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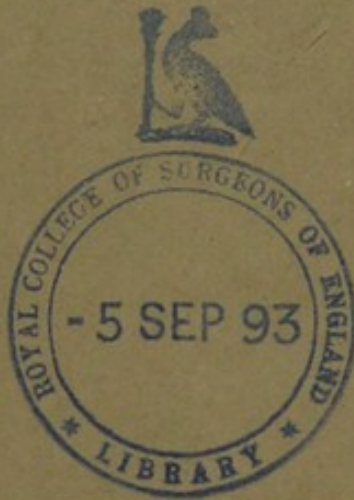
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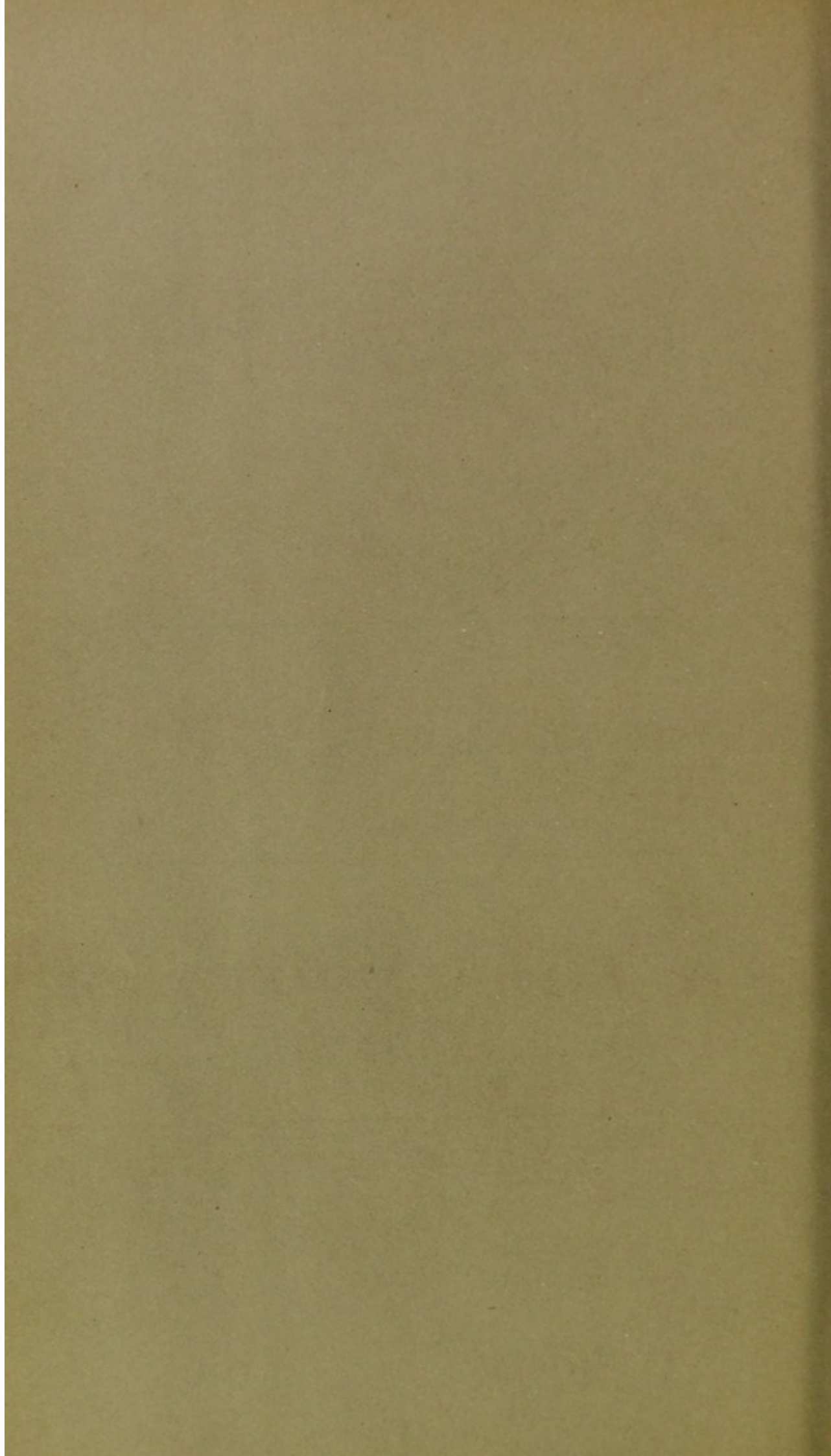
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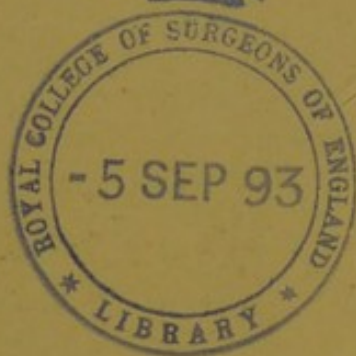
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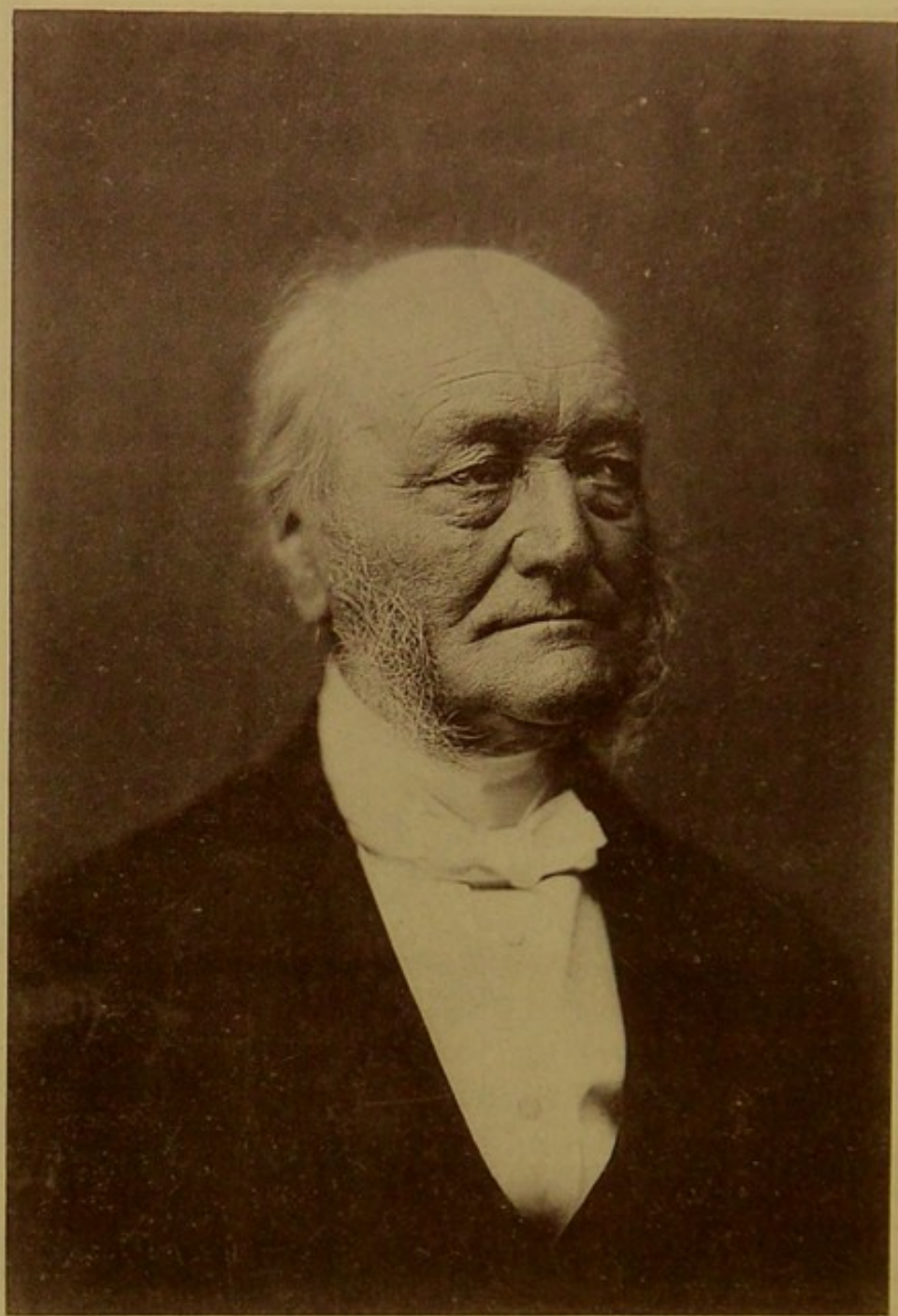
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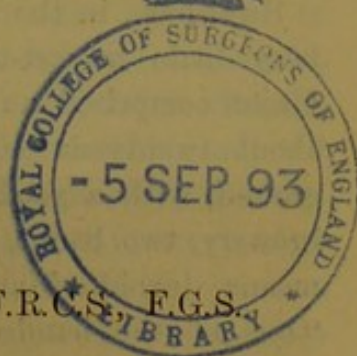
MEMOIR OF CALEB B. ROSE, F.R.C.S., F.G.S.







