The History of Anatomy during the Life of Goodsir

1814 - 1867

John Goodsir

By Charles Simpson

An Essay for the Wellcome Prize in History of Medicine
The History of Anatomy during the Life-time of Goodsir.

"Universal History, the history of what man has accomplished in this world is at bottom the History of the Great Men who have worked here."

Carlyle.

Medicine is in its Theory, a Science: in its Practice, an Art: in its History, a Philosophy. As a science, it becomes obsolete progressively in the measure of its own success. As an Art, it resides largely in the individuality of the exponent; and passes with him. As an history, it stands on no different plane, viturallyly, from other histories; and so may equally well claim a permanent place in life, and literature.

In this essay, we have to do with the History of Anatomy during the first half of the nineteenth century. Anatomy, in teaching and in practice, is one of the foundations of the system of medicine: historians seem to agree that each grand epoch in the art or science of medicine has derived its first impulse from a
new anatomy, originating as new surgery and a new physiology.

Just at the time of which our subject treats, there was such a new impulse afforded, by the arising interest in the study of the minute anatomy of the tissues, — Histology. Scientists were found enthusiastic and zealous in the furtherance of their science, — none more so than Good sir, who was admittedly one of the chief exponents of the subject in Britain. This brings us to the consideration of the scientific activities of Good sir.

John Good sir was born at Anstruther, in Fife, in 1814, in which county his father and grandfather were much respected practitioners of medicine. The family was related to the M'Nair who first occupied the chair of Anatomy in Edinburgh University. When little more than a boy, Good sir became a student in Arts in the University of St Andrews. He was later, in 1830, apprenticed to Robert Hasi myth, F.R.C.S.E., the leading dentist in Edinburgh; and at the same time attended classes both in the University and extra-mural medical school.

He took out the lectures on Descriptive Anatomy, given by Dr. Knox, in Old Surgeons Hall.
The eloquent delivery of the lectures, coupled with the studious bent of the pupil, engrossed Goodwin's mind in the study of anatomy; and he forthwith devoted his best attention to the science, unswervingly.

Though not actually dissecting during his first year, he was daily in the practical anatomy rooms, watching carefully the progress of the dissections; and continually adding to his stores of osteology. In his second year, he was still more absorbed in practical anatomy, and this predilection, fired by the influence of the stimulating discourses of Knox, caused him to ask his father's permission to become a surgeon, not a medical graduate.

After two years dentistry, a profession which had become irksome to him, he devoted himself, heart, head, and hand, to Anatomy. It became his favourite pursuit. He did not limit himself to the purely descriptive lectures, but assiduously endeavoured to advance his knowledge of surgical and pathological anatomy.

During the years 1832 and 1833, he adopted a means of perpetuating his dissections, by making a plaster-of-Paris replica of the part. This is a point of historical interest, for
while probably he alone of his class-fellows practiced this mode of rendering work permanently available for instruction; we might compare the custom of another distinguished anatomist, - Sir Charles Bell - who also made artistic models of his specimens. This appreciation of practical work was the result of the persuasion that, while a slovenly dissection is worse than useless, - as being a memorial of wasted, or misapplied time; - a perfect dissection is a thing of wonder and beauty.

In his third year, he made a collection of the healthy and morbid anatomy of the teeth for Nasmyth. This fact is historically noteworthy in his life, since it directed Goodall’s attention to the developmental anatomy of the human teeth, on which subject he made an epochal memoir, perhaps his best written work. Further, his studies in the morphological aspect of anatomy, initiated by the teaching of Knox, would be stimulated by his reading, at this time, the works of Carus, who laid especial emphasis on developmental anatomy.

The relations existing between lecturer and student were of the pleasantest, - Knox accounted Goodall one of his best pupils, while Goodall was ever grateful for the instruction afforded
by his teacher. Let us now agree for a little to consider the position of Knox in the history of anatomy of the period.

In 1830, Knox was far above his fellow-lecturers, and did more than any other teacher, professorial, or extra-mural, to revive the fame of the anatomical school of Edinburgh, which had been on the wane during the reign of Monro tertius. Knox was successor to Dr. Barclay, and extended the reputation of that distinguished anatomist.

Barclay was extra-mural lecturer on anatomy at Edinburgh, during 1825 and 1826. He collected a fine museum of comparative anatomy, which he bequeathed to the Royal College of Surgeons. His influence may be indicated from the fact that he numbered the celebrated naturalist, Owen, and the distinguished surgeon, Syme, among his pupils.

Knox was a gifted speaker, and his impressive delivery helped him to rapidly collect a large class of students; — indeed, he, at one time, commanded an audience of 500, — the largest anatomy class ever seen in Britain. His lectures were very wide in scope, — from the minute examination of the tissues, to the
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Prophecy of types and homologues. They were the most suggestive discourses on the subject in Britain; and certainly were a great force in the history of anatomy of the time — indeed, he it was, who influenced Goodair to forsake medicine for anatomy.

In addition to his activity as a teacher and dissector, Knox was the author of a "Manual of Anatomy," and, what is more important, translated the anatomical works of the great Frenchmen, Clocquet and Becleard, and tried to impress the British mind with the doctrines of the great Bichat and St Hilaire. This, along with his inclination to morphological anatomy, helped to foster the spirit of investigation in his pupils, enlarged their outlook, and promoted a philosophic anatomy in Britain. Truly, he was a force in anatomy in his day.

For the sake of completeness, we might here briefly mention some minor anatomists of Edinburgh, who had acquired, at the least, a local repute. These were: — Innes, a pupil of Malone secundus, and author of a book on muscles. Fyfe, the author of a work called "Human and Comparative Anatomy." Allen Burns, who
who published a treatise "On the Surgical Anatomy of the Head and Neck."

But to return to the life of Goodall, it is evident that under such a teacher as Knox, he must be inevitably confirmed in his devotion to Anatomy. At this time, he acted as a surgical dresser to Syme, who as a student in Edinburgh, had made anatomy his chief study; and who, before he was nineteen, was, in 1818, anatomical demonstrator under Huxton, before he devoted himself to the surgical teaching and practice where he gained a European reputation.

