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“THE DEVELOPMENT OF CHEMISTRY AND ITS
RELATION TO PHARMACY.”

BY FREDERICK B. POWER,
PROFESSOR OF PHARMACY AND MATERIA MEDICA IN THE UNIVERSITY OF WISCONSIN.

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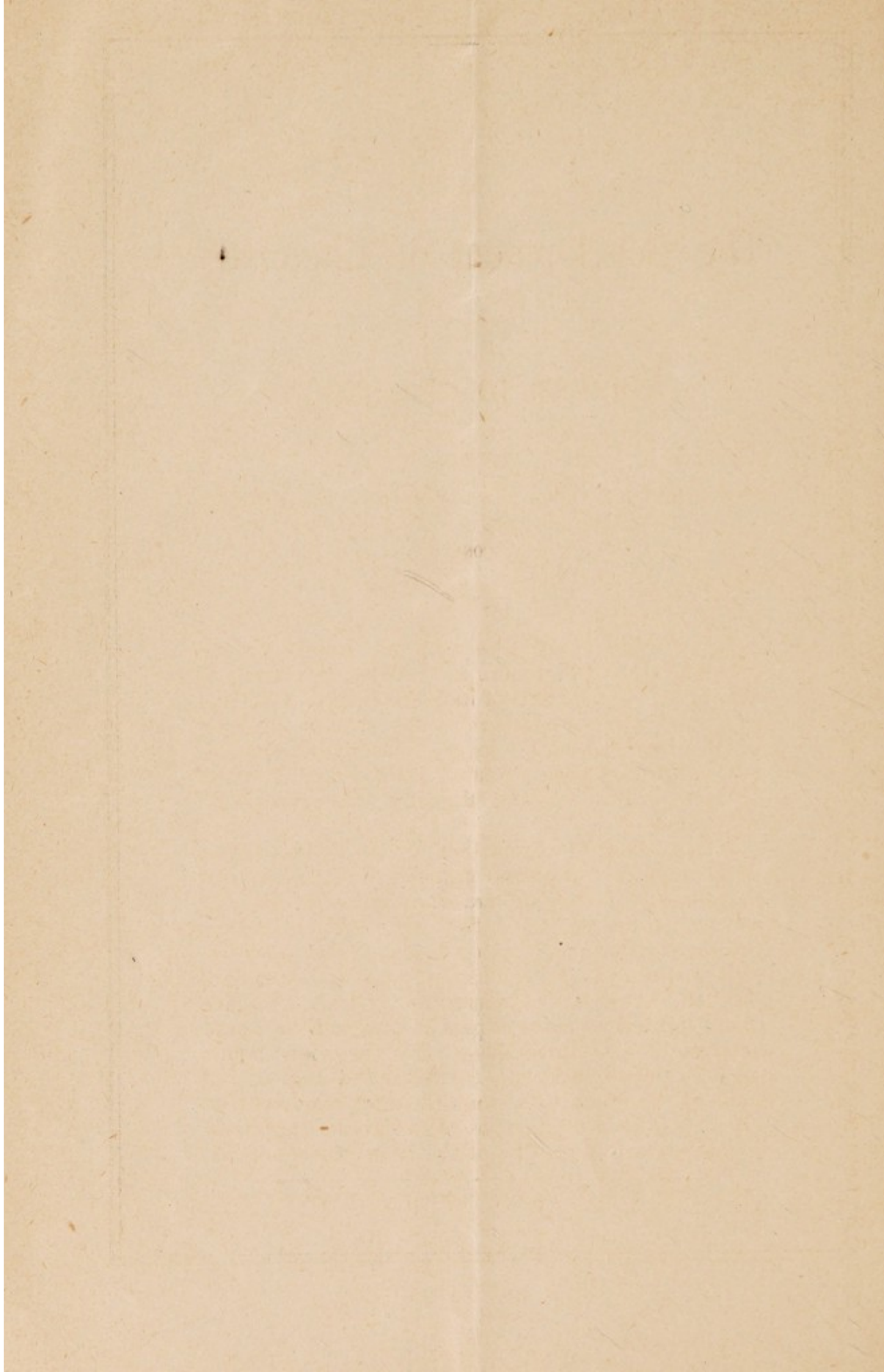
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The Development of Chemistry

AND ITS

Relation to Pharmacy.

BY FREDERICK B. POWER, PH. D., PROFESSOR OF PHARMACY
AND MATERIA MEDICA IN THE UNIVERSITY OF
WISCONSIN.

In accordance with a request expressed by some of your resident members to address the Association upon the occasion of its Fifth Annual Convention, it affords me pleasure to be able to respond to this invitation so far as my capabilities may admit, and to ask your attention for the consideration of the few fragments of thought which are here suggested.

It has occurred to me that in these days when progress is the universal watchword in every department of science and art, when steam, electricity and other forces are effecting such marvelous transformations and linking together the most distant portions of our globe in ever closer union, that an occasional retrospective glance into the dimly lighted recesses of past history will be found both useful and interesting. By the view which we may thus obtain, we are reminded not only of some of the gradations through which many of the grand results and triumphs of the present age, with which we are more familiar, have been accom-

*An address delivered before the Wisconsin Pharmaceutical Association, August 6, 1884.

plished, but also find outlined some of the steps in the history of a science with which the pharmacy present, past, and, to a certain extent, that of the future has been so closely identified and associated. It has been so closely identified and associated with the

It would be a presumption to suppose that for the achievements of modern science or the gigantic developments in all departments of human progress which are witnessed on every side we are indebted to the labors and intellect of a single generation, or that, on the other hand, they may be encompassed within restricted or narrow territorial limits. On the contrary, even the most superficial examination of historical facts will clearly reveal the impediments, struggles and frequent discouragements which have attended the reception of the first vaguely or imperfectly expressed ideas or principles, as developed by the earnest toilers of the remote past, but which, through successive generations, have served as the foundation upon which the grander superstructure has been reared. By such a comprehension, therefore, of the evolutionary processes of modern development, we are enabled not only to profit more fully from the teachings of the past, and to scan more clearly the future, but likewise to gather hope and encouragement for present efforts.

Our attention may now be profitably devoted for a brief space of time to the development of the science of chemistry, and afterward consider the relation which this science has hitherto borne, and still bears, to the pharmaceutical art.

Chemistry, al-kimiâ or alchemy, as with the prefix of the Arabic article it was known in the earlier periods of its development, was born in the starlit night of history and for many ages ran its course in the twilight of time. Even the etymology of the word itself is very obscure, and with it are connected many myths and traditions, but Plutarch asserts that Egypt was sometimes called *chemia*, with reference to the black color of the soil, while the same

word was applied to the black of the eye as a symbol of the dark and mysterious.

It is now considered highly probable that chemistry was first practiced as an art in Egypt, and that the doctrine of Aristotle, which embraced the dogma of the four elements—fire, air, earth and water—although considered in a more abstract light than at present, was extended by the Arabians, and, partly by the Moors by way of Africa and partly by the currents of returning crusaders, was subsequently brought to Europe. After its introduction into Europe the art found in Spain its earliest opportunities for new development, where it flourished for a time, and, from the eleventh to the sixteenth centuries, inclusive, was disseminated successively through England, Germany, France and Italy.

It would be quite impossible at the present time to attempt any consideration, however brief, of the lives of those whose names are recorded in the calendar of alchemy. A passing glance may, however, be cast upon those ideals which were the subjects of their sacred belief and the objects of their most enthusiastic hope.

The true alchemists believed in the transmutability of the metals, or that, through the agency of the philosopher's stone, the base metals could be transmuted into gold and silver. They believed likewise in the efficacy of the philosopher's stone as a universal panacea, or elixir of life, which was supposed to be capable of curing all curable diseases and prolonging life far beyond its present average of duration; while not the least remarkable of their ideals was that of a universal solvent or "alcahest." Regarding the latter substance, it is interesting to note that this has indeed been largely realized in modern times in the element Fluorine, which has resisted all the numerous attempts that have as yet been made for its isolation. Since, from the fact of its remarkable power of combination, no substance is known which is not attacked by it, it may well be considered as the

alcahest of old alchemy. Even Lavoisier, in his time, is stated to have expressed surprise that it should never have occurred to the older masters that no vessel on earth could hold the universal solvent, for the simple reason that it would also dissolve the vessel.