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Very Truly
C. B. Rose



VII.

A MEMOIR OF CALEB B. ROSE, F.R.C.S., F.G.S.

BY HORACE B. WOODWARD, F.G.S., *President.*

Read 28th February, 1893.

AMONG the early workers on Norfolk Geology there were Richard Cowling Taylor,* sometime resident in Norwich as a land surveyor; Samuel Woodward,† clerk in Gurney's Bank; John Gunn,‡ rector of Irstead; and the subject of the present memoir, Caleb Burrell Rose, surgeon, of Swaffham. Rose was born at Eye, in Suffolk, on February 10th, 1790. As a youth he was apprenticed to his uncle, a surgeon in that town, and later on pursued his studies in London, at Guy's and St. Thomas' Hospitals. Afterwards he became assistant to a surgeon in Derbyshire, and then, for a short time, took up a practice at Botesdale, in Suffolk. There is no record of his passing any examinations: indeed, in those early days of the century, such qualification was not necessary. Rose went to Swaffham, in Norfolk, in 1816, and there settled down, and practised as a surgeon for forty-three years. In 1836 he became a Member of the Medical and Chirurgical Society of London, and in the same year was admitted a Member of the Royal College of Surgeons. Ten years later he attained the distinction (by examination) of becoming a Fellow of the Royal College of Surgeons.

