therefore, that in Paris there has grown out of the scientific study of Buddhism a school of "Eclectic Buddhism," whose disciples are pledged to obey the principles of the school, to carry out the moral obligations it imposes, and are liable to expulsion if they transgress the "rule of conduct."

The "Master" is apparently Professor Leon de Rosny, whose lectures on Buddhism at the Sorbonne have excited much attention, and who is widely and favorably known in American as well as general ethnology. Last year he issued a brochure entitled "La Morale du Bouddhisme," which is probably the text-book of the school.

No one will doubt the solid ethical ground-work which