Leaving the historic period and subject of alchemy, and passing over the period which embraced the establishment of the so-called "phlogistic theory" and its overthrow by Lavoisier during the latter half of the past century, we may consider briefly the development of the "atomic" theory. This hypothesis, which was first clearly elucidated by the illustrious Dalton in the year 1803, and has since served as the foundation upon which the whole science of modern chemistry chiefly rests, may serve to illustrate through how many ages it was the subject of philosophic speculation before a clear and rational view of the phenomena was deduced which alone could satisfactorily explain observed facts and the known laws of chemical combination.

It would seem that some sort of doctrine conceiving of sensible matter as being produced or constituted by the concurrence of substantial or underlying atoms, not touching but moving more or less freely about one another, was very early promulgated among the ancient Hindoos. Even Democritus, who was born about 460 B. C., and was called the "laughing philosopher," in contrast to Heraclitus, or the "weeping philosopher," because he taught that a philosopher must regard the follies of man with the most serene equanimity, seems to have first conceived the idea that matter is composed of small, indivisible particles, or *atoms*. The theory of his philosophy is thus explained by him: "Everything is composed of atoms or infinitely small elements, and with a definite quality, form and movement, whose inevitable union and separation shape all different things and forms, laws and effects, and dissolve them again for new combinations. The gods themselves and the human

mind originate from such atoms. There are no casualties; everything is necessary and determined by the nature of the atoms, which have certain mutual affinities, attractions and repulsions."

To illustrate the same idea by still more simple language, a pebble from the brook was regarded, not as a blank, extended substance or dead stone, as it appears to the bodily eye, but as a palpable thing, resulting from the congregation of multitudes of atoms, or particles incapable of being broken to pieces, as the stone is broken when dashed against a rock, or worn to powder by friction with its neighbors. It was likewise assumed as important in connection with this definition that these aggregate and constituent atoms of the stone are not in contact with one another, although human eyesight is not fine enough to see the spaces between them; an hypothesis which, strangely enough, appears to be in perfect accordance with the views of modern science, as demonstrated by the elaborate researches of Sir William Thompson in the domain of molecular physics.

This marvelous view of Democritus, for at so early a period in the world's history it must be regarded as such, seems to have been the offspring of his still earlier thought, which presents the astronomical illustration that the "milky way" is not merely a blank extensive show of far-spread light, but the unique result of multitudinous heaps of stars, so distant and so crowded in their single plane of vision as to render the interspaces indistinguishable by the sight of man, although in reality perfectly free from one another, as is now clearly demonstrated by the modern telescope.

In connection with the development of the atomic theory, the name of that illustrious philosopher of the past century, Sir Isaac Newton, should not be forgotten; for he it was who first placed the conception of atoms in clear hypothetical connection with the phenomena of chemistry, although it was reserved for Dalton to impart enlargement and vitality to the memorable thought of him who, with

reference to his well-known valuable discovery, has been pronounced the astronomer-royal of the world.

With so clear a perception of the ultimate composition of matter, and as the discoverer of a law which has been conceded to be one of the most brilliant achievements of the human mind, it is not a little surprising to find that Newton should also have been a disciple of alchemy. History, however, tells us that for several years this man was intensely occupied with the endeavor to change the baser metals into gold, and which may serve to explain why he contributed but little to our present knowledge of chemistry, although he seems to have labored at this science for a longer period and with greater pleasure than any other. As a striking example of his zeal and earnestness in this pursuit, it is recorded of him that there were periods when his furnace fires were not allowed to go out for six weeks,—he and his secretary sitting up alternate nights to replenish them.

Among the earliest converts of established reputation to the atomic theory, after its generalization by Dalton, should be mentioned the names of Wollaston and Thomson, who were followed by Sir Humphrey Davy, Gay-Lussac, and that eminent Swedish scientist, Berzelius, and they in turn by the large number of chemists of the present century; for the prediction made several decades since still remains true, and has been but the more abundantly realized and verified by the lapse of years, that "chemists will doubtless always consider the atomic theory as a venerable and marvelous hypothesis, indefinitely likely to be the very truth of nature, although neither recognizable as such by sense, nor demonstrable by reason, yet conceived, defined, tended, cherished, and continually eyed with hope, not only as the all sufficient rationale of the young though gigantic science of chemistry, but also as the organ of advancing discovery."

Since the development and universal acceptance

of the atomic theory and the well substantiated laws of chemical combination, the progress of chemical science has been so rapid that volumes would be required to express any adequate idea of the labor performed, or results accomplished. Already it creates endless manufactories, tills the ground, casts its light into the subterranean physics of geology, and into the still more secret domains of physiology, pathology, and therapeutics.

It may and should be the source of pardonable pride that the pharmacy of the past has been so closely identified with the substantial and enduring discoveries of chemical science. Not many generations have passed since some of the most eminent philosophers and scientists of modern times first commenced their labors in the sphere of humble apothecaries—for what names are entitled to greater veneration than those of Scheele, Heinrich Rose, Liebig and Dumas; and it was doubtless in this pursuit that that love for investigation was first acquired, which became the leading characteristic of their lives, and the guiding star of their future destinies.

But few are now left of those who were the landmarks of the earlier decades of our century and the representatives of the older pharmaceutical school, from which emanated so many whose names and labors are indelibly associated with the progress of chemistry, botany, and other departments of natural science. The position which the pharmacy of to-day shall be accorded in future history will naturally depend upon the direction given to the labors of those who are now numbered among its devotees. The maintenance of its dignity or its claim to professional recognition reposes less upon the formulation of elaborate ethical codes than upon personal integrity and higher individual education. The laboratory of the chemist has now, indeed, become more or less completely separated from the shop of the apothecary, while the revolutions of trade and the ever-changing conditions of society have also given

rise to problems which are destined to exert an influence, for good or for evil, upon the pharmacy of the future. It can, however, only be hoped that these transitional epochs in its history shall prove but the means of purifying it from all depressing agencies and elevating it to its true and proper sphere, where, as the conservator of the public health, its responsibilities and trusts shall be justly appreciated and its interests sacredly guarded.

The pursuit of pharmacy, so long at least as it is entitled to the name, must always be accompanied by some knowledge of the experimental and descriptive sciences, and the more full and complete such knowledge, the broader will be the recognition and the field of usefulness of its votaries. By the peculiar nature of his vocation and early training, if this be wisely directed, the pharmacist endowed with a liberal education is not only specially fitted to perform certain duties relating to public hygiene, such as the examination of food and drugs, but also to enter upon fields of research which would otherwise not receive, or often escape, the attention of the professional chemist. A knowledge of botany and materia medica, which it must be presumed that he also possess, together with analytical skill and a conception regarding the relationship existing between plants of the same or allied families and their chemical constituents, will of itself often point the way to investigations attended by most fruitful and important results; and even though such investigations be not pursued to the ultimatum of positive knowledge, they will at least prepare the way for future labors, and bring to light facts which otherwise, for generations to come, might remain the hidden mysteries of nature.

Even our own broad Western prairies are carpeted with a vegetation, the chemistry of which is as yet but little known, and within whose confines a very large number of principles of greatest interest or value doubtless still remain concealed.

If, in this connection, and as a means of further illustration, we consider for

a moment the important class of substances derived from the vegetable kingdom known as the alkaloids or organic bases, and resort to the discovery of the first member of this class, morphine, by the apothecary Sertürner, in the beginning of this century, we shall see how large a number of most valuable and truly indispensable remedial agents embraced in this category alone have since been made known.

By the discovery of morphine, and a knowledge of its peculiar properties, there was an impulse given to investigation in the department of phytochemistry, which was attended by the discovery, in rapid sequence, of strychnine, narcotine, quinine, cinchonine, coffeine, coniine, nicotine, atropine and a large and continually increasing number of similar potent principles, while opium alone is capable of affording at least seventeen distinct organic bases, possibly not all pre-existing as such therein, but, nevertheless, each possessed with well defined individual characters. None the less interesting is the class of organic bases which have recently been brought to notice, closely related to many of those occurring in the vegetable kingdom, but produced by the decomposition and putrefaction of animal tissue, and, as a rule, extremely poisonous in their nature. Indeed, by the light of modern science it has recently been demonstrated that a poison of this class is contained, in extremely small amount, it is true, in the human saliva, and that in many of its properties, as well as by the virulence of its action, it is closely related to, if not identical with, the poison of the Cobra of India.