A pleasant history is the association of Goodall with Forbes, whom he initiated into that distinguished career in comparative anatomy and zoology. These two friends were conspicuous in the anatomy class and later in scientific societies, where it was Forbes who encouraged Goodall first to voice his views on the anatomy of some of the lower animals. It was such encouragement that the reserved anatomist required to bring his knowledge into currency.

In 1835, Goodall became a Licentiate of the Royal College of Surgeons; some of his
dissections of this period, such as those on the
preparations, prepared in 1837, are now
in the Anatomical Museum of Edinburgh
University.

In 1839, he communicated to the
British Association his inquiry 'On the
Origin and Development of the Pulps and
Roots of the Human Teeth.' This is an
excellent and characteristic piece of work,-
the result of his apprentice-ship in dentistry.
Hunter, Cuvier, Blandin, Purtne, Muller,
Retzius, Bell, and Owen, all had studied
this subject; and though Goodall worked
only with a simple lens, he furnished the
most complete and consistent account.

He divided the history of development
into three stages:--I. Follicular.  ii. Saecular.
iii. Eruptive, and gave a precise and systematic
description of each. As a result, he at once
acquired a reputation as an acute observer
and interpreter of developmental anatomy.
This work has been considered Goodall's best
by Owen, Sharpey, and Huxley. He
supplemented it by a paper on the Follicular
stage of Dentition in Ruminants.

By this time, his museum largely
anatomical and pathological, was considered an example in neatness, display, and classification. He was then in practice in St. Andrews, and interested in Natural History, on which subject he gave frequent papers to scientific societies.

In 1840, he gave a paper "On the Ophallic Terminations of the Sympathetic Nerve" which shows that he was, in this case, opposed to Cruveilhier's views, and supported the observations of Carus and St. Hilaire in cranial osteology. It showed that he was well versed in the views of the French and German schools, and gave an indication of his study of that higher anatomy of Goethe which had been ably extended by St. Hilaire, and advocated and developed in Britain, by Knox. Thus it is of historical note, as showing his wide knowledge of the opinions of his continental contemporaries.

An Anatomical and Physiological Society had been founded by Knox in 1833; this being resuscitated in 1840, Goodall resumed his membership and became president; and, in 1842, communicated to it his views on the structure of the liver and kidney.
In 1841, Goodair was elected the Conservator of the Royal College of Surgeons, a post which, though poorly remunerated, he desired for the sake of studying the collection of comparative anatomy and the preparations of John and Charles Bell. In this connection, he delivered a series of lectures to the élite of the medical world in Edinburgh, and displayed an extensive knowledge, with a surgical application, and cultivation of the higher anatomy.

Also, he demonstrated the collection to students, and these demonstrations in fullness and preparation resembled lectures. All this he was led to do in order to maintain his eminence in the scientific circle; for, at this time, there was much competition evidenced in the medical school, and men were zealous, if not aggressive, in their aspirations to first-rate rank and publicity. Great advances in Anatomy were being made, notably in France and Germany, which with Britain and Italy were the four great powers of surgery in Europe. Just at this time there was the innovation in anatomy mentioned in introduction—histology.
In connection, we may give the historical features of its rise.—essentially the development of our knowledge of the cell.

In 1825, Puschkine announced the germinal vesicle in the ovum of birds; this may be taken as the first hint of the cellular theory. In 1838, Schleiden and Schwann, who usually get the credit of being pioneers, described their new biological unit,—the primitive organic corpuscle or cell;—and applied the principle to plant as well as to animal anatomy. Its anatomy they described in the following terms:—

- cell wall;
- germinal vesicle, or nucleus;
- macula, or nucleolus.

This conception was advanced by the work of Von Baer, Valentin, Muller, and Henle among others: and it was now generally taught that the true essential of the cell was the germinal vesicle; and the cell-wall and other differentiations were added.

Goodsir and Virchow considered the cell as the ultimate morphological element of living substance,—the seat of real activity. Goodsir indicated centers of reproduction of cells, and that new cells were formed by this germinal spot. This is an
important advance, when we remember that the prevalent doctrine had been that a new cell arose by a process of precipitation, or molecular aggregation in a fluid-blastema, or evagination. In various essays, he describes the products of secretion in cells; and the importance of cells in various pathological conditions; the presence of soft nucleated masses, or bone corpuscles, in the lacunae of the Haversian systems of bone; and the absorption of bone by cells. These accurate and extensive discoveries were made possible by the compound achromatic microscope, a potent maker of history, as a means of research. in the hands of capable observers. Goodier's conception of the cell has been elaborated under the terms 'plasm' and 'protoplasma' up to Haeckel's idea of 'protophyle'—minute drops of living jelly, with no nucleus even, 'sans everything,' save only the power of producing pseudopodia.

In this department of Anatomy, the Continental schools were pre-eminent; for in Britain no works equalled the treatises of Heberden, Leiden and Lenné, while Bichat's grand 'Anatome Generale' was
a world classic even then. But it must be remembered that Continental scientists possessed many advantages over their fellow-scientists in Britain. The continental states were ever ready to encourage and support investigation; while in our country, the government has been notoriously indifferent to the needs of science, and its students.

Again, on the continent, facilities in the publication of results were afforded by numerous and excellent scientific periodicals, in which a student of any branch of knowledge might lay his work before the world, receive the criticism of his fellow-scientists and obtain references to literature on his particular subject. Thereby, he was enabled, the more expeditiously, to bring his investigation to a successful issue, or to avoid spending time, brains, and money, in the heart-breaking task of repeating another's work.