* R. C. Taylor (1789-1851) was born at Banham in Norfolk; he was third son of Samuel Taylor of New Buckenham. He was engaged for a time on the Ordnance Survey; and settled in the United States about the year 1830.

† S. Woodward (1790-1838); see Memoir in Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 563; and Geol. Mag. 1891, p. 1.

‡ J. Gunn (1801-1890); see 'Memorials of John Gunn,' 8vo. Norwich, 1891.

Swaffham, in the early part of the century, was a comparatively busy little market-town of about 3000 inhabitants, while the Union comprised no less than thirty-three parishes in an area of about twenty-six square miles. Pleasantly situated on rising ground, with a good market-place, wide streets, a fine church, a brewery, two banks, and an assembly room, the town was by no means devoid of attractions; indeed it has been spoken of as "one of the handsomest in the county." It possessed also a "divisional county jail," and it was said that "the prison invariably fills as soon as the harvest is got in and work ceases." To the south and west of the town, in those days, the country was wild and open, with large tracts of heath, and the Bustard, as Rose himself observed, was to be found on Marham Smeeth and Beachamwell Warren. There were then no regular roads to some of the villages in that direction, only tracks across the heath; and most people rode on horseback.

In early life Rose manifested great love for natural science, and he was especially attracted to the study of geology, which continued always to be his favourite pursuit. Shortly after he settled at Swaffham he began to form a collection, and the men who worked in the chalk-pits and brick-yards soon became acquainted with the fact, and with the value of specimens; and they laid aside fossils and anything unusual which they might find for the doctor's inspection.

Goddard Johnson, of Little Dunham, well-known in those days as a sagacious man, and a keen archæologist, was a frequent visitor at Mr. Rose's house. Generally on market-day he came to tea, and there were great talks on archæology and geology. Nevertheless, sympathy was not always forthcoming, and it may be worth noticing, as a not unfamiliar sign of those times, that certain clergymen and others looked askance at the doctor because he was a geologist, for they thought him likely to have dangerous and unsound notions; that in fact he might not believe all that, in their opinion, he ought to believe.*

It was in 1826 that Rose first came in contact with Samuel

* For most of the foregoing particulars, and for some that follow, I am indebted to Mr. Rose's son, Dr. Caleb Rose, of Ipswich. I have also had the advantage of reading many letters from Rose to S. Woodward (1826-1837); these letters are now in the possession of Dr. Henry Woodward.

Woodward, of Norwich, who was but a few months his junior in age. The latter hearing from the Rev. James Layton, of Catfield, that Rose contemplated bringing out a work on Norfolk Fossils, wrote (May 24) to offer any assistance he could give to this project.* Shortly afterwards Rose came to Norwich, and henceforth the two geologists became good friends, helping one another by the loan of books and the exchange of specimens, and communicating news of the observations and discoveries they made in their respective neighbourhoods. S. Woodward visited Rose at Swaffham in the same year, and they thus made acquaintance with the fossil treasures that each had gathered together—the one mainly from the strata of Upper Chalk and Crag in East Norfolk, the other from the Middle and Lower Chalk and the brickearth of West Norfolk.

Rose had commenced his labours when but little was known about the geology of West Norfolk, excepting from the descriptions of agricultural writers, and the early map of William Smith, published in 1819. Later on, in 1823, R. C. Taylor† gave some account of the Alluvial Strata and the Chalk of Norfolk and Suffolk; and also published a brief though detailed description of the strata in Hunstanton Cliff—the only important natural section in West Norfolk.

These were the few special works relating to the district; but in the 'Outlines of the Geology of England and Wales,' by Conybeare and Phillips (1822), although there were but brief references to West Norfolk, there were general accounts of the Chalk and other strata, most valuable for reference and comparison. Stimulated in his studies by this work, and still more perhaps by the great work of the two Sowerbys, on 'Mineral Conchology,' then in course of publication, Rose pursued his work with ardour, carefully noting all sections of the strata, and gathering together all the fossils which he could obtain. Writing of William Smith (in 1834) Rose says: "the more I examine West Norfolk, the more I can confirm his early observations."

* S. Woodward had in 1825 nearly completed two MS. works, illustrated with about 300 coloured drawings of the fossils of the Norwich Crag and Chalk. See Memoir in Trans. Norfolk and Norwich Nat. Soc. vol. ii. p. 570.

† Trans. Geol. Soc. ser. 2, vol. i. p. 374; and Phil. Mag. vol. lxi. p. 81.

Rose's contemplated work on the Norfolk fossils did not make great progress, indeed he ultimately abandoned his idea of publishing a book on so comprehensive a subject, and it was left to his friend, S. Woodward, to bring out the first 'Outline of the Geology of Norfolk,' which was issued in 1833.