In the hasty and very incomplete sketch which I have thus been able to delineate of the rise and progress of chemical science, the relation it has borne to the pharmacy of the past, and the possibilities which are presented for its future, may we not indulge the hope that pharmacists of succeeding generations shall hold inviolate the former prestige of their art, and, by their labors, continue to add their proper share to the fund of useful knowledge?

The realization of this ideal can only be attained by wise legislation for the suppression of empiricism and by demanding a more complete education and better qualifications of those who are permitted to enter its ranks.

To such who are thus capacitated, new and promising fields of usefulness are ever presented; for it has been truly said that there is little matter what a man finds to be his proper task, so he rest not until he has won all it can teach him, so he relax not until he has made the most of it for the world; so he relent not before he has adorned it with his proper virtue and ennobled it by his proper genius.

When all this has been done and our best efforts have been called into action, we may still, at the close of life's history, find the best expression of our experience in the sublime observation of the illustrious Newton: "I do not know what I may appear to the world, but to myself, I seem to have been only like a boy playing on the seashore, and diverting myself by now and then finding a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."







The Kaiser Wilhelm's University of Strassburg.

By *Frederick B. Power*, Ph. D., F. C. S.

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The Kaiser Wilhelm's University of Strassburg.

A brief historical sketch of its development and the celebration
of its twenty-fifth anniversary.

By *Frederick B. Power*, Ph. D., F. C. S.

In the early days of May, and favored by bright skies and all the freshness and beauty of spring time, the Kaiser Wilhelm's University of Strassburg celebrated its silver jubilee. From near and from far large numbers of the former students of the university made pilgrimages to the shrine of their *alma mater*, in order to give expression to their homage and devotion and to renew once again cherished associations, while large delegations of student organizations from nearly all the universities throughout the empire united in bringing to their younger sister — the "Wilhelma Argentinensis" — their personal greetings and tributes of congratulation.

For those, however, who will discern the true significance of this celebration, it will not suffice to simply look back over the short space of a quarter of a century to the time when the new German University was organized, or to consider only its grand development in the intervening years, but a glance must also be cast upon those remote days

when in the old free imperial city of Germany a stronghold of science was erected, which was to serve as the intellectual centre of Alsace, and which was destined to play so important a part in the struggle for freedom of thought and the promotion of mental culture.

It was, indeed, on May 1, 1667, or 230 years ago, that Strassburg was the scene of a celebration similar, although naturally on a scale incomparably smaller and less grand, in its character, to that of the present year, for it was designed to commemorate the one hundredth anniversary of the academy, to which the Emperor Maximilian II had, in the year 1566, granted its philosophical faculty the right to confer degrees, although it was first opened on May 1, 1567, and to which Ferdinand II, in 1621, gave the name and the rights of an university.

The history of the old Strassburg University shows that it was a product of the religious movement of the sixteenth century, and in that spirit of humanism, which was of so much importance to Alsace, it continued to develop and to exercise a beneficent activity until it fell a sacrifice to the oppression and the reaction produced by the French Revolution.

The actual and chief embodiment of the spirit from which the Strassburg University emanated, was the statesman Jacob Sturm, of Sturmeck, who was termed by Grasmus "the incomparable". At the beginning of the Reformation, educational institutions suffered many vicissitudes. Many of the convent schools were closed, and nothing was done to replace them by others. This subsequently gave rise, however, to the common or public school (Volksschule), which must be regarded as a true offspring of the Reformation, and it was due to Jacob Sturm that one of these was founded in Strassburg as early as 1525. In this school reading and writing were taught, and the New Testament and the Roman history of Livius were read in a German translation. As it is recorded "he wished to implant christianity and the Roman virtues in the hearts of the youth of the city."

At the same time, besides providing for the elementary instruction of children, an improvement was effected in the Latin schools, of which three existed, where Greek, Latin and Music, as also Hebrew and Theology, were taught.

In about the year 1530, Jacob Sturm and Butzer also established a higher theological school, for the maintenance of which many cities of southern Germany contributed, and which constituted the beginning of the later university. It was first, however, in 1536 that these higher institutions of learning received systematic organization and were brought together as an organic entity and conducted under the able direction of Johannes Sturm, a man of broad culture, who was called from Paris for this purpose. The plan of instruction of this new school included Greek, Hebrew, Mathematics, and other subjects, and the professors also became connected with the Church of St. Thomas, by means of which they were able to essentially improve their material position. Foreign scholars of reputation who passed through Strassburg also delivered lectures, and the toleration and hospitality which that city tendered to those men of intellectual capacity who had either suffered persecution or had been banished from France, Italy and other countries was rewarded by service rendered to its schools. In 1538, the number of French fugitives was so great that a special religious service was held for them, and it was in fact no less a man than Calvin who first conducted this service, and who otherwise during the three years of his residence took a most active part in the scientific and religious life of the town.

In May 1538, the school formed from the combined Latin schools then existing was opened as a gymnasium, and its first rector was Johannes Sturm. Slowly but steadily its development continued in spite of all opposition, and without being influenced by the storms of religious dissensions, which were so disastrous to the reform movement, until in 1566 a bold step forward was taken and the gymnasium became expanded into an academy, or, as it was termed, an incomplete

university with limited rights; for it still possessed no proper jurisdiction and had no professorship for canonical law. The intellectual life of the institution at this time was very active, for at the celebration of festivals of the academy stirring representations of Roman history were given on the *Forum romanum*, and on St. John's Day the dramatic poems of Plautus and Terence, of Sophocles, Euripides and Aristophanes were artistically presented in the beautiful theatre of the academy, which was also the first established theatre of Germany. These were much appreciated and enjoyed, not only by the scholars of the time and by professors and students, but also by the humbler citizens, for the latter, on account of the large amount of literature which was issued at Strassburg in the form of translations, had also become acquainted with the ancient classics and inspired with the free life of the old Greeks and Romans.

The further progress of the academy was for a time much impeded by a religious opposition to its free spirit, which caused the rector to be removed from office and delayed the project of converting the academy into a complete university. In the year 1594, King Rudolph II had indeed permitted the professors of medicine and of law to grant the lower degrees, but no use was made of this privilege on account of the exclusion of the theologians, who found no favor with the King. It was therefore first in 1621 that the city was granted a complete university, and on August 14 of that year the festivities of its inauguration began, which were continued for eight days with great pomp. The storms of war, which for three decades had devastated Germany, now again arose and obstructed the further development of its scientific life. On May 1, 1667, as already noted, the centennial jubilee of the university was celebrated, but Strassburg was compelled to share the fate of Alsace, and by the act of capitulation effected on September 30, 1681, the city was separated from the German Empire and placed under the protection of the King of France. This act,

however, embodied the assurance that the King should permit the university to retain the character which it at that time possessed. It was thus recognized on the part of the French as a stronghold of German thought, German science, German customs, and the German language, although they were jealous of the freedom which its independent position gave it. Three branches, history, medicine and the science of government, attained a special development, and exercised a remarkable influence upon the culture of the entire century.

In the year 1738, there was established at Strassburg the first school of theoretical and practical gynaecology, in which were educated the most eminent gynaecologists of Germany, Switzerland, Holland and the North. The foundation of a maternity hospital, a botanical garden, and a cabinet of natural history also took place at this period, and in 1773 there already existed an astronomical observatory. The library, the beginnings of which dated from the time of the Reformation and from the donations of Jacob Sturm, was likewise increased, especially by the rich legacy of the celebrated historian Johann Schöpflin, of whom Goethe has expressed his admiration in the poem "Dichtung und Wahrheit." Teachers of modern languages were appointed, and in order to attract rich and prominent students, a riding school was established. Such was the reputation imparted to the university by Schöpflin and by the teacher of state rights — Wilhelm Koch — that in Germany and France, and even in Russia, those young men were preferably selected for offices of diplomacy and instruction who had been trained at Strassburg.