In Britain, there was inaugurated a scientific periodical, - the Cyclopedia of Anatomy and Physiology, edited by Dr. Lock; which was a sign of progress in this connection, and gave hopes of
Notwithstanding the difficulties under which the British laboured, they frequently produced a man of the highest eminence, as, for example, Owen, Hunter, and Goodison. Others of the British school engaged in microscopic research were: the embryologist, Allen Thomson; the physiologist, Hughes Bennet; and the anatomist Sharphey. This last lectured on Anatomy in Edinburgh from 1832 to 1836, and systematically used the microscope to illustrate his anatomical course. Indeed, to such an extent, were people interested in the investigations in this new department, that Comte in his philosophy found in the 'cell', a type of humanity.

Goodison lectures in the theatre of the Royal College of Surgeons were in part reprinted, along with some observations by his brother Starry, and published in 1845 in a volume entitled 'Anatomical and Pathological Observations'. These researches established Goodison's reputation, both as an observer and a thinker, and were received with favour both at home, and abroad. In 1843, Goodison accepted from Syme the
Curatorship of the University Museum. He described the fibro-cellular structure of the kidney; and pursued the enquiries of Owen, Shadley, and Weber, on the structure of the placenta, the formation of the decidua, the enlargement of the follicles in the mucous membrane, and the arrangement of the blood-vessels, in which he demonstrated several modifications.

In 1844, he was appointed the Demonstrator of Anatomy to Professor Monro; and in 1846, succeeded Monro in the Chair of Anatomy of Edinburgh University. Soon after, he communicated to the Royal Society a paper "On the Supra-renal, Thymus, and Thyroid Bodies," which was read by Owen. In the same year Goodric was elected a Fellow of the Royal Society.

Subsequent to his entry on the professorship, he published five anatomical papers, and applied himself to anatomical teaching; but he became more and more a historical force, for he kept the Edinburgh school in the fore-ground, and supplied his pupils with the latest thought and discovery in the science. He extended and improved
the dissecting-rooms, and established an active and capable staff of demonstrators and assistants. His own experience as a student taught him that success in a professor was dependent on the character and amount of instruction afforded his pupils in the practical anatomy course. Therefore, he founded a thoroughly good system of descriptive and surgical anatomy; and it is a sign of the times that the department of histology was no less complete; for not only did he lecture on this subject, and display diagrams of the minute anatomy of the tissues, but he demonstrated specimens under the microscope, - the only adequate way of teaching. He had a partiality for the 'tutorial' system, then so full sway in English universities. This he considered an important adjunct to professorial disquisition, and he tried a similar plan to prepare his pupils for their higher studies in anatomy. Knowing that a lecture must be more general than particular, he afforded an opportunity for seeing and examining structures described in the lectures; also he facilitated the attainment of more precise, and detailed information, than
could be supplied from a lecture, which, in order to preserve a line of thought, must avoid continual digressions. Further, he made it his care that the student kept well up with the course.

Thus his complete course consisted of:

Firstly: lectures on anatomy, in which the structures of the body were systematically described; secondly: anatomical demonstrations in which the body was topographically presented; thirdly: practical Anatomy under his own and the demonstrators' supervision.

As will thus be evident, the system was an excellent one, well calculated to secure efficiency in the science; and indeed, it obtains, materially, to this day, in Edinburgh.

At first, he, personally, conducted the microscopic demonstrations in histology, but later this duty was entrusted to Drummond, the author of the article on The Sympathetic Nerve in the cyclopaedia of Anatomy and Physiology, and to the now Sir William Turner.

Such a teacher could not fail to stimulate his students, and thereby constitute an historical factor of his epoch. It is true that his delivery had none of the charm.
and eloquence of Knox and that he tended rather to be pedantic and dry. Nevertheless, his personality was impressive. Look at his portrait hanging in the Bone Room at the University, or its reproduction as frontispiece of Sir William Stewart's edition of his memoirs. And we see a tall, gaunt man, with a grave and even sombre visage; gazing thoughtfully from deep, serious eyes; his whole demeanour reflected the strong will and disciplined mind; - calmness and perseverance were writ plain on him. And these great hands, strong, but capable of most delicate work in dissection. Not the theatre, but the practical room was his kingdom; - there he moved among his students, ever zealous to advance their knowledge of the science; - therefore they revered him. He never sought ease, - never even for two successive years gave a course of lectures on the same lines. Always he must needs give of his best, leaving himself no time to embody his work in writing which should make him famous.

He was thorough in his knowledge.
for although already an authority on myology, he, even so late as this, dissected a subject, and made casts of the different layers of muscles, which casts are now in the Anatomical Museum.

Hunter and Owen were his exemplars. In 1847, he gave a series of lectures on the comparative anatomy of the vertebrates, and we may note Goodric's capability in natural history, when in 1853 he delivered a notable series of lectures on General Zoology for Professor Jamieson.

Next to his labours in cellular anatomy and physiology, was his study of anatomical features, such as the joints, in terms of geometry and mechanics, after the manner of the Webers and Meyer. It is a fact that bulked largely in the latter part of his life, that in his geometrical survey of the body he adopted the triangle as the basis of organic forms, and found living things, - tree or man, - reducible to a tetrahedron. Doubtless, he was led to take this extravagance seriously, by his study of aesthetics, and the desire to concoct a formula for beauty. These papers he
read to the Royal Society of Edinburgh. He also studied and repeated the investigations of Müller, Cotti, and Kolliker and others, on the terminations centrally and peripherally, of the nerves. He was here guided by the severe criteria of embryology, and rejected St Hilaire’s methods as fantastic and pointless. Goethe, who studied anatomy under Loder of Jena, laid the foundations of animal morphology as far back as 1791, when in his general introduction to “Comparative Anatomy founded on Osteology” he proposed to establish an anatomical type, representing the bones of all animals, and to which all skeletons might be reduced, and with which compared.

Owen followed this lead in his "Programmi," published in 1807; and Carus, Meckel, Cuvier, and St Hilaire, Owen, and Huxley, continued to investigate the subject. All the conclusions and speculations, Goodwin criticized in the light shed by embryology, whose importance he continually emphasized. For example, in his essay "On the
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Morphological Relations of the Nervous System, he declares that "inquiry demands constant reference to the series of embryos as well as of adult forms." He was himself a morphological genius.