In the meanwhile Rose forwarded specimens from time to time to James de Carle Sowerby, who since 1822 carried on the great work commenced by his father, James Sowerby. Writing to S. Woodward (Aug. 23, 1827) Rose says: "I sent this summer twenty specimens of Ammonites to Sowerby to name, and he found among them seven new species, or [species] not figured in his 'Mineral Conchology'; he took sketches of them. I also sent him two new *Serpulæ*, which he intends publishing." On referring to Sowerby's work (vol. vi. 1829), it will be seen that the following species from Rose's collection are figured:—

<i>Baculites Faujasii</i> , Sow.	...	...	Fig. 592
<i>Inoceramus involutus</i> , Sow.	...	...	" 583
" <i>latus</i> , Mant.	...	...	" 582
<i>Serpula obtusa</i> , Sow.	...	...	" 608

As Miss Etheldred Benett and Dr. Mantell were at the time sending to Sowerby many chalk fossils from Wiltshire and Sussex, it is probable that they obtained better specimens than some of those sent by Rose; an explanation sufficient to account for the fact that all Rose's "new species" were not figured.

Early in 1828 a sad trial came to him in the death of his wife, and for a time he contemplated leaving Swaffham. Writing to S. Woodward (Jan. 31) he says: "My heavy domestic calamity, that has taken from me an inestimable companion, has sadly broken in upon my pursuits, and it is very probable I shall leave my present house. I am at this time inclined to part with my collection of fossils, and think of offering it to the Norwich Museum. Do you think they have spirit or means to purchase it, for I cannot afford to give it?"

Later on, in the same year, his interest happily revived. He finds a new *Inoceramus*, which was sent to Sowerby, but is somewhat surprised to learn that his shells from the brickearth of East Winch, in the Nar Valley, were not considered by that authority to be fossils. Sowerby did, however, figure the *Aporrhais* (*Rostellaria*)

pes-pellicani and *Turritella terebra* from Rose's specimens, for these species occur also in the Crag.*

Rose also forwarded a paper to the 'Philosophical Magazine.' This, however, was not accepted, and he feels that he has not had "fair play" from the editor, Richard Taylor (a cousin of R. C. Taylor). Later on he sent a paper to the 'Quarterly Journal of Science, Literature, and Art' (the Journal of the Royal Institution), and received a complimentary letter from Professor W. T. Brande. His paper, "On the Organic Remains of the Diluvium in Norfolk," was printed, but curiously enough, as Rose remarks, a reference in it is by mistake made to a former part of the paper that was not published (letter to S. Woodward, February 5th, 1829). This former paper dealt with the character of the so-called diluvial formations.

During the years 1830 to 1833 the first edition of Lyell's 'Principles of Geology' was published in three volumes; and his son remarks: "I well remember, many years ago as it is, the exceeding great pleasure which this book gave him."

Rose mentions (in a letter to S. Woodward) that driving through Sandringham in August, 1834, he was tempted to enter the hall, where a sale of the property of H. H. Henley † was then going on. Although Henley had resided at Sandringham Hall, he was Lord of the Manor of Lyme Regis, in Dorset; and a number of Lias fossils, as well as other specimens, were being sold at the auction. Rose purchased a few fossils, and mentioned that a very fine example of the Liassic fish *Dapedium politum* was sold for eight shillings. While in the yard at Sandringham looking at a cast-away skin, his son Caleb, who was with him, inquired what it was. "The skin of a Boa, my lad," said Rose. "A Boar, sir!" quoth a countryman, "I believe it is something of a Serpent."

Rose had in 1830 sent a list of the localities of his West Norfolk fossils to S. Woodward, and later on helped him with his Geological Map of Norfolk, by drawing the divisions of the Chalk in the western portion of the county. ‡

* 'Mineral Conchology,' vol. vi. figs. 558 and 565.

† The well-known *Ammonites Henleyi* of the Lias was named after H. H. Henley by Sowerby.

‡ See 'Geology of Norfolk,' pp. 3, 32.

It was not until 1835—36 that Rose published his most important paper, 'A Sketch of the Geology of West Norfolk,' which contained the results of his observations made during the previous seventeen years. Geologists at the present day are hardly content to wait so long a time before recording their facts and conclusions; the consequence is that, while more prolific in producing papers, the results appear often in an attenuated form, and lack the sterling value of some of the earlier and more matured pieces of work.

Rose tells us that in arranging and publishing his geological notes, he but responded to an appeal made by Dr. Fitton, from the chair of the Geological Society at the Annual General Meeting of the Fellows in 1828, in the following words:

"But those who are deprived of the privilege of travelling even in England, must not suppose that they can be of no service as geologists: or if they belong to our body, that they are thus released from their obligation to be active in our cause: and there are two descriptions of persons,—the resident clergy, and members of the medical profession in the country,—to whom what I am about to say may be more particularly deserving of attention. Such persons, if they have not yet acquired a taste for natural science, can hardly conceive the interest which the face of the country in their vicinity would gain, however unpromising it may appear, by their having such inquiries before them; how much the monotony of life in a remote or thinly inhabited district would thus be relieved; nor how much benefit they might confer on the natural history of their country."

It is interesting to note that Fitton appeals to the clergy, for, as previously remarked, their attitude was often opposed to scientific inquiry. He, however, had admirable examples in Buckland, Conybeare, and Sedgwick; while in Norfolk, John Gunn, James Layton, and others devoted themselves in a humbler way to the search after truth.