The more, however, the French element expanded in Alsace and in Strassburg, and, since the middle of the eighteenth century, the more the French language also began to replace the German, the greater were the efforts of the French Government to obtain influence over the university. But such an attempt was repulsed by a memorandum of the teaching staff, in which it was emphasized that the university was dependent only on the

chief magistrate, and that "in consideration of its constitution, as also especially in view of its relations with the other celebrated universities of Germany, it must be regarded as a German and a protestant university." It was specified in the very cleverly constructed act of incorporation that it would be a great political mistake if the previously adopted methods of instruction, which had been so fruitful in results, should become gradually changed and arranged to suit the taste of a French university. Thus the management of the old German university in Alsace remained secure until the time of the French Revolution, notwithstanding the mighty political storms, which swept over the land.

From this period onward the names of the most celebrated scholars were associated with Strassburg university, and their fame was extended not only throughout Germany, but to adjacent countries. The sons of noblemen and many German princes were attracted thither, and many of these afterward became prominent as statesmen and diplomats in Germany and Austria. Thus in the years 1785—1787 among the young people of high rank in attendance at the university there were, besides 17 Germans, 16 Frenchmen, 23 Englishmen and Scotchmen, 11 Danes and Swedes, 5 from the electoral dominions and Poland, and 44 Russians. Most prominent of all these was Goethe, who was matriculated on April 18, 1770, and whose inscription as a student of the university reads as follows: Johannes Wolfgang Goethe Moeno-Francofurtensis, with the appended note "logiere bey H. Schlag, auf dem Fischmarkt." The house thus referred to, in which he lodged, still remains and is designated by a suitably inscribed tablet. In an old publication of 1744 there occur the words: "Strassburg liebt die Musen und wird von den Musen geliebt" (Strassburg loves the Muses and is loved by them), and thus we find that Goethe in the poem "Dichtung und Wahrheit" has also rendered an enduring tribute of praise to the old Strassburg university.

That which the French Government was not

able to accomplish on account of the firm resistance of the university corporation, was, however, finally effected by the events connected with the revolution. In the year 1793, three of the professors were arrested, and many others soon experienced the same fate. The catholic academy had previously been destroyed, the city library was closed, and in accordance with a decree of August 15, 1797, the protestant university, after a glorious existence of one hundred and fifty years, was finally compelled to close, as was also the protestant gymnasium. As a result of these events it is recorded that in the scientific circles of Alsace, and especially of Strassburg, there prevailed at that time "the solitude of a cemetery," for only scantily equipped primary schools were available for instruction, and in these the French language was made compulsory. It was the avowed purpose to attack "the Hydra of German culture and customs," as the university that had been allowed to remain in the midst of the French organizations was regarded, and it was therefore decreed that this should and must be killed.

Amid this devastation only the school of medicine was allowed to remain, as this was needed by the army. Under the consulate, and as tranquility and some degree of stability began to return in public affairs, a School of Pharmacy was also established. By a decree of Napoleon I, dated March 17, 1808, these were united with the gradually created faculties of theology, mathematics and natural science, and belles-lettres to form a higher institution of learning, which was known as the Académie imperiale. The protestant academy, which had again been revived, was known from this time on as the protestant seminary. Of the former teachers in the university only a few were drawn to the new French academy, which existed until the war with Germany in 1870, but which naturally was never able to attain again the significance and the influence which the old German university had possessed.

No sooner had it become an established fact that Alsace-Lorraine had again been made a

German province, than everywhere the desire was expressed that the old university of its chief city should be restored. This was responded to the more willingly by the government from the fact that the wish was also shared by the Alsatians. The first one to give official expression to this idea was the Deputy von Treitschke, at that time a Heidelberg professor. In his speech in the German parliament on May 20, 1871, on the occasion of the consideration of the bill relating to the union of Alsace-Lorraine with the German Empire, he said: "Above all else we wish to see the revival of the university on the frontier. The old province of the humanists — Alsace — should see again a flower of free science bloom in its chief city." A few days afterward a formal motion was made that the chancellor of the empire — Prince von Bismarck — should be commissioned to found a German university in Strassburg, and on December 11 of the same year Baron von Roggenbach, in Baden, was entrusted with the duty of its organization. This distinguished statesman gave expression to his purpose to create "a German university of the first rank, which should be a conservator of German science and a seat of culture worthy of the German spirit." As sufficient means stood at his disposal, the most eminent teachers were called to the new institution, and there were indeed many among those who filled the professorial chairs whose names were not only an ornament to the university, but to the sciences or departments of learning which they respectively represented. Many of these earlier teachers have since passed from the stage of human life and activity, but there are none whose memory will be more enduring or more reverently cherished by pharmaceutical students than that of the late lamented Professor Flückiger. That the natural sciences generally were well represented at the time of the re-organization of the university, is attested by such well known names as von Baeyer, afterwards succeeded by Fittig and Rose (Chemistry), Hoppe-Seyler (Physiological Chemistry), Schmiedeberg (Pharmacology), De Bary (Botany), Kundt

vi/

(Physics), Groth (Mineralogy), etc., while the various other faculties were equally well equipped with talented teachers and investigators.

The buildings first occupied by the new university were those of the French academy, but others of great architectural beauty and much better adapted to the requirements of the various institutes were gradually constructed in the newer portion of the city, and these were dedicated in 1884. To those interested in the advancement of pharmaceutical science it is a matter of disappointment and regret that this department is the only one still unprovided with a new building, for it continues to occupy the very inadequate quarters of the old *École de Pharmacie*, where Pasteur taught nearly fifty years ago. The hope is entertained, however, that these requirements may also soon be appropriately met.

In the beginning of this brief historical sketch reference was made to the recent celebration of the twenty-fifth anniversary of the Kaiser Wilhelm's University, and it may be assumed that some account of the exercises and festivities connected therewith, which ~~even~~ extended over a period of four days, will not be devoid of interest. They were initiated on April 30, by a reception of the guests in the Civil Casino, and especially in the evening of the same day by a torchlight procession of the students. No better illustration could be given of the spirit which dominates the German Universities, and which has been aptly termed the *universitas universitatum*, than this grand spectacle presented. Although torchlight processions are not of such rare occurrence as to be an altogether unfamiliar incident of German student life, and the older students of Strassburg will always retain a vivid recollection of a demonstration of this character in 1877, on the occasion of the dedication of the Strassburg University as the "Kaiser Wilhelm's Universität," when the venerable Emperor Wilhelm I, the lamented Crown Prince Friederich and Count von Moltke were its most honored guests, it may still be said that so imposing a scene of academic life had never before been wit-

nessed in Strassburg, and perhaps in no other university town. Between 1600 and 1800 students, accompanied by many bands of music and mounted heralds, took part in this procession, which included delegations from the universities of Berlin, Bonn, Breslau, Erlangen, Freiburg, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Leipzig, Jena, Marburg, Rostock, Tübingen, Würzburg, and from Basel and Zürich. This great body of students with their flaming torches, and the bright costumes of the various organizations with their banners and flags, were seen to the best advantage from the main building of the university, where a short halt was made in order that a deputation might be received by the rector. The brilliancy of the scene was further enhanced by powerful electric lights, which were directed upon the spire of the Cathedral and other prominent buildings. The line of march was subsequently taken up to the residence of the Governor of Alsace-Lorraine and through the principal streets of the town, which occupied $2\frac{1}{2}$ hours, and the procession was finally brought to a close in the Cathedral square, where, during the singing of *Guadepamus igitur*, the burning torches were thrown together.

On May 1, the celebration found its chief and more serious expression in the so-called "Festact" or official ceremony, which took place in the Aula or grand central court of the main building of the university. In this palatial room, which was appropriately decorated, were assembled the present and former teachers and students of the university, prominent officials representing the empire, province, and municipality, the military and clergy, as also a committee of the deputies and other notables from the city and country at large, while on either side the auditorium was flanked by representatives of the various student corporations, arrayed in bright costumes and each bearing its standard of colors. The proceedings were opened by orchestral music, which included a specially composed overture, the national hymn, and an allegro in which selections from the best known student melodies were interspersed, after which the

vast assemblage was greeted in the name of the academical senate by the rector of the university. The state secretary, as the representative of the Governor, who was absent from the city, then delivered a congratulatory address from the German Emperor, who had signalized the anniversary by conferring upon the rector an official chain of office to be worn on all festal occasions, and with which he was formally decorated. This quite massive chain, of most exquisite workmanship, is composed of gold medallions, each of which is in some respect emblematic, while the general character of the whole is designed to typify the time of the dedication of the old Strassburg University in 1567. Addresses were then delivered by the rector, prorector, the mayor of Strassburg and others, after which many beautiful gifts commemorative of the jubilee, such as paintings, literary works, etc., were presented to the university by the faculty and by former students and friends. The rendering of a cantata by the academic glee club brought to an official close these impressive and inspiring ceremonies.