We might note that Goodair went carefully over Goethe's work, at the request of Bünzler, who wished to determine the value of the contributions to the science by Germans, so that Goodair was open to the influence of the great scientist-poet. He also recommended a change in the terminology of the science and suggested one of his own. Larens of Leipsie, writing in 1853, in presenting a copy of his "System of Animal Morphology" acknowledged that his anatomical facts were largely derived from British investigations.

Next to his love of teaching, Goodair desired to form a museum which should be second to none in Britain. With this intention, he projected improvements to the University Museum to make it equal to Hunter's great collection in London; and although the resources at the disposal of the University authorities were not
sufficient to sustain his scheme, he supplemented the work of Monro, and substantially improved the collection by the beautiful dissections prepared to illustrate his anatomical course.

In the latter part of his life, he studied the German language to make himself acquainted with its scientific literature. Journeying for his holidays to the continent, he made the acquaintance in Berlin in 1857 of Johannes Müller, the great leader of one of the foremost schools of sciences. whose Archives indeed are a treasury of original investigation, and constantly referred to in scientific books even at this day. Frequently Goodsir spent six hours a day in the museum with Hirtel, Kolliker, or Retzius. He communicated with every man of note in anatomy in Europe.

In 1857, he was elected president of the Physiology and Zoology departments of the British Association, and was acknowledged the greatest master of anatomical science after Hunter. It is most unfortunate that he left so very few prepared written records, and his editor found in his manuscripts the beginnings of
immensurable articles and projects. - schemes
begun, but to be cast away in the rush
after some new thing attracting him still
on in the practical work of his science,
leaving no time to perpetuate in writing
his already many worthy discoveries.

His anatomical lectures constitute
a potent factor in the history of anatomy
of his epoch. No one in Britain took
so wide a survey, or marshalled so
many facts for anatomical tabulation
and synthesis. He died in 1867.
His place is not then decreed by his
writings - they are indeed few - but by
his museum specimens, and above all
by his professional teachings, which
brought to eminence so many worthy
scientists whose fame redounds to his.

His writings on Biological science
were collected, and edited by Sir William
Turner; and published in 1868. We
may now briefly review some of the
anatomical papers, to be found in
this collection.
On the Origin and Development of the Pulps and Sacs of the Human Teeth. 1839.
Blandin, in 1836, in his "Anatomie du Systeme Dentaire" mentions the paucity of accurate knowledge regarding the human teeth. Goebsir was the first to supply a full and exact account. He carefully dissected and described specimens ranging from an embryo of the sixth week to the adult condition. His account might have been very slightly anticipated in a notice by Arnold, but this in no way detracts from the novelty and importance of the work.

On the Supra-renal, Thyroid, and Pharynx Bodies. 1844.

This paper was communicated to the Royal Society, and read by Professor Owen. Its account was of the then very little understood "ductless glands" and they could not be appreciated until the discoveries of Sir E.A. Schäfer in 1894 revealed their significance.

On the Morphological Constitution of the Vertebrate Head.

This is a long and detailed account of the segments of the skull. The points to be determined were the number and modifications of the selerotomes in the various forms of
vertebrate head.


In this paper, Goosan rejects the cephalic origin of the upper limb as had been propounded by Oken, and adopted by Carus, and even reproduced by Owen. He rightly viewed the upper upper limb as being derived from the elements of the trunk.

v. "On the horizontal Curvature of the Femoral Condyle..."

The title explains itself. The Anatomy of the knee had been well described by the brothers Weber in 1836, and their observations were developed by Meyer of Zurich in 1853, and extended by Goodwin as regards especially the latter part of the title.

vi. "On the mechanism of the Knee-Joint."

This paper is supplementary to the preceding. Besides Weber's description in 1836, this subject was alluded to in Heule's "System of Anatomy" in 1858.

vii. "On the Curvature and Movements of the Acting facets of the articular surfaces."

This a continuation and prepared
essay following the subject of the last.
From the three preceding papers we may form
some idea of Goodsin's useful work in
descriptive anatomy. Indeed his descriptions
are quoted at the present in Cunningham's
Textbook of Anatomy.

viii "On the Retina"

A paper on a subject on which Müller and
Kolliker had done pioneer work.
ix "On the Lamina spirale of the cochlea."

This part had been previously described
by Corti and Kolliker.

x "Observations on the Structure on the
Kidney and Liver."

This paper, published in 1842, followed
the account given by Bright of the kidney.

Goodsin described the fibro-cellular stroma
and extended Kranz's investigations in
the study of the distribution of the areolar
tissue. Hering also pursues this subject
in Schultze's "Archives."

Other memoirs such as those on the
secreting structures of the intestines
and on the centres of nutrition belong
more to the realms of physiology than
to Anatomy.
In Goodacre's time, much attention was paid to the anatomy of the more complicated structures, such as the lymphatics. Mosso, Bichat, was an adept at the art of injecting specimens with mercury, and some of his preparations, e.g. the tubes and lymphatics of the testis, are in the University Museum. At this period we see signs of the advent of that specialisation so prominent in our day, especially in histology, but there were still anatomists of wide grasp in the persons of Müller Retzius, Hyrtl, Henle, Owen, and Goodacre. Great among the comparative anatomists were Hunter, Cuvier, and Rulolphii. In physiological anatomy, Ludwig, in 1851, described the chordal lymphatic nerve, and in 1866, the depressor nerve of the heart. While even Gall of Vienna of Vienna in the beginning of the nineteenth century, though his methods rendered his phrenology invalid, initiated inquiry which revealed by other men and methods, e.g. Fournier, Poirier, and Tostit, many new facts about the finer anatomy of the brain. The leading systems of descriptive
anatomy at the time were those of Portal, Meckel, Bidet, bloquet, Hildebrandt, Zömmerring, and Blandan; all more or less influenced by the work of Wrislow.

II

Hitherto, our attention has been centred at Edinburgh, but now let us turn to consider the great anatomist-surgeons of London,- Brodie, Bell, and Cooper. These eminent men had a method of teaching somewhat different from that obtaining in Edinburgh. Let us then consider them individually in a series of brief biographies.

