

SCIENCE

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REMINISCENCES OF BUNSEN AND THE HEIDELBERG LABORATORY, 1863-1865.

I FIRST met Bunsen in the lovely, retired valley of Engelberg, Switzerland, during the summer of 1863; I had spent the preceding twelve months in Paris, working in Dumas' laboratory at the Sorbonne, and in the *École de Médecine* under Wurtz, and was expecting to continue my studies in Heidelberg. Learning by accident that Bunsen was at an adjoining *Gasthaus* I called on him and told him of my plans; he received me graciously and immediately won my heart by his affability, by the charming smile that lit up his large features, and by his unselfish interest in my personal affairs. Being myself quite ignorant of the German language we conversed in French, and he gave me useful hints as to the opening of the University laboratory.

My first semester at Heidelberg was devoted almost exclusively to laboratory work, but I attended Bunsen's lectures on general chemistry every morning at nine o'clock in the adjoining auditorium. Bunsen's habit of saying one word when he meant to use another was at first puzzling, particularly as I was very weak in German, but when he exhibited the violet vapor of iodine and called it chlorine, my previous knowledge of chemistry assisted comprehension. After every lecture Bunsen rarely missed spending several hours in the laboratory, going

from student to student with enquiries, suggestions and useful hints. Desirous of securing my share of this personal contact I soon found the best way to induce the Hofrath to linger was to have a supply of clean test-tubes and beakers on an orderly desk, with a query or two requiring experimental answers. Any suggestion as to the use of the spectroscope in connection with a substance under examination was sure to interest the Professor, as that famous instrument was a comparatively new adjunct to chemical work, being then about four years old.

When in the laboratory Bunsen habitually carried between his lips a short, unlighted cigar, and he often stopped at a student's desk only long enough to light the tobacco at a 'Bunsen Burner'; in a few minutes the cigar was again without a spark owing to his absent-minded neglect to pull on it. Absent-mindedness was a marked trait in Bunsen's character, and many amusing anecdotes are told of the difficulties it brought him. The statement that he remained a bachelor because he forgot his wedding day is, of course, apocryphal, as is the other about his putting on a suit of garments on the top of others that he had forgotten to take off; but the following came under my personal observation. Bunsen used to dine every day at a little table reserved for him in a restaurant connected with the hotel in which I lived; one spring he fell into the habit of ordering veal-cutlets and asparagus as the chief item for his meal, and without reflection or feeling that a change of diet would be agreeable, he continued to order '*Kalbs-Cotelette und Spargel*,' daily for several weeks, until one day the *Kellner* gravely informed him that asparagus was no longer in season and could not be supplied. Bunsen seemed to be immensely taken a-back and to realize for the first time that he had been dining on one dish for a long period; he soon recovered him-

self, however, and asked the waiter for the bill-of-fare, from which, after careful examination, he ordered mutton-chops and peas, and this was his daily diet up to the time I changed my hotel.

When the laboratory was closed for the Christmas holidays I tried to get permission to work in the deserted rooms, but in vain, and not wishing to be idle I worked at growing crystals, improvising a desk out of a hotel wash-stand, and a heater out of the huge porcelain stove. Some time after I showed to Bunsen a single crystal of copper-calcium acetate about three inches long, with perfectly regular facets, and of which I was quite proud; he looked at it rather solemnly, as I thought, and enunciated the single word '*ausgezeichnet*!' This was not in my limited vocabulary and whether a commendation or a disapproval I could not divine; I puzzled over the word all day, and on returning home the dictionary explained its meaning to my great satisfaction.

As my knowledge of German increased I attended the lectures of Kirchhoff and of Kopp, but never was able to *enjoy* the latter's interminable sentences and involved style.

Bunsen's assistants in the laboratory at the time of my sojourn were Dr. Bender and Dr. Rose; the latter had the reputation among the students of giving more accurate instruction in mineral analysis than Bunsen himself. Rose is now professor in the University of Strassburg.

Bunsen's methods in mineral analysis were not wholly approved by the students; one day he stopped at my desk for a moment, and picking up a filter containing a moist precipitate he inquired: "What have you here?" Seeing with consternation a portion of my *quantitative* precipitate sticking to his thumb, I hastily seized a '*Spritz-Flasche*,' and washed the substance off his thumb into the filter on the funnel before venturing a reply. Bunsen smiled genially and passed on to my neighbor.

Bunsen showed extraordinary callousness to heat, being able to hold in his fingers metal nearly red hot; on one occasion when stirring a glowing crucible with a very short spatula, his skin fairly sizzled and for relief he took hold of the lobe of his ear with his smoking thumb and fore-finger, explaining that the ear was the coolest part of the body.