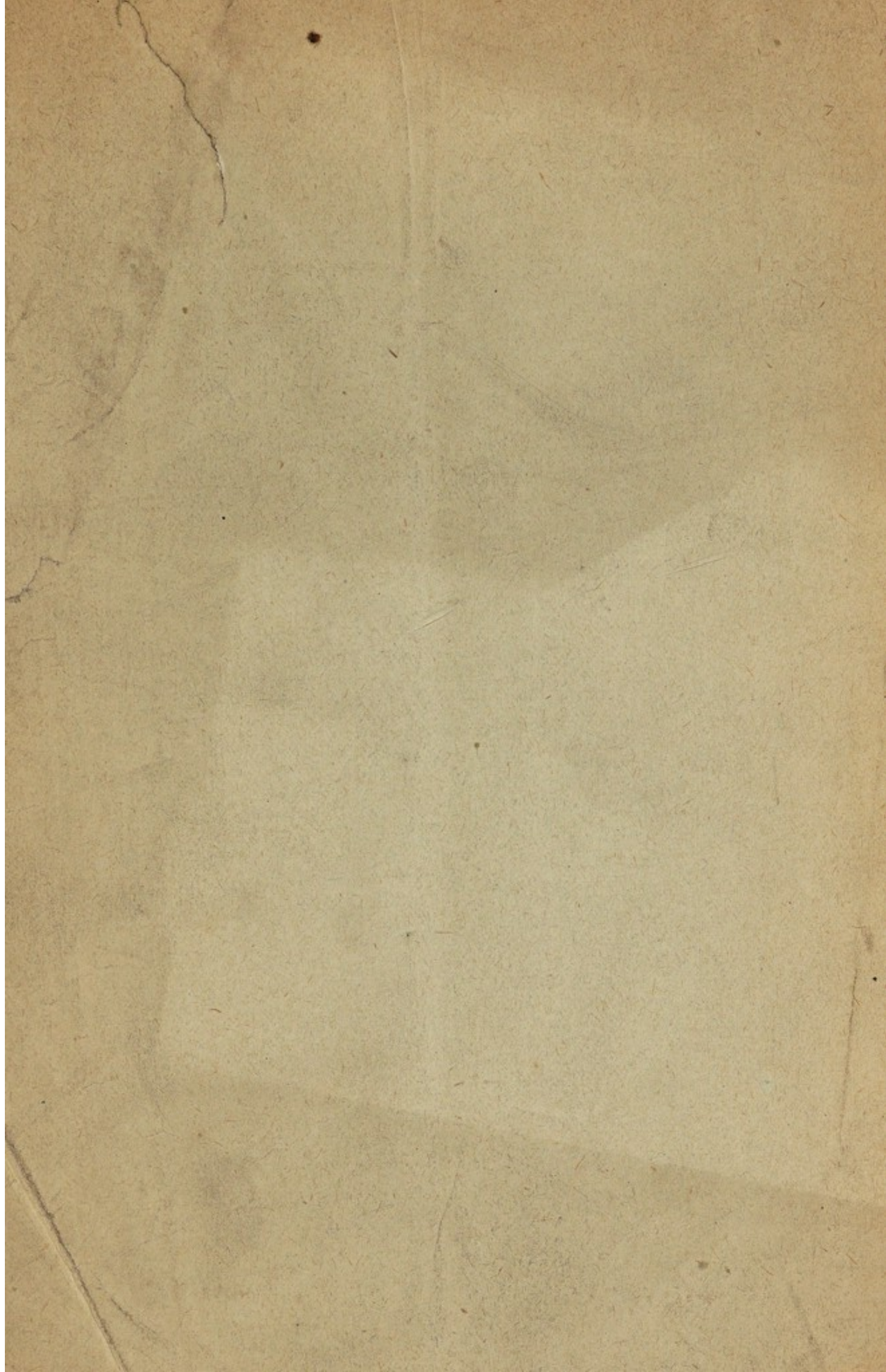
Of the various social entertainments provided for the occasion there need only be specially mentioned an excursion into the Vosges mountains on the last day of the festival. A large company of professors, students and guests, between 600 and 700 in number, were conveyed by a special train to Türkheim, from which point a pleasant walk through the forest led to a summit known as the "Drei Aehren," where a view over the Rhine valley and extending even to the snow-crowned peaks of the Alps disclosed a panorama of rare beauty and grandeur. It was, however, not only the delights of the surrounding landscape, but more especially the opportunity afforded for the intimate association of teachers and students, and the commingling of friends who had been long and distantly separated, that imparted to the day its peculiar charm and crowned it with its pleasantest memories.

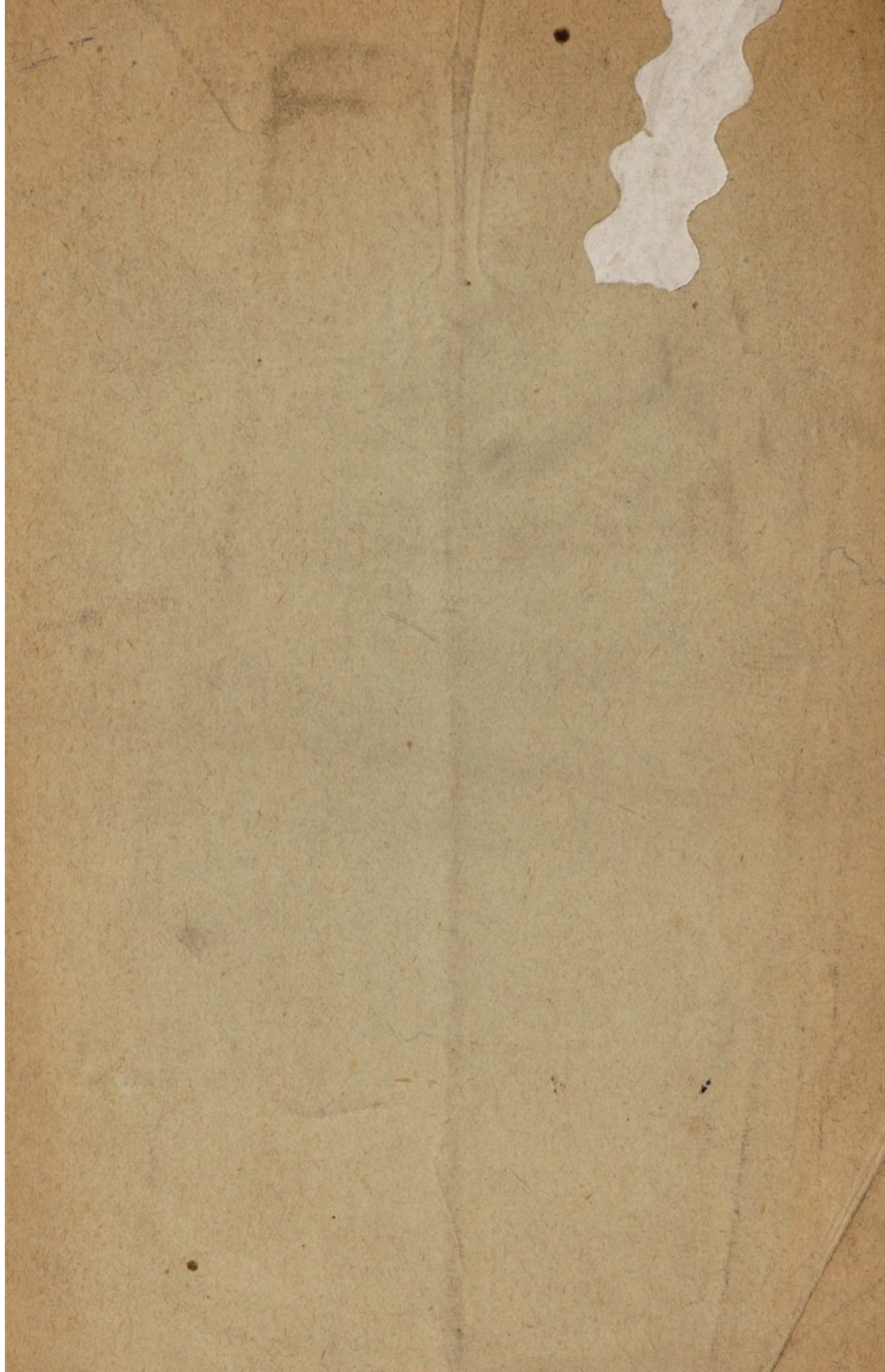
The earlier poets had sung in latin verse *laudem Argentorati*, but those former students of

the Kaiser Wilhelm's University who, after an absence of many years, have not only had the pleasure of visiting historic Strassburg and participating in the celebration of its jubilee, but who have received new inspiration from a revival of old associations with friends and teachers, can perhaps give no more fitting expression to their sentiment than in the verse written by Scheffel on the occasion of the dedication of the new university:

Stosst an! Neu Strassburg soll leben,
Soll wachsen und kraftvoll gedeih'n,
Als Strasse für geistfrisches Streben
Als Burg der Weisheit am Rhein!