Benjamin Brodie was born in Wells, in 1783. His father, a man of considerable attainments, was rector there, and educated his children under his own strict discipline. He sent Brodie to study medicine at London. The young man there became a pupil of Abernethy, whose lectures on anatomy were of the best in the capital. So instructive and attractive did Brodie find Abernethy's teaching, that he was fired with the desire to become a great surgeon like him.

He worked in Abernethy's dissecting-
rooms, and also attended demonstrations by Wilson in the famous Windmill Street Anatomy School. He did not, however, trouble to attend descriptive lectures in anatomy very systematically or regularly, but preferred to make his own observations in the practical rooms and hospital wards.

After two years preliminary study, he, in 1803, entered St. George's Hospital, and became a pupil of Everard Home, one of the very first flight of surgeons in London. His progress was rapid, and his reputation extending, he was engaged to give demonstrations in anatomy in Wilson's school, where soon he became a lecturer. His discourses here were very popular: he possessed, as may be seen in Watts' portrait of him, a fine presence; and this but set off his fluent and perfect delivery, and sound assimilated knowledge. At a later date, he received students in anatomy at his house, and some boarded with him.

Now began the first tentative efforts to found regular schools, for up to this time, though famous men had taught physic, surgery, and anatomy in London.
and some in more especial connection with certain hospitals, it could hardly be said that there was anything in the nature of a hospital school, or in fact, was so regarded. Thus when Pott taught surgery at St. Bartholomew's, or John Hunter at St. George's, or Abernethy, anatomy at St. George's, their lectures were attended by scholars from all parts of London; and doubtless by many who had no connection with any school. In fact, there was then no school of a hospital apart from the lectures of eminent persons, which might be delivered within its precincts for the lecturer's convenience; while other teachers, equally for their own convenience, lectured in private premises, and as a private speculation.

Of these latter sort, were such as William Hunter, James Wilson, and Brodie himself. In fact, the student in medicine became an apprentice or pupil of any great authority who taught the requisite subjects. Brodie's lectures on surgery were commenced in the same semi-private way when in 1808, he joined Wilson in the
delivery of a course of surgical lectures at the Whitmill Street School; and it was long before the school was moved to the neighbourhood of St George's Hospital, and the students received their whole medical education in the wards of the hospital.

Wilson did not long continue to lecture, and Brodie remained in sole possession of that department, and he lectured in Brodie's Anatomical School in Blenheim Street as well as in Whitmill Street School; till, after twenty years, he resigned his position to Babington and Caesar Hawkins.

Brodie's lectures on anatomy were the fruit of ripe experience, they obtained a surgical application from his assistantship to Everard Home, while they were widened in scope by his studies in comparative anatomy, and he was also conversant with the works of Riolat. It may be of interest to note that the paper which gained him admission to the Royal Society was a communication on the dissection of a foetus which had no heart.
while his researches on the morbid anatomy of the joints in disease, are famous, and of important surgical application.

As a foot-note to the educational history of anatomy and medicine of the time it is to be recorded that Brodie was concerned in the requirements of the examinations in anatomy and surgery. He suggested that instead of one mere 'viva voce' examination, such as had previously sufficed, there should be one at half term, and another at the end of the term; and of each, a part was to be written work. Thus he may be regarded as instigator of those reforms which revolutionised the study of anatomy and the requirements for degrees in the sciences of medicine and surgery; for a more difficult and searching examination demands a corresponding more thorough and advanced knowledge of the subject.

When Wilson purposed to give up his anatomical establishment, he offered the business to Brodie; but the latter having neither the funds nor the
inclination to purchase, expedited the transaction by which Sir Charles Bell acquired the school and became teacher there.

At the conclusion of the wars on the continent many scientific men visited Britain, and Brodie made the acquaintance of Roux, Orfila and Magendie. In 1819, he became Professor of Comparative Anatomy and Physiology at the College of Surgeons, and in 1822 became principal surgeon at St George's Hospital. His death put an end to a life of steady endeavor and uniform success.

We may now proceed with the series of contemporary portraits; briefly notice the career of another eminent surgeon-anatomist, - Astley Cooper, - a man very different in temperament from the steady Brodie.

Astley Cooper was born in 1768, and being both fullness of time sent to study medicine at London, he was received into the household of Cline, - a famous surgeon of St Thomas's Hospital.
Cline was an ardent admirer of John Hunter. He was born in 1750 and articled as a pupil to a surgeon in St Thomas's Hospital in 1767. He became a celebrated teacher of anatomy, lecturing at first in collaboration with Dr. Eloc, on whose death he purchased his collection, and became sole lecturer on anatomy.

Cooper was at first, but little inclined to shun delights and live laborious days. However, on joining the Physical Society in 1784, he delivered to it his first professional essay, on a cancer of the breast. In 1786, Cooper began to study anatomy in earnest nor did he relax his diligence in its pursuit while he lived. This application was the foundation of his great knowledge of surgery, and the basis of his later papers on "pathological anatomy".

His skill in dissection was requisitioned by Cline's students as an aid in their dissections. While devoting his attention to lectures on surgery and anatomy at St Thomas's and Guy's Hospitals
he dissected daily. He also attended the lectures of the famous comparative anatomist John Hunter.

In 1884 he visited Edinburgh for a session, and heard Tyne lecture on anatomy. This teacher was a pupil of Monro, and a hard-working dissector who published an anatomy in four volumes, illustrated with coloured plates. In 1889, Cooper became demonstrator at St Thomas’s Hospital, in place of Haighton and was co-lecturer with Cline in Anatomy, taking the surgical side of the science. He also studied under Desenat and Chopart of Paris.

