acid, the synthesis of salicylic acid (by Kolbe and Lautemann), and the reduction of numerous oxy-acids by means of hydriodic acid, carried out by his pupils, belong to this group. In this connection it is right to note that it is to Kolbe that we owe our knowledge of the antiseptic action of salicylic acid.

Besides numerous scientific papers, chiefly published in the *Annalen der Chemie und Pharmacie* and in the *Journal für praktische Chemie*, Kolbe wrote many of the articles in the great *Dictionary of Chemistry*, of which he was editor, and a very valuable *Ausführliches Lehrbuch der organischen Chemie*. In the first and second volumes of this *Lehrbuch* (the only part written entirely by Kolbe) we have a very full account of his views on the constitution of the alcohols, acids, and their derivatives. He also published two short text-books, one on inorganic, and the other on organic chemistry.

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## James Duncan Matthews. By Professor W. Carmichael M'Intosh, F.R.SS. Lond. and Edin.

(Read January 5, 1891.)

The story of a long life, spent in the service of science, for the most part tells it own tale, and is more or less independent of the biographer; but it is different when a young worker, broken in health, and thus hampered in his efforts, succumbs before reaching middle age.

Born in Aberdeen, Mr Matthews commenced life as an architect in the office of his father (ex-Lord Provost Matthews of Springhill), intending to follow this profession. At the age of nineteen, however, he suffered from a severe attack of typhoid fever, which greatly enfeebled his constitution, and permanently injured his lungs. Though he made several long sea-voyages to Australia and America for the benefit of his health, he only partially succeeded, for the chest-affection continued slowly to progress.

Though in feeble physical health, his active mind was eager for action, and he was led to pursue microscopical work. He then entered Aberdeen University, and studied various biological subjects—especially zoology—which was taught by Professor Ewart, then newly appointed, and with whom a friendship sprung up. Greatly interested in the subject, he resolved to devote his

whole energies to zoological pursuits. His first essay—communicated to the British Association at Southport—was on "Wool Plugs and Sterilised Fluids," a subject for which his conscientious exactness and ingenuity peculiarly fitted him. He concluded by expressing doubts as to the efficiency of wool plugs as filtering agents when a strong current passed through them.

When Professor Ewart was transferred to Edinburgh, Mr Matthews followed him—becoming Demonstrator in Zoology in the University. While in this position, he won the favour of the students and others by his unvarying courtesy, punctuality, and attention to duty. Professor Prince, now of St Mungo's College, Glasgow, who was associated with him in class-work during the summer of 1884, writes of him thus:—"One of the brightest spots in my Edinburgh experience was my daily association with Duncan Matthews, a devoted and unwearied worker amidst all the disadvantages of ill-health and bodily weakness. He was a most accurate and painstaking zoologist, a skilful draughtsman, and was well acquainted with foreign ichthyological literature. Edinburgh never had a more worthy and accomplished, or a more unobtrusive and kindly, professorial assistant. His published papers give no idea of his laborious industry and devotion to zoological work—work which social and other circumstances rendered by no means a necessity."

Along with Professor Ewart he drew up and published a series of directions for the students of the Practical Class on the examination of various invertebrates—similar to those used in University College, London. The critical acuteness of Mr Matthews was well fitted for this work, which, indeed, mainly fell on his shoulders. Yet at this time he seemed to experienced eyes to be on the verge of grave thoracic complications, and one could not but feel for the young assistant gallantly adhering to duty in the absence of his senior when the cold winds of spring told so heavily on his cough. Nevertheless, no complaint fell from his lips, and he performed every task cheerfully and well. He subsequently, however, had to interrupt his labours, and obtain partial relief of the symptoms by a visit to the quiet grounds of Springhill. Next year (1885) he published a very interesting paper on the presence of an oviduct in an adult male skate, besides another series of the joint notes for the

students on the dissection of the skate. These notes gave him even more labour than the previous publication on the invertebrates.

Besides his duties in connection with the class of Zoology in the University, he was employed by the Fishery Board for Scotland to carry on various researches on fisheries' subjects and tabulate results, but he was not responsible for certain of the deductions made from the latter. His singularly clear and cautious mind made him slow to arrive at conclusions—especially in cases fraught with both doubt and difficulty. One of his earlier papers on fisheries' questions was a most careful and methodical report on the sprat-fishing of 1883–84. He accurately pointed out the various distinctions between the sprat and the herring (with the exception of the pelagic egg of the sprat—then unknown), and concluded by demonstrating that in the Firths of Forth and Tay, and in the Moray Firth, the sprat fishermen captured during the winter months 143,000,000 young herrings.

He continued his researches, notwithstanding very feeble health, in 1885, and—his father being then Lord Provost of Aberdeen—he besides took much interest in the arrangements for the meeting of the British Association at Aberdeen in the autumn of the same year. He attended many of the meetings of the Association—especially in Section D (Biology)—though he did not communicate any of his papers. He had much to do, however, in aiding his father in his entertainments at Springhill, and in making his guests (amongst whom were Sir Lyon Playfair, President of the Association, Lady Playfair, and Lord Rayleigh) spend a most pleasant week.