London, June 1897.





THE INFLUENCE AND DEVELOPMENT
OF SOME OF THE RESEARCHES OF
DANIEL HANBURY.*

BY

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The custom which has long prevailed, especially in professional institutions, of initiating a new session by an address to the students is one which has been most worthily maintained in the School of Pharmacy of the Pharmaceutical Society. In responding to the very kind invitation extended to me by the President and Council to deliver the address on this occasion I have been deeply conscious of the responsibility which is thereby assumed, as well as of the honour and privilege which have thus been conferred. In undertaking this pleasant duty it was primarily my desire to render to the Society any service of which I might be deemed capable, while at the same time the hope was entertained that it might be possible to bring some message of interest to those who are now either entering upon, or engaged in, a course of professional study in this School.

A consideration of the many able discourses which have been delivered here on similar occasions in preceding years has somewhat accentuated the difficulty of deciding upon a subject for my address to-day. It has, however, occurred to me that it would be both profitable and of interest at this time to consider some of the achievements of one whose name is inseparably associated with, and adorns, the annals

* Inaugural Sessional Address delivered before the Pharmaceutical Society of Great Britain at the opening of the School of Pharmacy, October 1, 1913, and reprinted from *The Pharmaceutical Journal and Pharmacist*, October 4, 1913.

of this Society, and whose memory will always be revered wherever pharmacy is known. I have, therefore, chosen as my theme "The Influence and Development of Some of the Researches of Daniel Hanbury."

Before proceeding to the principal part of my subject I would like to make a slight digression in order to recall some incidents that are not entirely disconnected from it, and which are now somewhat vividly brought to my mind.

It was not my privilege ever to have met Daniel Hanbury, but so long ago as the time when I was a student of pharmacy I became familiar with his name and writings, and ever since that time I have felt that I knew him. The first time that his name was brought prominently to my notice was in the course of lectures in materia medica given at the Philadelphia College of Pharmacy during the session of 1873-1874 by my honoured teacher, the late Professor John M. Maisch. It was the custom of Professor Maisch not to restrict his teaching to the statements of the text-books, but, with characteristic thoroughness, he brought to his students the latest results of scientific investigation in the special field of study to which he was devoted. At about the time referred to it had been shown by Mr. Hanbury, in a most interesting paper (*Pharm. J.*, 1873, 33, 81, 102), that the true Pareira Brava, or the root to which the reputation of the drug as a medicinal agent is due, was not derived from *Cissampelos Pareira*, Linné, as stated in the Pharmacopœias and text-books of that period, and as had, indeed, been assumed for over a century, but that the plant yielding it was *Chondodendron tomentosum*, Ruiz and Pavon. It was, furthermore, shown that the so-called Pareira Brava which then occurred in commerce was for the most part of unknown botanical origin and of doubtful medicinal value. Thus the name of Daniel Hanbury first became familiar to me, and although many things have passed from mind during the somewhat long interval of years, the source and characters of at least one South American drug had become firmly fixed in my memory.

It was also at about the time indicated—namely, in 1874—that the classical work 'Pharmacographia' appeared, the result of the joint labours of Mr. Hanbury and his friend, Professor Flückiger. The influence which this work was destined to exert in so many directions Mr. Hanbury was, unfortunately, not permitted to see, for he passed away in the early part of the following year.

The interest which had been awakened in the subject of the chemistry and natural history of drugs through the publication of 'Pharmacographia' was not confined to the British Isles, but extended across the Atlantic, and even to more remote parts of the world. So far as I can remember, it was largely due to the impression this work had produced that I was led shortly thereafter, in 1876, to seek instruction from one of its authors at the University of Strassburg. Although

my studies were by no means restricted to the subjects which Professor Flückiger taught—namely, pharmacognosy and pharmaceutical chemistry, it was my happy privilege to have been for four years in close association with him, and during that time I was the recipient of his unceasing kindness. A friendship was, indeed, formed which was only terminated by his lamented death in 1894.

On my first visit to the home of Professor Flückiger, in Strassburg, my attention was specially attracted to a fine portrait which adorned the walls of his study. It was that of his friend and co-worker, Daniel Hanbury, of whom he frequently spoke in terms of deepest affection, and whose loss to himself and the world he never ceased to mourn.

Among the gifts received during my student days from Professor Flückiger there was one that I particularly prized. It was a copy of the then recently-issued 'Science Papers,' with a presentation inscription in my teacher's own writing, and this valued memento I hold in my hand to-day.

The researches of Hanbury did not include a great deal pertaining to the chemistry of drugs, for his early training and inclinations did not lead him in that direction. On the other hand, historical and botanical studies appear to have had a special attraction for him, particularly in their bearing on the history and source of drugs, and it is evident, from a perusal of his writings, that he was also deeply interested in many other subjects, such as records of travel and exploration, as well as classical literature. The motto he is said to have adopted from the French chemist Fourcroy (1755-1809), *Il faut que chacun ne fasse que ce qu'il sait faire*, which may be rendered into English by the precept that "one should only do that which he knows how to do," indicates that he recognised the limitations of effort which individual endowments or circumstances impose, notwithstanding his own varied gifts and the capability of doing many things well.

In indicating my purpose to consider the development of some of the researches of Daniel Hanbury, it might easily be presumed that I had completely disregarded the motto which has just been quoted, inasmuch as it would be quite beyond my capacity to discuss in any critical sense the various historical and botanical investigations to which Mr. Hanbury had devoted the greater part of his life. It may, therefore, be explained that I shall only undertake to touch somewhat lightly upon a few selected topics of either general or chemical interest which have been suggested by his researches, but which may, nevertheless, serve to illustrate their nature and development. The most striking characteristics of Mr. Hanbury are said to have been thoroughness and accuracy, and it was these qualities which have given to his writings a permanent value. In this connection it may not be amiss to emphasise the importance of accurate know-

ledge respecting the botanical source or identity of plants and plant products which are intended to be used for chemical investigation, as otherwise much uncertainty or confusion is likely to occur. Fortunately, there still remains a connecting link between the days of Hanbury and the present generation which enables such information to be secured, for no one can be considered to possess a more exact and comprehensive knowledge of drugs than the accomplished Curator of the Museum of the Pharmaceutical Society. His recent contribution to the history and source of myrrh (*P.J.*, 1913, 91, 116) has further elucidated a subject which forty years ago had likewise engaged the attention of Hanbury (compare 'Science Papers,' p. 378), and in the communications of the earlier and the later investigator one may observe the same careful consideration of facts and precision of statement.

The first communication made by Daniel Hanbury to the Pharmaceutical Society was in 1850, and was entitled, "On Turnsole" (*Pharm. J.*, 1850, 9, 308). Although a short paper, on account of its orderly arrangement and clearness of diction it might still serve as a model for scientific writers.

It is quite probable that the word turnsole (Fr. *Tournesol*) is not very familiar to either the pharmacists or chemists of the present day. In the course of time it has, in fact, been applied to several plants or products, and considerable confusion has thus been produced. In accordance with its etymology the name has been given to the heliotrope, and also to *Euphorbia helioscopia*, Linné, with reference either to the supposed turning of the flower toward the sun or the flowering of the plants at the summer solstice.