His own lectures were assured success from his wide knowledge of the subject; and in 1893 he was appointed Professor of Anatomy in Surgeons’ Hall and reappointed in the two succeeding years. At this time, published some essays and engaged in the dissection of various animals, including even an elephant, whose skeleton he articulated. In 1800 he was elected Surgeon to Guy’s Hospital, and communicated a paper to
the Royal Society, on a subject connected with the ear, — auxiliary to a research of Everard Home. He also was interested in the study of histology, and the injection of the lymphatics, — favourite pursuits of his day. He also, for his surgical benefit, dissected the parts connected with hernia, and in this connection published a "Treatise on Hernia," an undertaking far superior to his former publications, both in size and importance.

His extensive dissections of healthy and morbid anatomy, he illustrated by preparations and drawings, while still be lectured in the anatomical theatre at St. Thomas's Hospital. Even in his private premises, Cooper had a well-fitted dissecting-room, whether he brought for examination, parts secured in the hospital. In 1813 he was elected Professor of Comparative Anatomy to the Royal College of Surgeons, and in 1818 published his "Surgical Essays." From being examiner at the Royal College, he became president in 1822 subsequent to the issue of a treatise on "Dislocations and fractures." Even after
his retirement to the country, he kept a dissecting-room, whether he was wont to repair almost daily to his practical anatomy. He was honoured by the appointment as Surgeon-Sergeant to George IV, and his election to the Vice-Presidency of the Royal Society.

It may be noted that George IV always exhibited great interest in anatomy, and had a very fair knowledge of it. He had been very early instructed in the science by the desire of his father, at whose request John Hunter made a complete set of anatomical preparations especially for the use and information of the young prince and his brother. He maintained, throughout his life, an active interest in the science; and frequently conversed on it, and examined novel specimens.

Cooper's last publications were on the Anatomy of the Thyroid Gland issued in 1832, and on the Anatomy of the Breast in 1840, — the latter with regard to the diseases of the part. In these memoirs are reflected his style of writing, his use of simple language, and his faithfulness to
nature in descriptions. He died, loaded with honours, having successively conferred on him, the Memberships of the Institute of France, the Legion of Honour and the D.L.L. of Oxford.

Another distinguished anatomist who claims our attention at this point was Sir Charles Bell. John Bell, the brother of Charles, was a famous surgeon in Edinburgh but only a member of the Royal College of Surgeons. He opened a class in anatomy in which demonstrations of dissections leading on surgical operations were given. Many students were attracted to the course by the superior knowledge of the lecturer as compared with the Professor of the Faculty, whose lessons were more theoretical than practical were wholly insufficient.

Charles Bell, therefore, was naturally a student in this class, although he attended, at the same time, the lectures of Professor Monro. John Bell was an earnest and thorough teacher, and Charles applied himself with zeal to the study of anatomy and thereby helped himself greatly by his
gifts of executing beautiful drawings of the dissections. It is noteworthy, that while still a student, he published a System or Manual of Anatomy and Dissection with plates engraved after his own designs. Also, he wrote the description of the Nervous System for his brother’s "Anatomy of the Human Body", published in successive volumes from 1794 to 1800. It was about this time that the great Frenchman, Bichat, published his "Treatise on the Membranes" as a prelude to his immortal "General Anatomy".

In 1799, Charles was admitted to the College of Surgeons, and showed in various operations, his skill as a surgeon and an anatomist. He also modelled specimens in coloured wax, which are now in the College of Surgeons Museum, and he collected a museum of anatomy. Both he and his brother were refused appointments in the hospital, and thereupon John gave up dissecting, while Charles continued for some time.

After his preliminary education in Edinburgh, Charles Bell went to London
in 1804, and was received there by Baillie and Astley Cooper, the latter having formerly studied in Edinburgh with John Bell.

While waiting for a practice in London, Bell visited the galleries of the capital, and completed the plates for his "Treatise on Anatomy for the Use of Painters," which first appeared in a quarto volume of 186 pages, entitled "An Essay on the Anatomy of Expression in Painting." This effort was brought to notice, and rudely and reviewerly reviewed by his friend, Jeffrey, the great critic of the famous Edinburgh Review, who compared it favourably with Leconi’s "Treatise on Physiognomy" and Brisbane’s "Anatomy of Painters." Subsequently, many artists, including Davie Wilkie, listened to his lectures on anatomy.

His class increased, and later, Bell declared: "I have educated more than eight hundred English Surgeons." In 1811, he printed his "Idea of a New Anatomy of the Brain," but limited its distribution to private circulation among his friends.
It was received with coolness, although he had long worked on it, and had hoped much for its success.

After his marriage, he purchased the Anatomical school in Windmill Street, and succeeded Brodie there as principal professor. He was, later, elected to Middlesex Hospital staff, a position equivalent to a chair in clinical surgery, for as we have seen on previous pages the hospitals constituted the only centres for education. Still cherishing his idea on the new anatomy of the brain, he carried out dissections of the nerves and of the brain. In 1867 he published a System of Operative Surgery. In 1871 he issued his essay on the Nervous System in the Philosophical Transactions of that year. This paper embodied his famous discovery as to the difference between the identity of between the motor and sensory nerves, and their separate mode of origin from the spinal medulla, as the anterior and posterior nerve roots. Its appearance created a furor, and in a letter to his brother he himself described it in the words.
I have made a greater discovery than ever was made by any one man in anatomy.

Verily, it was admirably argued, and displayed philosophic disquisition, but it lacked crowning proof of practical demonstration. This was furnished at a later date by the French anatomist, Magendie, and straight-way arose the famous dispute as to the right of discovery. So no it seems that the priority belongs to Bell, while the establishment depends largely on Magendie, and following the example of Florence we share the laurels — the lion's share to Bell.

In 1819, he published an "Essay" on the forces that circulate the blood, in which memoir he agrees with Abernethy. This was followed by his "Treatise on the Hand" — the most popular of his works. He became professor of surgery and anatomy at the College of Surgeons, and was listened to with appreciation by surgeons and artists as well as by students, even Abernethy and Blain attended his lectures. These lectures were collected, and published as the volumes on "Animal Mechanics." He returned to Edinburgh, and resided
the chair vacated by his brother John. For the remainder of his life he lectured, but published little.