In his paper on West Norfolk, Rose took as the eastern limit of his observations a line drawn from Wells to Thetford. Commencing with an account of the oldest strata, he shows how difficult it is to fix a plane of division between the Oxford and Kimmeridge Clays, on account of the local absence of the "Coral rag beds." His careful record of facts, and the fossils which he determined, enable us, however, to identify the horizon of the Corallian beds at Denver Sluice, and in a deep well-sinking at Lynn; for the recent observations of Thomas Roberts in Cambridgeshire and Lincolnshire, show that the "Coral rag," or Corallian beds, as they are now called, are

represented by their fossils in the great clay-foundation of the Fenland. In the Kimmeridge Clay Rose obtained a specimen of shale that "burns readily, crepitating like cannel coal," a fact of interest, as similar bituminous shale is well known to occur in Dorsetshire and also in Lincolnshire in the same formation; and in the former county the "Kimmeridge Coal" has proved of some economic value.

Rose gives a good stratigraphical account of the "Inferior Greensand," provincially called Carstone, but he had at that time obtained no fossils from it. In lithological characters he identified it with the Lower Greensand of Sussex.

In S. Woodward's Geological Map of Norfolk the Gault was omitted, as Rose then entertained great doubt of its presence in the county: but when he met William Smith at the Cambridge meeting of the British Association in 1833, that geologist so positively assured him of its existence in Norfolk, that on his return home he "redoubled his inquiries." Sedgwick, moreover, had stated in 1826 that the Red Chalk of Hunstanton was exactly in the place of the Gault of Cambridge; and eventually Rose was able to "fully concur with the distinguished Professor in considering the red beds the equivalent of the gault."

His observations are full of interest when we bear in mind the subsequent debates that have taken place on the age of the Hunstanton Red-rock; * for Rose clearly recognises the true state of the case when he remarks: "The gault of Norfolk affords a remarkable example of dissimilarity in the mineralogical character of adjoining portions of a contemporaneous deposit, and is an additional illustration of the necessity for employing the zoological character to determine their identity."

Again, in reference to the White Chalk of Hunstanton, Rose found it difficult to determine the equivalents of Upper Greensand and Chalk Marl, for the fossils were so intermingled. He remarks: "And from this circumstance we are led to infer that at the epoch when the *upper green-sand and chalk-marl* of Wiltshire and Devonshire were depositing, and the then existing marine Testaceæ were entombed, similar phænomena were in progress in this portion of the great chalk basin; but the material supplied being more

* See Whitaker, Proc. Norwich Geol. Soc. vol. i. p. 212.

cretaceous, the strata consequently exhibited a dissimilar *mineralogical* character." Subsequent researches fully bear out this view of the case.* With regard to the "ramose Zoophyte" of the so-called Sponge Bed, he cautiously remarks that the nature of the organism is "not satisfactorily determined." It is now regarded as an inorganic structure by Professor Hughes.†

Rose also mentions that "The singular striæ observed by Mr. Mantell to occur at the natural separations of the chalk in Sussex, are also seen here, particularly in the pits at Marham and Westacre. Mr. Mantell thinks these striæ were 'produced by a subsidence of the strata which caused them to slip over each other before they were entirely consolidated.' May they not also be the result of concussion from remote volcanic action?" Like appearances have since been noticed in Yorkshire and elsewhere; and it is thought that in some cases they are due rather to "incipient crystallisation" than to agents producing slickensides.‡

Rose mentions the various kinds of flints, including thin tabular flint: and he asks, "Does it not favour the opinion, that the siliceous molecules, by elective attraction, separate themselves from the calcareous matter, above and below certain parallels determined by the proportion of silex contained in the chalk, and approach each other until they arrange themselves in the tabular form?" This explanation would apply rather to the nodules that occur in layers than to the tabular flint that occurs in veins that cross the beds obliquely; but, in illustration, Rose quotes from the 'Penny Magazine' of October 4th, 1834, the statement that when the masses of clay mixed with ground flints, prepared for making fine pottery and china, "are allowed to stand unused for some time, it often happens that the particles of the powdered flint separate from the clay into detached hard stony nodules. The observation of this fact has thrown considerable light on the probable origin of the nodules of flint in chalk, a subject which was very obscure, and of which no satisfactory theory had previously been proposed." This suggestive statement was based on

* A. J. Jukes-Browne and W. Hill, Quart. Journ. Geol. Soc. vol. xliii. p. 544. See also C. Reid and G. Sharman, Geol. Mag. 1886, p. 55.

† Quart. Journ. Geol. Soc. vol. xl. p. 273.

‡ Quart. Journ. Geol. Soc. vol. xxix. pp. 417—419.

observations recorded by Charles Babbage;* but the matter during the past sixty years has not attracted the attention it would seem to deserve.

Rose's careful lists of fossils, and his remarks on their geological and geographical distribution are most valuable, for he clearly recognised that succession of forms belonging to different stages in the Chalk, that are now ranged into "zones."

Coming to the "Diluvium," he remarked that "the *boulders*, so abundantly found in the clay, inclose organic remains which enable us to determine that their parent rocks are situated fifty, nay hundreds of miles apart from *them*. Without noticing the fragments of primitive rocks (which are more difficult to identify, in consequence of their not containing *organic remains*), I may particularise boulders from the *old red sandstone*, *mountain limestone*, *alum-shale* of Whitby, *blue lias*, *cornbrash limestone*, *Septaria* of the *Oxford* and *Kimmeridge clays*, &c., all inclosing *exuviae* that indubitably determine from what strata they were disrupted." His descriptions of this mixed accumulation, which we now know to be Glacial Drift, is exceedingly accurate; but we cannot wonder that he remarks (cautiously enough) that the facts "all combine to render it highly probable that the transport of these materials could not have been effected by any other agent than the Noachian Deluge." An account of the organic remains of this Drift formed the subject of his earliest geological paper (1828); and he then maintained, from the absence of contemporaneous "marine testacea," that the deluge must have been produced by freshwater. As he remarks in a letter to S. Woodward (1834): "I cannot yet desert the Scriptural account of the Deluge."