Now fairly entering into the spirit of the fisheries' work, he took up the question of the varieties of the herring. In the skilful hands, and by the exact methods, of Mr Matthews certainty took the place of doubt, and though difficulties still remained, he at any rate reduced the errors from limitation of observation to a minimum. Heincke's paper on the varieties of the Baltic herring did not come into his hands before his own observations were nearly completed, but he was able to make a comparison of the methods. The labour involved in this paper may be estimated when it mentioned that 16,000 measurements and 20,000 subsequent calculations were included, and that the general size, dimensions of the head, differ-

ences in the position of the fins, and other points, were elaborately investigated and tabulated with a tenacity of purpose and innate skill in the manipulation of figures which were prominent characteristics of Mr Matthews. He cautiously concludes this preliminary paper by the statement that the winter and summer herrings slightly differ, viz., in the more posterior position of the fins, the doubtfully smaller head and slightly lesser size of the summer herrings.

About this time he also investigated the kindred subject of the whitebait of the Thames and Forth, and published, in conjunction with Professor Ewart, his results in a short paper. The percentage of sprats and young herrings in these localities is given—the former largely predominating. In the winter fishing of the Firth of Forth the young herrings are practically absent, and in that of the Thames they are in the proportion of only 6 per cent. As the season advances the number of young herrings increases—reaching in May and June 80 per cent. of the shoals, but again decreasing in July.

He continued his persevering researches on the supposed races of the herring in Scottish waters, and issued a second paper on the subject in the Fishery Board's Report for 1887. Here, again, the careful nature of his work, his respect for the observations of others, and his own sound deductions are noteworthy. As the result of his laborious tables and long-continued attention to the subject, he states that there is no true racial distinction between the herrings of the various localities around our coasts, and that the slight differences indicated in his former paper do not—after more extended observations—warrant him in making a distinction. The variations in the position of the dorsal fin during the growth of the herring would alone have rendered the observer careful not to place too much weight on the slight differences formerly indicated, and one can almost sympathise with the earnest young worker who so faithfully plodded through such a mass of materials—skilfully handling every available point—yet with only a negative result as the reward of his free expenditure of labour. He, however, had a talent for figures, and his deductions were always characterised by conscientiousness and exactness.

His investigations on the herring had rendered him familiar with

the anatomy of the fish, and more particularly with the skeleton and its variations. Accordingly, at this time he drew up an elaborate account of the skeleton of the herring, detailing every bone individually and in relation to its neighbours—the whole illustrated by seven plates, for he had a facile and accurate pencil. The amount of patient and monotonous work in this treatise is great, and must with his other labours have taxed the delicate frame of Mr Matthews to a dangerous extent—careful as he was to husband his energies—solely for the advancement of science. The skull, vertebræ, fins, and other parts are minutely described and figured, and the more important differences occurring in the twaite and the allis shad, the pilchard and the sprat, are mentioned. This investigation alone would have entitled Mr Matthews—as a skilful comparative anatomist—to the respect of every zoologist.

This year (1887) was his most prolific one, for in addition to the foregoing laborious papers he produced two others. The first consisted of a report on the examination of 400 stomachs of whiting, the contents of which were carefully tabulated. His observations led him to believe that the whiting fed for the most part on small fishes and crustaceans, thus differing to some extent from the cod and haddock, both of which had a more varied dietary. The second paper gave an account of the nest, eggs, and newly-hatched larvæ of the Ballan Wrasse (*Labrus maculatus*) from Broadford in Skye. Mr Matthews was thus the first observer who recorded this feature in our country.

The efforts of 1887 just recorded, and of the previous years—when he several times lectured for Professor Ewart, as well as conducted the class of Practical Zoology—proved too severe a strain, and he had to retire to Springhill, his quiet walks amidst the beautiful gardens and grounds of which had formerly restored a measure of health. There, as his brother-in-law, Dr Ogston, tells us, he lived amongst his specimens and aquaria—"converting his rooms into extemporised workshops and laboratories, where his investigations were carried on. As his strength waned, these grew more intermittent, but even to the latest hour of consciousness he remained surrounded by his plants and animals, and showed his interest in them." A journey to London to attend the funeral of his uncle, Dr Matthews Duncan,

a kindred spirit, and to whom he was tenderly attached, dangerously exhausted him, and since that time his strength gradually diminished. He died on the 24th November 1870 at the age of thirty-nine years.

Mr Matthews had a singularly clear, well-balanced, and vigorous intellect, keen observation, and remarkable powers of application. There is, indeed, no doubt that he would have achieved an eminent position in science if his health had been favourable. As it was, he became one of the best authorities on the clupeoids, and no one took more interest in the group. Even when confined to bed, and unable to do more than write briefly in pencil, he perseveringly tried to secure anchovies, then appearing here and there on our coasts, so that fresh observations on this form might be carried out.

Taken as a whole, the career of Mr Matthews is an instance of exemplary devotion to duty—under great physical difficulties—in a field he had deliberately chosen. Many men in his position would have felt the weight of physical illness sufficient to bear, and would have passed their valetudinarian hours in search of ease and repose. Not so with Mr Matthews. Like Edouard Claperède of Geneva, he even adhered to his labours after repeated hæmoptyses—preferring "rather to wear the sword out than let it rust out." The hand of the gentle young naturalist has vanished, but his accurate work will remain as a proof of his resolute perseverence under difficulties, and of his loyalty to zoological science.

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## Memoir of Colonel Sir Henry Yule, R.E., C.B., K.C.S.I., LL.D., &c. By Coutts Trotter.

(Read January 5, 1891.)

When the Royal Society of Edinburgh, in 1883, conferred the distinction of an Honorary Fellowship on Colonel Henry Yule, they were moved thereto, probably, as much by the wide range of subjects felicitously touched by his genius, as by the rare quality of the work done by him in his special domain of Comparative Geography.

The difficulty of adequately handling these numerous and