Now we must mention two other great men, who, though their work was somewhat remote from pure anatomy, still are giants in their spheres, and potent forces in the history of anatomy of the epoch. They were Owen and Darwin.

Richard Owen was born in Lancaster in 1804, he studied medicine at Edinburgh in 1822, and in the following year entered St Bartholomew's Hospital, London. In 1826, he obtained the Diploma of the Royal College of Surgeons, and in the same year published his first scientific essay, which was "On Calculus of the Urinary Bladder.

While at St Bartholomew's, he exercised his talents in anatomy as one of the dissectors under the famous surgeon, Abernethy, who later insisted on Owen undertaking the work of cataloguing the famous collection of John Hunter. His knowledge of comparative anatomy must have been thus considerably widened, as may be evidenced in his paper on the anatomy
of the orang-outang, which was read before the first meeting of the Zoological Society of London.

At the age of thirty, he became a Fellow of the Royal Society, and his own hospital elected him to the newly established Chair of Comparative Anatomy. After his marriage, in 1836, he succeeded Sir Charles Bell as Professor of Anatomy and Physiology to the College of Surgeons. He was also elected to the Hunterian chair; and in 1837, edited Hunter's Annual Economy.

While still engaged in cataloguing the Museum, he was appointed Conservator and in 1856 became Superintendent of the Natural History Department of the British Museum. He was a prolific writer in Natural History, such volumes as 'Odontology and Lectures on Comparative Anatomy' evidence his capability in the science. His influence was great, and he became the ideal scientist of many distinguished men, such as Goodriche.

Charles Darwin was born in 1809, and in 1825, he came with his brother to study medicine at Edinburgh. He was not very strenuous in pursuit of the science.
and indeed he was disgusted with practical anatomy, though he later regretted not acquiring a habit of dissecting which would have proved invaluable in his future work.

Tired of the medical course, he proceeded from Edinburgh to Cambridge nominally to become a clergyman, but his bent was more towards study. Therefore, he readily accepted the opportunity of making the voyage in H.M.S. Beagle, which extended over the period 1831-1836. In 1838, for his services to science, he was elected Fellow of the Royal Society, and the outcome of this voyage of investigation was that epochal work published in 1859 - the "Origin of the Species by Natural Selection".

Darwin was not strictly or chiefly a pure anatomist, but his natural history so stimulated discussion that supporters and opponents alike were thrown back on the study of anatomy for a basis of argument, and thus was the science extended and revised. It was his own conclusion that his work was a force in anatomical history, that his theory would give zest to Recent and Fossil Comparative Anatomy.
The preceding pages have been devoted more particularly to the tabulation, in a biographical fashion, of the scientific detail of discovery during the period under consideration. It would now be well to take a comprehensive view of the general conditions and progress of the science, as admirably supplied by Dr. Parsons.

The perfection to which anatomical science attained in the last decade of the eighteenth and during the nineteenth century is evinced not only in the improved character of the systems published by anatomists, but in the enormous advance which had taken place in the knowledge of the minute anatomy of the tissues, of the development of the tissues and organs, and of the modifications exhibited in form and structure exhibited by various groups of animals.

The first to give a good modern system was Sabatier, but his work was soon eclipsed by the treatises of Sömmering, Brodat and Portal. Within the lifetime of Goodair, Sömmering's work was republished at Leipzig in eight
volumes, appearing during the period 1841 to 1847, with additional information by other eminent German anatomists.

To convey an impression of the character of a typical anatomical textbook of the time, we may describe Sömmering's compilation. The first volume was devoted to an account of the life and labours of Sömmering by Wagner. The second, described the anatomy of the bones and ligaments. In the third, Heine demonstrated the anatomy of the muscles and of the vascular system. The fourth, presented the histology of the brain by Valentin. The fifth contained the anatomy of the viscera and organs of sense by Hufeland. In the sixth, was set forth a complete system of general anatomy confirmed by the observations of Heine. The seventh contained an account of development in man and mammals by Bischoff, while the last dealt with pathological anatomy by Jourdan.

This library was translated into French as the "Encyclopédie Anatomique" in 1846. While, in 1847, the eighth volume was rendered into English.
So much for the German school. There existed in France an even more illustrious series of scientists. Bichat in his great "Anatome Generale" secured for himself an enduring reputation as a genius in philosophic anatomy. His "Anatome descriptive" is lucid and natural in arrangement, precise in description and as a whole displays great general rigour, while his physiological deductions are always interesting and usually correct. Unfortunately the author did not live to finish his great work, it was worthily completed by Roux.

Portal, another distinguished Frenchman, besides furnishing a valuable and correct digest of anatomy and pathology, was the author of an accurate "Histoire de l'anatomie et de la chirurgie." Bloquet continued, in an excellent system modelled on Bichat, the precision of Sommerring and the detail of Portal. This work was translated into English by Dr Knox, of Edinburgh.

Cruveilhier in 1834 and 1835 published a worthy general treatise on descriptive anatomy, which in the "Library of Medicine" was rendered into English.
Surgery also produced an elaborate work remarkable for its beautiful illustrations. It treated of anatomy in four aspects: descriptive, general, surgical and philosophical.

And now a word to the conditions under which the science was prosecuted. The history of modern human anatomy or anthropotomy begins when dissections of the human body became part of the essential training of medical students. This benefit is due to the great scientist, William Hunter.

When there were no opportunities for human dissection, animals were employed as subjects, and very poor preparation for human surgery. The makeshift must have been. But when human subjects became available and were regularly used the practice grew rapidly, so that in Goodwin's time there were over a thousand regular anatomy students in London.

At this time, only murderers were allowed to be dissected. This circumstance implied a stigma on the subject, and naturally, relatives and friends were very hostile to the practice. But the custom had come to stay, for surgery demanded
an accurate knowledge of human anatomy so, as the supply became insufficient, the demand became urgent, and bodies were procured at all hazards. Thus came into prevalence the practice of exhumation, both in Britani and in America. Such desperate resource was not required on the continent as the supply of subjects was there not so restricted. And so, there arose the vile traffic of the resurrection men.