Rose's name will always be connected with the "Brickearth of the Nar," which he introduced to the attention of geologists. Arthur Young, in his 'Agricultural Survey of Norfolk,' had indeed described the shelly mud with oysters, as being used by farmers in the proportion of ten loads to an acre, as a good dressing for land. Rose collected and determined the fossils, and traced out the extent of the strata. His earliest account appeared in 1836, and he then recorded many of the species, including not only Mollusca,

* 'Economy of Manufactures,' ed. 2, p. 50. Babbage's statements are quoted and enlarged upon by De la Beche, 'Researches in Theoretical Geology,' 1834, p. 98.

but also fragments of a tooth and bones of an Elephant (*Elephas primigenius*) and a broken tooth of Rhinoceros (*R. tichorhinus*). My father, Dr. S. P. Woodward, examined Rose's collection in 1863, and named the species of Mollusca. A revised list of the organic remains was afterwards published by Rose, and he then recorded all his further observations on the deposits.* He mentions that Lyell, in 1839, visited the East Winch brickyard, under his guidance; and in 1864 Professor Otto Torell went with him to see the famous Nar Valley deposit.

In his early paper Rose rightly regarded the deposit as an estuarine mud or alluvium of "post-diluvian" age. Comparing this with other beds that had been described, he then suggested that, "in imitation of the technical language of Mr. Lyell, the period of these deposits may be termed the *pascene*," from the Greek words signifying *all*, and *recent*; all the shells being of recent species. The term Pleistocene is now employed for the deposits yielding remains of the Mammoth, &c. Rose describes the Submarine Forests off Brancaster and other parts of West Norfolk, and recognises that they must be newer than the Forest Bed of Cromer. He also gives an account of an "Ancient Beach" at Hunstanton, to which much attention has since been given by others.†

Some years later Rose obtained remains of the Reindeer (*Cervus tarandus*) from "beneath a peat-moss in a small moor at East Bilney, near East Dereham." The remains, which consisted of a fragment of the skull with the antlers attached, were sent to Owen, who figured them.‡ In his paper of 1843, Rose gives a very full account of the strata that form the Bedford Level, and he describes the changes effected by man, as well as those due to natural causes. Of other geological papers a brief mention only need be made.

In 1836 Rose went to London, met Owen and Sowerby, and paid a visit to the Museum of the Geological Society. In 1837 he spent some time at Cromer, whither he went in search of rest.

Rose was elected a Fellow of the Geological Society of

* Geol. Mag. 1865, p. 8.

† See B. B. Woodward, Proc. Geol. Assoc. vol. viii. p. 97.

‡ 'British Fossil Mammals and Birds,' 1846, pp. 479, 481.

London on April 24th, 1839; and it is interesting to note that Robert Fitch, of Norwich, was elected a Fellow during the following month.

Concerning the researches connected with his profession, it may be mentioned that as early as 1815 Rose communicated to the 'Annals of Philosophy' (vol. v. pp. 424—428) the results of some experiments relating to Hepatitis.

In 1826 he described a case of transposition of the viscera (Lond. Med. and Phys. Journ. vol. lvi. pp. 345, 346); and in 1831 related "Instances of Monstrous Productions" (Mag. Nat. Hist. vol. iv. pp. 403—410). His son informs me that "he took great interest in the study of Entozoa, particularly those hydatids so frequently found in rabbits and sheep; and devoted much time and attention to the subject, making many dissections and microscopical examinations. In 1833 he published in the 'London Medical Gazette' a paper on the "Vesicular Entozoa," in which he, first I believe in this country, correctly described and named a hydatid which infests the rabbit. This was the *Cysticercus tenuicollis*, a fuller account of the anatomy and physiology of which organism he communicated in 1848 to the 'Transactions of the Medical and Chirurgical Society' (vol. xxxi. pp. 215—238). In 1832 he notes that the Asiatic cholera had affected some individuals within his district; and he mentions in particular a case at Downham in which he was greatly interested.

In later years Rose was much occupied in the study of certain parasitic borings in scales of fossil fishes. In 1852 he brought before the Belfast meeting of the British Association his discovery of borings in Chalk fish-scales; and he suggested the name of *Talpina squamæ* for the new organism. In 1855 he communicated his fuller observations on the subject, together with illustrations, to the Microscopical Society.

There can be no doubt that the cultivation of any branch of natural history is valuable to the surgeon and physician, not only from a recreative point of view, but also on scientific grounds—for the study of nature tends to infuse a more scientific spirit into the ordinary work of the surgeon. As his son informs me, "he had always the habit of careful and accurate observation, which made him a good practitioner;" and "in several respects he was quite in advance of his time." Thus Rose gained an extensive

sphere of professional labour, while the work of his leisure hours brought him into correspondence with many of the leading geologists and microscopists of his day.