The word turnsole has, however, been more particularly employed to designate a product obtained from the small euphorbiaceous plant, *Crotophora tinctoria*, A. Juss¹. (*Croton tinctorium*, Linné), which is indigenous to Southern Europe and the Orient. The expressed juice of the plant is said to be at first of a dark green colour, but speedily to assume a purple hue on exposure to the air. Coarse hempen cloths were soaked in this juice, then dried, and exposed to the vapour of ammonia, after which treatment, and under the name of turnsole rags, they were shipped to Holland. When steeped in water, which extracts all the colour, the rags yield a bright purple solution, and this is said to be reddened on the addition of an acid or an alkali. It was the special object of Mr. Hanbury's inquiry to ascertain the uses to which these rags were put by the Dutch, and, although quoting one author as asserting that the use of turnsole is confined to colouring the exterior of cheese, he concludes his paper by stating that "we are still in want of more precise information." It may, therefore, now be noted that some further information on the subject has in the meantime been re-

¹ Hanbury attributes the botanical name of the plant to Endlicher.

corded, which serves to confirm the statement regarding the use of turnsole (*Kew Bulletin*, 1899, p. 88). According to this more recent account,² the stems and leaves of the plant are placed in small heaps, whereby they undergo fermentation with the production of a red colouring matter. The material thus prepared is then sent to Holland, where it is used for wrapping cheese, the exterior of the latter thereby acquiring the familiar red colour of the Dutch product.

It appears, furthermore, from the paper by Mr. Hanbury that turnsole was supposed by some of the older writers to form the colouring matter of litmus, which is now known to be obtained from various lichens, and Dr. Ure is quoted as stating that the name was applied to litmus in order to conceal the true origin of the latter substance. In view of the source and characters of turnsole, it has been somewhat surprising to find that in one of the largely used commentaries ('U.S. Dispensatory,' eighteenth edition, p. 1,711) it is still only mentioned as a synonym for litmus, and in a similar work of reference ('National Standard Dispensatory,' p. 892) the word *tournesol* is given as the French equivalent for the latter substance. The last-mentioned work has, however, also recorded (p. 612) that *Crotophaga tinctoria* "yields an indigo, and is a fatal poison" (compare *Kew Bulletin*, 1889, p. 279, and 1896, p. 233). Notwithstanding a somewhat extended search through the literature, I have been unable to find any further information concerning the constituents of this plant than has here been noted. It would thus appear to merit a chemical examination, both with respect to the nature of the colouring matter and its asserted toxic properties, the latter, however, being not uncommon among plants of the family to which it belongs.

Shortly after the communication on turnsole, Mr. Hanbury published a paper "On the Resin of the Norway Spruce Fir" (*Pharm. J.*, 1850, 9, 400), in which he described the characters of the true so-called Burgundy pitch and the various fictitious preparations which were frequently sold under that name. After an interval of seventeen years, this resin was again the subject of investigation by him (*Pharm. J.*, 1867, 27, 162), and it was then shown to be obtained from *Abies excelsa*, DC., the countries of its production having been definitely ascertained. It was likewise pointed out that the appellation "Burgundy," as applied to this resin, is a misnomer, inasmuch as it was not produced in France, or, at least, not in modern times.

It has been noted by the editor of 'Science Papers,' Mr. Joseph Ince (*loc. cit.*, p. 11), that among the separate investigations of Mr. Hanbury, general opinion would attribute the warmest praise to a communication "On Otto of Rose" which was read before the Pharmaceutical Society in 1859

² My thanks are due to Mr. E. M. Holmes, F.L.S., for having kindly brought this account to my notice.

(*Pharm. J.*, 1859, 18, 400), although Mr. Hanbury himself was supposed to have attached most importance to his essays on Calabrian manna (*Pharm. J.*, 1869, 29, 326; 1872, 32, 421) and Pareira Brava (*loc. cit.*). The last-mentioned drug, to which I have already briefly referred, has in recent years been the subject of several extended investigations with respect to its alkaloidal constituents (*Arch. Pharm.*, 1898, 236, 530; 1899, 237, 199; 1906, 244, 555; 1911, 249, 408; 1912, 250, 684).

The subject of otto of rose was discussed by Mr. Hanbury under the three main divisions of production, adulteration, and chemical characters. The chemical examination was restricted to determinations of the liquefying point of the otto and of the percentage of stearoptene in samples produced in England, France, and Turkey, but it should be remembered that at that early period comparatively little was known of the constituents of essential oils or of the methods which are now employed for their investigation. They were then considered to be quite simple products, consisting of liquid and solid portions, which, in accordance with a suggestion of Berzelius in 1837, were designated respectively as *elaoptene* and *stearoptene*, and the latter term is still in frequent use.

In no branch of chemistry has the advance in knowledge during recent years been more marked than in that pertaining to the constituents of the large group of natural products known as the essential or volatile oils. This was amply demonstrated in the interesting course of special lectures delivered before the Society last year, but for the present purpose it may be exemplified by the otto of rose, which is now known to be of very complex composition. The substances which up to the present time have been identified as constituents of this fragrant oil are as follows: Geraniol, *l*-linalool, *l*-citronellol, nerol, phenylethyl alcohol, citral, *n*-nonylic aldehyde, eugenol, and an aliphatic sesquiterpene alcohol, $C_{15}H_{26}O$, which apparently is identical with farnesol (*Ber.*, 1904, 37, 1904; 1913, 46, 1732). The alcohol, farnesol, so named from the fact that it was obtained from the cassie flowers (*Acacia Farnesiana*, Willd.), is now known to be widely distributed in nature, occurring apparently in the largest proportion in ambrette seed (*Hibiscus Abelmoschus*, Linné), and also in relatively smaller amounts in the flowers of the common or false acacia (*Robinia pseudacacia*, Linné), the linden (*Tilia europæa*, Linné), lilac (*Syringa vulgaris*, Linné), mignonette (*Reseda odorata*, Linné), and lily-of-the-valley (*Convallaria majalis*, Linné). The sweet fragrance of many flowers, including those mentioned, appears, in fact, to be due to a considerable extent to the alcohol farnesol. The predominating constituent of otto of rose is the alcohol geraniol, but it is by no means the most important one, since both the citronellol and nerol, and esters of the respective alcohols, as well as some of the other com-

pounds mentioned, contribute largely to its fragrance. The phenylethyl alcohol, which possesses a mild odour, appears to be contained in rose oil, as well as in the oil of orange flowers (neroli), not only as such, but also in the form of esters of benzoic and phenylacetic acids (Gildemeister and Hoffmann, 'Die aetherischen Oele,' 2nd edit., Bd. I., p. 388). The interesting observation has also been made that although this alcohol is contained in exceedingly small amount in the otto of rose, it represents quantitatively the chief volatile constituent of the rose petals. On account of being quite freely soluble in water it remains for the most part in the aqueous portion of the distillate from which the otto of rose has been separated (*Ber.*, 1900, **33**, 1720, 1903; 1901, **34**, 2803).

The so-called stearoptene of otto of rose, as already mentioned, was the subject of some experiments by Hanbury, and it may incidentally be noted that it also attracted the attention of Flückiger, who was the first to show that it belonged to the paraffin series of hydrocarbons (*Pharm. J.*, 1868, **28**, 147). While serving as his assistant (1879-1880), a particularly nice specimen of this substance was given to me by him for the purpose of analysis and the determination of its vapour density, the results of which indicated it to possess the formula $C_{16}H_{34}$ (Flückiger, 'Pharmakognosie,' 3rd edit., p. 170). It has, however, since been found by Schimmel and Co. ('Semi-annual Report,' October, 1890, p. 54) that even the stearoptene of rose oil is not a simple substance, but consists of a mixture of apparently homologous hydrocarbons, the composition of which has not as yet been determined.

The only other investigation by Mr. Hanbury pertaining to an essential oil was one concerning the source of the so-called oil of origanum of English commerce (*Pharm. J.*, 1850, **10**, 6; 1851, **10**, 324). It was then shown that this was really the oil of thyme, imported from the south of France, and that the true oil of origanum, as distilled by himself from *Origanum vulgare*, Linné, was quite different in character.