The celebrated Dr. Fresenius, of Wiesbaden, having appropriated some discovery or method of Bunsen, without giving credit, was cordially disliked by him, and he once showed it by a significant act. A student accosted the Hofrath as he passed by and put to him some simple question in analytical chemistry; on the desk lay open a copy of Fresenius's '*Anleitung*,' whereupon Bunsen closed the book with a deprecatory gesture, pulled out the drawer of the student's desk to its extreme limit, and thrust into it as far back as possible the objectionable volume, saying: "*Nun, mein Herr*, we will proceed."

Bunsen was rather sensitive to criticism; one of my American colleagues tells me of an incident illustrating this. The professor proposed to the student the joint preparation of certain Cesium and Rubidium salts, saying he would secure several barrels of the mineral water rich in the chlorides and would have the water boiled down to a small volume ready for the separation of the rare elements. The American felt highly pleased at the flattering proposal and to show his interest in the matter mentioned that he had studied under Professor O. D. Allen, of New Haven, who had done work on Cesium and Rubidium. This was an unfortunate remark, however, for Allen had corrected Bunsen's figures for the Atomic Weight of Cs., and the Hofrath remembering this never again mentioned the subject to my friend.

In those days students were obliged to prepare some substances now commonly

provided, and to construct some apparatus with their own hands. Every student had to etch and calibrate his own eudiometer, and some of them wasted much time over the hydrofluoric acid process before getting good results. I remember, too, purifying potassium hydroxid by solution in alcohol (an extra charge), and evaporation in a large silver basin loaned by an assistant. One green, Russian student bought at Desaga's potassium cyanid instead of the hydroxid and was vainly trying to dissolve it, walking about the laboratory shaking the bottle for hours, when Bunsen noted its singular appearance, he caused the operation to be suspended, and on ascertaining the nature of the substance cautioned the student against it.

Speaking of Russians reminds me of an amusing occurrence; one of them was instructed to precipitate a substance '*mit überschüssigem Kali*,' and not finding any bottle labelled '*überschüssiges Kali*,' he inquired for it of a neighbor, who mischievously sent him to Dr. Bender, telling him the article was kept under lock and key with other costly substances, such as silver nitrate and platinum chlorid. The astonished assistant explained to the Russian that an *excess* of potash did not require a special bottle; the student was nicknamed '*Überschüssiges Kali*' for the rest of the *semester*.

Many nationalities were represented in Heidelberg laboratory, besides Russians there were Bessarabians, Hollanders, Bohemians, Germans from North and from South, Austrians, one Chilian, one Englishman (the late Dr. Walter Flight), one Scotchman, one Irishman and several Americans, fifty-nine students in all, of which fifty-eight were incessantly smoking; the fumes of tobacco mingled with vapors of H_2S , SO_2 , HNO_3 , and NH_3 , making an atmosphere so thick that I regret not having cut off a slice as a souvenir.

The students, from time immemorial, had

a voluntary organization to maintain order in the laboratory; they elected at the beginning of each *semester* an officer known as '*Polizei-Diener*,' who was authorized to impose small fines for petty offenses, the money thus secured being devoted at the end of the term to the purchase of books for the small library placed on shelves in the balance-room. This custom I understand still obtains. At the opening of my third term I was elected '*Polizei*,' and duly instructed in my duties; being watchful and courageous I collected more money during my term of office than had been added to the library fund for many years. The misdemeanors for which fines were imposed were leaving an unused gasburner lighted, failure to resort to the '*Stink-Zimmer*' when noxious gases were generated, failure to replace bottles or apparatus used in common, and leaving a balance door open or weights on the pans, which latter was accounted a very heinous offense; the fines ranged from six kreutzers (Baden) to half a gulden. My official life was marked by two events that greatly excited and amused the whole laboratory; one of the events was regarded as an exhibition of unparalleled audacity, of which only an American was capable—I fined Hofrath Bunsen! The Professor, after lighting his cigar at the flame of a Bunsen burner left the gas burning and went out of the room; according to custom, and to the consternation of the students, I chalked on the desk that Bunsen had used, the words '6 Kr.' over my initials, a notice that could not be erased until the fine was paid. Next day when Bunsen approached the desk, he glanced at the inscription, smiled broadly, and to the amusement of the crowd of students that had gathered to see the result of my daring, opened his purse and handed me the six kreutzers with a pleasant commendation of the fidelity of the '*Polizei*.'