In 1859 Rose retired from practice and went to reside at 25 King Street, Great Yarmouth, where he passed the remainder of his days. Here he continued his geological observations, and they afforded him ample scope and solace after his busy professional career. In October, of the same year, he accompanied John Gunn, Prof. Prestwich, and Sir John Evans on a visit to Hoxne; and he again visited the locality in the following autumn. He records the finding, by the Rev. S. W. King, of two Celts or flint-implements: one in brickearth four feet from the surface, the other from gravelly shingle between the brickearth and the fluviatile bed that underlies it.*

Rose paid some attention to the Glacial Drifts near Yarmouth, and ventured to doubt the occurrence of a lower Boulder Clay, speaking of the "Lower Drift" that occurs beneath the [Chalky] Boulder Clay, as a ferruginous loam with sands and gravels, while he employed the term Upper Drift for the gravels, &c. that overlie the Boulder Clay.† He refers also in one of his papers (1859) to a "drifted mass of chalk lying upon the Kimmeridge Clay in a pit at Ely."‡ This statement is interesting, as some controversy subsequently arose on the mode of occurrence of the Chalk at this locality: and the rock was eventually proved to be a Boulder.

In 1860 he drew the attention of John Gunn and Professor Prestwich to the deep boring at Lacon's Brewery at Yarmouth, whereby the presence of the London Clay and Woolwich and Reading series was for the first time notified in Norfolk.|| Rose himself has given some account of the boring, § and notes the presence of ten feet of Crag above the London Clay. The occurrence of Crag has always been a doubtful matter. Rose recorded the occurrence of *Balanus*, *Mytilus edulis*, and *Tellina balthica*. §

* 'Geologist,' vol. iii. p. 347.

† *Ibid*, p. 137.

‡ *Ibid*, vol. ii. p. 295; and O. Fisher, *Geol. Mag.* 1868, p. 407.

|| Prestwich, *Quart. Journ. Geol. Soc.* vol. xvi. p. 449; and vol. xxviii. p. xlv.

§ 'Geologist,' vol. iii. p. 141.

The last-named species would relegate the deposit to the highest stage of the Norwich Crag Series (if it be Crag at all), or in other words, to the Weybourn Crag or Bure Valley Beds of some authorities. Rose also refers to the Mammalian remains obtained from an Oyster-bank about 11 fathoms deep, and from $1\frac{1}{2}$ to 2 miles from Yarmouth beach. These remains include Hippopotamus, Mammoth, Irish Elk, &c. Similar remains have been obtained from the Dogger Bank.

On November 5th, 1860, Rose became a member of the Geologists' Association, and to the Proceedings of this Society he contributed several papers. In 1861 he described the "beds of redeposited Crag shells" in the Drift Sand near Yarmouth; and in 1862 gave a general account of the Cretaceous group in Norfolk, together with notes on the deep boring made by Messrs. Colman at Norwich. Therein Rose records the presence of Upper Greensand, as well as Gault, beneath the great thickness of Chalk. In this paper he supplements his early work on Western Norfolk with additional notes on the fossils; and records his discovery of some species in the Lower Greensand.* Further observations on the Cretaceous Beds of Norfolk and Kent were also communicated in 1866 to the Norwich Geological Society: Rose having in the meanwhile paid a visit to Folkestone.† In 1864 he journeyed to Boulogne in company with his friend the Rev. Thomas Wiltshire, and published a short account of their observations.

In the same year Rose drew attention (by letter) to the occurrence of fossiliferous Crag at Yarn Hill, near Easton Bavent; and the section was afterwards independently noticed and described by the Rev. O. Fisher.‡ Four years later Rose first brought into notice the rich bed of Crag that occurs at Aldeby; but he had already discovered it in 1865, at that time regarding the section as in Toft Monks an adjoining parish. He rightly grouped this Aldeby Crag with the upper bed of Norwich Crag at Bramerton.

Rose was for many years a regular attendant at the meetings of

* Proc. Geol. Assoc. vol. i. p. 226.

† Geol. Mag. 1867, p. 29. In this paper he records several fossils from the Lower Greensand of West Norfolk.

‡ Whitaker, 'Geology of Southwold,' p. 15; and Fisher, Quart. Journ. Geol. Soc. vol. xxii. p. 26.

the British Association. He was at the first Cambridge meeting in 1833, where he met William Smith; but it was not until the Manchester meeting of 1861 that he became a member of the Association. He was away at the Birmingham meeting when in the autumn of 1865 I went in company with Mr. T. G. Bayfield to call upon him; but next year I had the privilege of seeing him and of glancing over many of his treasures from the Chalk and the Crag. One of the large Ammonites from the Lower Chalk (*A. peramplus*, two feet in diameter) and a double *Paramoudra* attracted my attention.

Rose was active in promoting the successful reception of the British Association at Norwich in 1868, and (as afterwards remarked) "it is to be feared he never recovered the exertions he made at that time."* He died at Yarmouth on January 29th, 1872, in the eighty-second year of his age.

The large and valuable collection of fossils which he had gathered together and arranged was given, according to his wishes, to the Norwich Museum.† Although not confined to specimens from West Norfolk, the collection consisted chiefly of fossils from that district, and especially from the Chalk. Unfortunately, as I am informed by Mr. J. Reeve, the type specimens figured by Sowerby were not presented to the Museum.