It has been of interest to observe, by a perusal of 'Science Papers,' that several natural products which received the consideration of Mr. Hanbury, either with respect to their origin, characters, or uses, have within the past few years been the subjects of somewhat extended chemical research in this country, and some further contribution has thus been made to our knowledge of them. Among such investigations there may be mentioned those pertaining to chaulmoogra oil and allied products (*J. Chem. Soc.*, 1904, **85**, 838, 851; 1905, **87**, 349, 884, 896; 1907, **91**, 557), the constituents of olive leaves (*Ibid.*, 1908, **93**, 891), jalap and scammony (*J. Amer. Chem. Soc.*, 1910, **32**, 80; *J. Chem. Soc.*, 1912, **101**, 1 and 398), and the ordeal bean of Calabar, from *Physostigma venenosum*, Balf. (*J. Chem. Soc.*, 1911, **99**, 2,148).

Another subject which had attracted the attention of Mr. Hanbury would appear to merit at least a brief notice at this

time on account of the very considerable degree of interest that has recently been revived concerning it. This is the so-called *Lignum nephriticum*, a Mexican wood, which has long been the subject of inquiry respecting its botanical origin. It appears from 'Science Papers' (pp. 173, 184) that the 'Admiralty Manual of Scientific Inquiry' in 1859, and again in 1871, contained requests for information concerning a number of natural products which were used either medicinally or in the arts. These botanical and pharmacological inquiries, which were formulated at the first-mentioned date by Sir W. J. Hooker and Mr. Hanbury, and subsequently by Professor Oliver and Mr. Hanbury, included a question concerning the tree which yields *Lignum nephriticum*, a specimen of the wood so designated having been sent from Mexico to the Paris Exhibition of 1855. Quite recently a very interesting monograph has been published by Mr. H. J. Möller, of Copenhagen³ (*Ber. d. deutsch. pharm. Ges.*, 1912, 23, 88-154), in which he has recorded the results of an extended research concerning the history and botanical source of the wood in question. The wood is particularly characterised by the deep blue fluorescence which it imparts to water containing a trace of alkali, and it has been stated that the first observation of the phenomenon of fluorescence was with this material. It was described in 1663 by Robert Boyle in his treatise on 'The Experimental History of Colours,' and an aqueous infusion of the wood was used by him as an indicator for acids. Isaac Newton mentions "the tincture of *Lignum nephriticum*" in his work on 'Opticks,' published in London, in 1704, and the poet Goethe, in his 'Theory of Colour' ('*Zur Farbenlehre*'), published in 1810, likewise mentions "das nephritische Holz," with a regret that the true *Lignum nephriticum* could no longer be obtained.

With regard to the botanical source of the wood referred to, Mr. Möller has been led to conclude from his investigations that it represents the heart-wood of several species of *Pterocarpus*, these differing according to the country from which it is obtained. Thus the wood from Mexico is referred to *Pterocarpus Amphymenium*, DC., and probably also *P. orbiculatus*, DC., while that from the Philippines is derived, according to the determinations of E. D. Merrill, from *P. Indicus*, Willd., *P. echinatus*, Pers., and *P. blancoi*, Merrill. It is, furthermore, considered probable that the plant yielding the *Lignum nephriticum nigrum* of Brazil is *P. violaceus*, Vogel.

In a recent brief communication on the subject by Mr E. M. Holmes (*Pharm. J.*, 1913, 90, 898), he notes that in 1909 Dr. O. Stapf, of the Royal Botanic Gardens, Kew, had referred the Mexican *Lignum nephriticum* to *Eysenhardtia*

³ This publication has been issued in separate form by Gebrüder Borntraeger, Berlin, 1913.

amorphoides, H. B. and K. (*Kew Bulletin*, 1909, pp. 293-305).⁴ It was stated by Dr. Stapf (*loc. cit.*, p. 294) that "there were two timber specimens of *Eysenhardtia* in the Kew Museum, and one of them, obtained from the Paris International Exhibition of 1900, was marked 'Cuatl.' This, when infused with water, gave the peculiar reaction of *Lignum nephriticum* in an unmistakable way. A comparison of Hernandez' description with herbarium specimens and with technical descriptions of *Eysenhardtia amorphoides* made it clear that this was actually the source of the old *Lignum nephriticum*."

Mr. Möller (*loc. cit.*, pp. 43, 56), although apparently not having seen Dr. Stapf's paper, had, however, also considered *Eysenhardtia*, and mentions having examined a specimen of the wood received from Professor C. A. Purpus through the Danish Consulate in Mexico. He remarks concerning it that "the wood is white, bears no resemblance to *Lignum nephriticum*, and its aqueous infusion does not show the blue fluorescence." In view of these conflicting statements, the subject would still seem to require some further elucidation.

Although the wood under consideration was recognised by many of the Pharmacopœias of the seventeenth and eighteenth centuries, including the 'Pharmacopœia Londinensis' of 1695, it appears to have long since fallen into disuse as a medicinal agent. The fluorescent constituent of the wood has been assumed to be a glucoside, but its chemical composition and characters appear never to have been determined, and such an investigation would doubtless be of considerable interest.

Any survey of the work of Daniel Hanbury, however limited in its scope, should include at least a passing reference to his contributions to Chinese Materia Medica (compare 'Science Papers,' pp. 209-275). These researches, which were conducted fifty years ago, naturally involved very great difficulties, both on account of the language and the limited facilities at that time for securing accurate information. Although regarded by their author only as descriptive notes, which were necessarily somewhat incomplete, they nevertheless contain much of interest, and are of permanent value. With consideration of the recent developments in China, and the establishment of a fully-equipped British University at Hong Kong, it may be anticipated that the natural resources of that vast country will soon be rendered more accessible for scientific study.

In view of the immense fund of knowledge which has been accumulated through the centuries, as witnessed in the great libraries and museums of London alone, it may sometimes seem as if but little could be added to that which is already known, but, notwithstanding all the recorded facts and

⁴ Through the kindness of Mr. Holmes I have had the opportunity of perusing this very interesting publication.

observations and the wonderful progress that has been made in recent years in every department of learning, the boundaries of science are constantly becoming enlarged, and, with the broader view which is thus obtained, the greater is the scope for intellectual effort and achievement. I would therefore like to assure the students who will soon be entering upon their careers that the field of research is still practically unlimited. If we consider, for example, only those branches of knowledge with which we are more particularly concerned, there is much immediately before us and readily available which requires further investigation. Moreover, the vast continents of Africa and Asia and the forests of South America, as well as the islands of the sea, doubtless contain among their natural resources many thousands of plants which have never yet been touched by human hand, and a still larger number which have not as yet been named or classified. This wealth of material which nature has provided will be sufficient to engage the attention of both the botanist and the chemist for a period of time so remotely distant that it cannot be forecast. There can, furthermore, be no doubt that the chemical study of the countless number of plants or plant products whose constituents are as yet completely unknown will not only reveal much of scientific interest, but also principles of medicinal value which may be capable of alleviating some of the ills of mankind.

It will thus be seen that there is a large and fruitful field of research which still awaits development. Those who enter upon the exploration of this field will surely meet with ample reward, but at the close of their labours they will doubtless also experience in some measure the feeling of Sir Isaac Newton, who said: "I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself by now and then finding a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

One is tempted to dwell longer on the investigations of Hanbury, or the topics of interest which are suggested by them, but time forbids. Although the account which I have been able to present of his achievements is necessarily brief, and therefore very incomplete, it may, nevertheless, serve to illustrate the earnestness and diligence with which he pursued the search for truth. At the same time, the hope may be expressed that the principles by which he was guided may be emulated by students in this School of Pharmacy for many generations yet to come. It should especially be remembered by those who are now enjoying the exceptional facilities for the acquisition of knowledge which this school affords, that success in scientific pursuits, as in all other vocations in life, can only be attained by unremitting toil. Neither great wealth nor abundant leisure can alone secure that development of the mind upon which all true success depends. It may indeed be said that the path which must be trod by

those who aspire to the highest achievements is usually a rugged one, and it has been well depicted in the lines by Longfellow :—

The heights by great men reached and kept,
Were not attained by sudden flight,
But they, while their companions slept,
Were toiling upward in the night.

Such a man I believe to have been Daniel Hanbury, for only by a life of constant toil could he have gained the eminence and distinction which have been accorded him in the world of science, and to which both this Society and British pharmacy may refer with pride. It will always be for me a happy recollection to have had the privilege to-day, and in this historic hall, of rendering a slight tribute to his memory.



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