The other event concerned a very close-fisted American whose numerous fines I was unable to collect; when they reached the enormous sum of one and a half gulden, (about 60 cents), I consulted some of the older German students stating the facts and asking for advice. They declared they had never heard of such a case, and they authorized me to confiscate some chemical apparatus belonging to the American and to sell it at auction. I secured a fine beaker-glass, the outside one of a large nest, and after due notice, amid the shouts of the 59 students gathered in the lecture-room the beaker was sold at auction; the competition to secure it was so keen that it brought a very high price, the sum covering the fine plus the value of the glass. The excess had to be paid back to the lucky American, so that the fine did not come out of his pockets, after all.

Several times in the course of his life Bunsen was injured by explosions; he was popularly believed to be minus one eye, one ear, and one lung, and there is some foundation for this, for he lost an eye when working at cacodyle, and he was slightly deaf. It was related of him that on one occasion a violent explosion threw him to the ground and made him unconscious, on coming to, his first words were: "Has any of the substance been saved?"

In 1865 Bunsen was invited to fill a chair in the University of Berlin, and after due consideration he declined the flattering call to the delight of all educational Heidelberg. In his honor the students organized a torch-light parade; the chemists marched in a body, and carried away by enthusiasm I imprudently joined them, carrying a torch with the crowd. The procession paraded the principal streets and then assembled in the open square before the *Aula*, or central Hall of the University; there the students singing the *Studenten Lieder* and formed a ring, gradually closed in towards the center, mak-

ing the ring smaller, until at a given signal they threw their half-burned torches into the very center and the pile blazed on high, making an impressive ceremonial. I have said I imprudently joined because I failed to anticipate the disagreeable consequences; the smoke of a half-a-thousand torches, the dripping grease, and the dust of the streets, combined with the moist exudation of my membranous integument, to form a black deposit that would have honored a stoker, besides ruining a suit of clothes.

During my residence in Heidelberg a lamentable and terrible affair took place that threw a profound gloom over the University and the entire town. Two German students having quarreled decided the earth was not large enough for both of them to live in, and resorted to the diabolical practice called the 'American Duel.' In a darkened room the two young men drew lots, having sworn that he who drew the black ball would commit suicide. The unhappy loser went to his room and discharged a bullet into his breast, but missed his heart and lingered for several days on his death-bed; his parents were summoned by telegraph and besought him on their knees to disclose the name of his antagonist, but he steadfastly refused and died with the secret in his breast. The students not only excused his conduct but praised his courage, and when his remains were taken to the railway station to be transported to a distant city, they accompanied the funeral cortège with torches and music. The students claimed he was not a suicide for he was killed in an honorable duel, and they maintained that his opponent was not accessory to his death because he shot himself; I had many arguments with them and never could convince them of their extraordinary tergiversation.

The whole system of dueling at Heidelberg is an interesting feature of student life that I had good opportunities of observing

without taking part, but, as Kipling says, 'that is another story.'

The intimacy of Bunsen and Kopp is well known, I have often seen them walk through the narrow streets hand-in-hand like affectionate schoolgirls, Bunsen's large frame and Kopp's diminutive stature making a strong contrast.

Bunsen had great talents and personal attractions yet he did not succeed in fostering original work on the part of those who studied with him; I think this is partly due to the fact that they were chiefly beginners and when they had acquired the rudiments of general chemistry they took to the fertile fields of organic chemistry under other masters. Yet his pupils include some men of high rank in the profession, Lothar Meyer, Sir Henry Roscoe, Beilstein, Lieben and Carius.

I last saw Geheimerath Bunsen during a brief visit to Heidelberg in 1891; he had retired from active duty and complained of the infirmities of advancing years, being subject to rheumatism, but he exhibited the same cordial manner, the charming smile, and a willingness to listen to the accounts of Americans who had pursued their studies in the Heidelberg Laboratory. Bunsen died after a lingering illness, August 16, 1899, at the great age of 88.

Among the Americans contemporary with me may be named:

Eli W. Blake, afterwards professor of physics at Brown University, deceased.

Orren W. Root, afterwards professor of chemistry at Hamilton College, deceased.

Charles Wolf, of Cincinnati, deceased.

George M. Miller, of New York.

Harry McBurney, of Boston.

Lyman Nichols, of Boston.

Arnold Hague, of the United States Geological Survey.

Frank Slingsuff, of Baltimore.

There was no club or association among the Americans such as exists in Göttingen,

and a full list of Americans who studied under Bunsen could only be made from the official register of the university.