In one of his early letters to S. Woodward, Rose remarked on the importance of collecting facts and avoiding theories. His published papers prove how clearly he kept this idea in mind, and they remain of the highest value for reference on the districts he described. There is, I believe, in all geological literature no more valuable paper of its kind than Rose's "Sketch of the Geology of West Norfolk;" and Professor Prestwich has spoken of it as one of the best accounts of any county geology we possessed.‡

It is pleasant to look back at the time, some seventy-five years ago, when the four geologists mentioned at the beginning of this memoir commenced their labours; to consider the state of science

* Geol. Mag. 1872, p. 191.

† Some account of this Collection was read before the Norwich Geological Society, in 1872, by John Gunn, see 'Norfolk News,' No. 1424, April 6th, 1872.

‡ Obituary Notice of C. B. Rose, Address to Geol. Soc. 1872.

at that period, the difficulties of travel and of communication, the few workers, the trouble in getting books or in visiting museums ; and then to realise how much they did. The field, it is true, was comparatively clear, and there was no vast amount of literature to be studied ; but while it is one thing to go into the field now with the benefit of the training and experience of others, it was quite another thing to start in a country about which little was known, and at a time when geology was quite in its infancy.

The annals of Norfolk naturalists have indeed been enriched by the labours of Caleb B. Rose.

The accompanying portrait is from a negative taken by the late Mr. Hugh Rump, of Wells, during a visit which Mr. Rose paid him about the year 1868, and which was kindly lent by Lady Eade, of Norwich.

LIST OF GEOLOGICAL PAPERS BY C. B. ROSE.

1828.

1. On the Organic Remains of the Diluvium in Norfolk (Quart. Journ. Sci. Lit. and Art, part 2, July to Dec. pp. 308—314).

1829.

2. On the Anatomy of the Ventriculites of Mantell (Mag. Nat. Hist. vol. ii. pp. 332—341).

1835—36.

3. A Sketch of the Geology of West Norfolk (Phil. Mag. ser. 3. vol. vii. pp. 171—182, 274—279, 370—376 ; and vol. viii. pp. 28—42).

1840.

4. On the Brickearth Deposit of the Valley of the Nar (Proc. Sci. Soc. Lond. vol. ii. pp. 61—63).

1842.

5. Notice of Bones of the Ox, found in Clay at Gayton Thorpe, Norfolk ('Moxon's Geologist,' vol. i. pp. 36, 37).

1843.

6. On the Alluvium of the Bedford Level ('Moxon's Geologist,' vol. ii. pp. 73—103).

1846.

7. On the Occurrence of a Fossil Petro-tympanic Bone of a Whale from the Crag near Ipswich (Quart. Journ. Geol. Soc. vol. ii. pp. 32, 33).

1853.

8. Notice of the Discovery of a new *Talpina*? (Rep. Brit. Assoc. for 1852, Trans. of Sect. pp. 55, 56).

1855.

9. On the Discovery of Parasitic Borings in Fossil Fish-scales (Trans. Micros. Soc. ser. 2. vol. iii. pp. 7—9).

1859.

10. Geological Pearls ('Geologist,' vol. ii. p. 295).

1860.

11. On the Divisions of the Drift in Norfolk and Suffolk ('Geologist,' vol. iii. pp. 137—141, 317).

12. Flint Implements at Hoxne (*Ibid*, pp. 347, 348).

13. On the Mastoid Appearances exhibited on the Faced Flints employed for the Outer Walls of Buildings (Proc. Geol. Assoc. vol. i. pp. 192—194).

1862.

14. On two beds of Re-deposited Crag Shells in the Vicinity of Yarmouth, Norfolk (Proc. Geol. Assoc. vol. i. pp. 192—194).

15. On the Cretaceous Group in Norfolk (Proc. Geol. Assoc. vol. i. pp. 226—237).

16. Notice of some Fossilised Mammalian Remains from the Bed of the German Ocean (Rep. Brit. Assoc. for 1862, pp. 91, 92; 'Geologist,' vol. v. p. 459).

1864.

17. On the Occurrence of Cycloid Fish-scales, &c. in the Oolitic Formation (Geol. Mag. vol. i. pp. 92—94).

18. On a Recent Marine Deposit at Boulogne (Proc. Geol. Assoc. vol. i. pp. 402—404).

1865.

19. On the Brickearth of the Nar (Geol. Mag. vol. ii. pp. 8—12).

1867.

20. On the Cretaceous Groups of Norfolk and Kent (Norwich Geol. Soc. Oct. 2, 1866 ; Geol. Mag. vol. iv. pp. 29—31).

1868.

21. On the Crag at Aldeby (Rep. Brit. Assoc. for 1868, Trans. of Sect. p. 77 ; Geol. and Nat. Hist. Repertory, vol. ii. p. 244).

22. The Conchoidal Fracture of Flint, as seen in Norwich Buildings (Rep. Brit. Assoc. for 1868 [title only] ; 'Norfolk News,' Aug. 22 [see No. 13]).

23. On the Thickness of the Chalk in Norfolk (Rep. Brit. Assoc. for 1868 [title only] ; Geol. and Nat. Hist. Repertory, vol. ii. pp. 257, 258).
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