In the early years of the nineteenth century the number of students increased so rapidly that in addition to the regular dissecting rooms attached to St Thomas' Guy's and St Bartholomew's Hospitals, many private anatomy schools arose, the most notable being the Windmill Street School where Caesar Hawkins and Mayo, as well as the distinguished anatomists mentioned on previous pages, lectured. This new development demanded a great supply of bodies to the number to the number of about eight hundred every year and so the 'body snatchers' encroached on the graves of the wealthier classes.
These people were better able to make effectual resistance to the depredations, so that the supply again became scarce. On the continent, as previously mentioned, there was no such difficulty in obtaining bodies, so that some two hundred British students had to go to Paris for their practical anatomy course. In this city, also, a number of English anatomists settled and gave lectures on the subject.

In view of this serious menace to the progress of surgery, an anatomical society was formed in 1810 to impress on the Government the necessity of allowing opportunities for instruction in anatomy more than merely "winking" at the practice of robbing the graves of the poor. Prominent advocates of this reform were the great London surgeons: Abernethy, Bell, Home, Brodie, Cooper and Clinton. The result of their representations was the formation of a committee in 1828 to enquire into the matter, and in 1832 the Anatomy Act was passed, probably expedited by the arrest and conviction of the notorious resurrection men - Burke and Hare.
This legislation is a most important event in the history of anatomy. It stimulated anatomical research, and text-books were produced to embody the latest discoveries. It is noteworthy that also about this time the first real anatomy act was passed in America, in 1831. The revelation of the methods used in procuring bodies brought the science of anatomy into very bitter general disfavour, and its practitioners were regarded, with deep hate by the common folk. Indeed Dr Knox who had been supplied by Burke and Hare, was compelled by adverse public opinion to leave Edinburgh.

In the early years of the nineteenth century, Charles Bell's work on human anatomy is held to be the greatest in Britain. He wrote the article on the Nervous System in his brother, John Bell's, work on the Anatomy of the Human Body. He also provided notable publications on the Anatomy of Expression on the respiratory movements, on the hand and on the arteries. But his chief claim to distinction rests on the epochal distinction between the motor and sensory nerves, and
mode of origin from the central nervous system. Astley Cooper, in 1867, had brought out a beautifully illustrated essay on the anatomy of hernia, and the Edinburgh school had treatises in the names of Hone, Bell, Monro and Good sir. In 1828, appeared the first edition of "Quain's Anatomy," edited by James Quain. This eminently work is still among the very best in the language and now is in its tenth edition. Its excellent bibliography renders it invaluable to the teacher and research student. In 1858, another great British text-book appeared in Gray's Anatomy. Still famous and popular in its sixteenth edition, it treats of anatomy with a surgical application.

The "Cyclopedia of Anatomy and Physiology," edited by Dr. Todd, from 1835 to 1839, was a valuable periodical containing articles on human and comparative anatomy. The facilities for the acquirement and dissemination of knowledge afforded by it must be reckoned in the historical factors for the advance of the science in its age. In 1867, the year of Good sir's death, appeared a new force in anatomy in the
first volume of the Journal of Anatomy and Physiology. This enables British work to be published, and foreign work to be noticed, and in the respect of digesting the discoveries in the science it is invaluable.

The limits of this essay are now approached, though the subject is far from being exhausted. Both in life, and literature, and science, the period under consideration was a great age. There were giants in these days, even in that perhaps recondite department of knowledge, anatomy, which it was ours for a short time to survey.

We would conclude in the words of the great contemporary in literature of Gooden, - Carlyle, himself an Edinburgh student. We have undertaken to discourse here for a little on Great Men, their manner of appearance in our world's business, how they have shaped themselves in the world's history, what work they did.

Too clearly, it is a topic we shall do no justice to in this place! One comfort is, that Great Men, taken up
in any way, are profitable company.

But so much as the study of them affords
us an appreciation of the inspiration,
firing the minds of men to do great
things, - moulding the affairs of our world.
- the Spirit of the Age.
Bibliographical Notes.

The nature of this essay precludes that it should be more of the nature of a compilation than an original investigation. Quotation, therefore, is necessary, and in order not to interrupt the continuity of the account, condensed as it is, references have not been given in the text. Even where long passages are borrowed acknowledgments must now be paid to the following sources:

"Anatomical Memoirs of John Good sir" edited by Sir William Turner, with a biography by Dr Henry Lonsdale.

The biography is agreeably written, and enlivened by the personal touch; even if it is somewhat discursive as a source for particulars for a history of anatomy, still it will repay a reading. The anatomical memoirs are the literary remains of Good sir and are of interest and instruction in giving an idea of Good sir's literary style and his philosophical anatomy, especially those on the dignity of man.

The biography is what interests us mostly. It is an example of Brodie's restrained and dignified - one might say, careful and guarded, style. Indeed his tendency is to belittle his anatomical achievements, no merit in the eyes of one searching for historical data.

"Benjamin Brodie" by Timothy Holmes in the "Masters of Medicine" Series.

A well-written, and readable book in an attractive format, containing much valuable knowledge about the teaching of anatomy in London in Goodier's time.

"Life and Labours of Sir Charles Bell" by Pechor.

The French doctor gives an interesting life, and is fortunate in the gift of putting us in sympathy with the subject - very necessary in understanding Bell's volatile mind, with its elations and depressions.

"Life of Sir Astley Cooper" by B.B. Cooper. an account of great length, detailing all sorts of evanescent episodes and with practically no scientific interest. However it may
appeal to the reader as the story of the life of Cooper, it is almost useless for our purpose. Life and Letters of Charles Darwin, edited by Francis Darwin. This is a standard work among many on the subject. It is fully adequate to our needs. "Sir Richard Owen - a notice in the Times" of Dec 19, 1892. gives a short biography of this great comparative anatomist. History of Anatomy - an article in the British Encyclopaedia by Dr Parsons. This is an admirable digest of an extensive and difficult subject, unfortunately it gives no references.
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