Of the charm of residence in the picturesque little city on the Neckar, with its magnificent ruined castle, its attractive forest-covered hills threaded by enticing paths, its historical associations, and its excellent beer, there can be but one opinion; but in winter we often felt the truth of the old couplet:

'Heidelberg ist eine schöne Stadt
Wenn es ausgerechnet hat!'

HENRY CARRINGTON BOLTON.

A SKELETON OF *DIPLODOCUS*, RECENTLY
MOUNTED IN THE AMERICAN
MUSEUM.*

IN the spring of 1897, one division of the American Museum exploring party was sent by the writer to the Como Bluffs of Wyoming, made famous by numerous discoveries of Dinosaurs. It was believed that this rich locality had been exhausted by the continuous excavations of the United States Geological Survey under the direction of Professor Marsh. The first prospecting, however, resulted in the discovery, by Mr. Barnum Brown and the writer, of a large femur, which guided us to a very remarkable skeleton of *Diplodocus longus* Marsh. Dr. J. L. Wortman joined the party later and superintended the work of excavation which occupied several months.

At one time strong hopes were aroused that the entire animal would be found together. The long tail stretched off parallel with the cliff, interrupted only by a narrow gully which

* Extract from Memoirs of the American Museum of Natural History, Vol. I., Part V. Issued October 25, 1899.

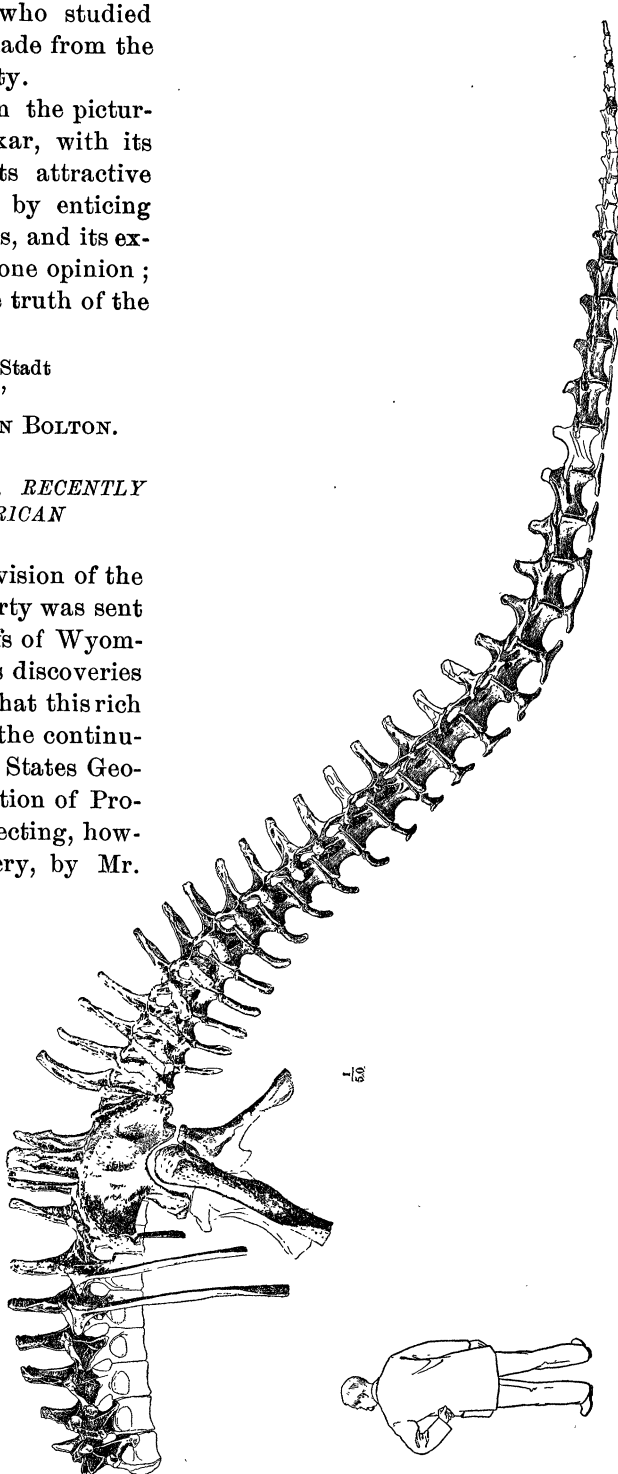


FIG. 1. Posterior half of Vertebral Column of the *Diplodocus* Skeleton with Pelvis and Femur in Position. The figure is of a man of the average height. $\frac{1}{50}$ nat. size. Parts missing in contours.