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EDITORIAL NOTE

Andrew Combe (1797–1847) is not to be confused with John Combe (1796–1883), a physician in Leith who in 1822 gave the first clear description of pernicious anaemia (Boyd DHA *The first four consulting physicians of Leith Hospital, Proceedings* 1993; **23:** 518–529). Dr Boyd tells us that although the fathers of both Andrew Combe and John Combe were brewers in Leith, he could find no connection between the two families.

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CIRCUMSTANCES SURROUNDING THE EXAMINATION OF THE SKULL AND BRAIN OF GEORGE COMBE (1788–1858) ADVOCATE OF PHRENOLOGY

M. H. Kaufman, Department of Anatomy, University of Edinburgh Medical School

George Combe (1788–1858), an Edinburgh lawyer, and his younger brother Andrew Combe (1797–1847), Fellow of the College and Physician-in-Ordinary to Queen Victoria, were the foremost British proponents of phrenology during the early to middle part of the nineteenth century. An account of the life of Andrew and of the history of the Edinburgh Phrenology Society has been published in *Proceedings*.[1] George (Fig 1a and b) was the author of *The Constitution of Man*.[2] When Andrew died, George undertook the phrenological examination of his brain, and the findings were published in Andrew's biography. George provided John Struthers, anatomist and surgeon, with instructions for the post-mortem examination of his own brain, so that the features of George's brain and Andrew's brain could be compared. The post-mortem report on the skull and brain of George Combe which, contrary to George's wishes was never published, has recently been discovered in the department of anatomy, along with Combe's instructions to Struthers, together with relevant correspondence which describes the unusual circumstances surrounding the events that took place shortly after Combe's death.

In the biography of George Combe published twenty years after his death in 1858[3] the author, Gibbon, records that 3 months before his death he had given detailed written instructions to his nephew, Robert Cox, and to the anatomist Dr John Struthers, as to how the post-mortem examination of his brain should be carried out.[4] He was especially keen that a comparison be made between the features of his brain and those of his brother Andrew, the distinguished physician and phrenologist[5, 6] who had died in 1847 at the age of 49.

Death of Andrew Combe

The circumstances surrounding Andrew's death are recorded in the biography written by his brother, George,[5] and have been referred to in the previous paper.[1] The details of his life are fully recorded and the final chapter of the book deals exclusively with the findings from the post-mortem. This was carried out by a number of distinguished physicians and anatomists, but the detailed description and subsequent phrenological analyses of the skull and brain were carried out by the most distinguished phrenologist of the day, his brother, George.

Andrew died suddenly on the 9th of August 1847, though he had for many years been unwell with what was at the time believed to be pulmonary tuberculosis. He had been struck down by a severe bout of diarrhoea and unexpectedly died while on a visit to a nephew at Gorgie Mill, near Edinburgh. One can only imagine that the team of pathologists that had been selected to conduct the post-mortem must have been in a state of immediate readiness, for when death occurred the examination was only delayed by the time taken by a professional modeller to prepare the death mask. The post-mortem started almost exactly 13 hours after Andrew drew his last breath.

FIGURE 1a

Engraving of George Combe, dated 1836, when he was 48. From a painting by Sir David Macnee, President of the Royal Scottish Academy. Frontispiece to The Life of George Combe, Volume 1.

FIGURE 1b

Engraving of George Combe, dated 1857, when he was 69. From a painting by Sir John Watson Gordon, President of the Royal Scottish Academy. Frontispiece to The Life of George Combe, Volume 2.

Circumstances surrounding George's death

When George died, the circumstances were entirely different. He and his wife Cecilia had arrived at Moor Park, in Farnham, a 'watercure establishment' run by their friend Dr Edward Lane on 10th July 1858, with the intention of remaining there for about a month. They had then planned to pay a visit to Mr T. H. Bastard, another friend, at Charlton, Dorsetshire. During their first few weeks at Moor Park the weather was fine, and they spent the time socialising with their friends, walking and driving in the surrounding countryside; the time passed extremely agreeably. From the 26th of July to the end of the month, however, George felt increasingly low and sleepless. During the first week of August he felt better and was able to undertake light activities as well as receiving visitors such as Sir James Clark, Physician-in-Ordinary to Queen Victoria, and Lady Clark, and his nephew Robert Cox of Edinburgh. He, like George Combe, had given up his practice as a lawyer after he became secretary of the Edinburgh Phrenological Society and conservator of their museum. He was editor of the *Phrenological Journal* from 1841–1847, when publication ceased.

On the 8th, George was unwell again and nauseous. Despite feeling rather better on the 9th, he decided to write to Mr Bastard to postpone the date of their proposed visit, little suspecting that his own death was only days away. On the 10th, he retired to bed. He was restless, very weak, had a poor appetite, was hot and very thirsty. The next day his fever continued. He became increasingly breathless and excessively weak. On the 12th and 13th, his pulse was rapid, and he was restless and unable to take more than a little food and drink. During the early hours of Saturday 14th August, his condition deteriorated, and his last words to his wife were uttered at about 4 am. His breathing became increasingly

laboured, and he died just before midday. The cause of death was given as pleuro-pneumonia.

At 3 pm, his two nephews, Dr Abram Cox of Kingston, and Robert Cox, arrived. Dr Cox went to London to try to arrange the making of a cast (i.e. a death mask) of his uncle, but it appears that he was unable to find a sculptor who was prepared to undertake the task. Robert went to Farnham to make the arrangements to transport both himself and Mrs Combe, as well as the body, to Edinburgh. The plan was that they should leave Moor Park on Sunday afternoon, so as to reach Edinburgh by Tuesday evening, the funeral to be on the Friday (20th August, 1858). Because of the duration of the journey, it seems more likely that they travelled by coach rather than by rail.

While Gibbon's biography[3] describes in great detail all of the events immediately leading up to Combe's death, it is at this stage rather vague. In the final section, written by Mrs Combe, she states that 'All his wishes and directions will be faithfully carried out', presumably alluding to Combe's wish that a post-mortem examination of his brain be undertaken for the specific purpose of comparing its features with those of his brother Andrew which George had examined more than ten years previously (see above). Gibbon then indicates that George's body was buried in the Dean Cemetry, and that his wife, Cecilia, daughter of the famous actress Mrs Sarah Siddons, was later buried next to him. Cecilia died in Nice in February 1868, having survivied George by almost 10 years.

New unpublished information

What has completely transformed understanding of the events that occurred during the week or so after George's death has been the discovery in the department of anatomy of a series of critical documents, namely:

1. A manuscript entitled *Hints for the examination of the brain of George Combe*, dated 23rd May 1858, and signed Geo. Combe. This manuscript is 8 pages in length.[4]
2. A letter from Dr John Struthers to Robert Cox, dated August 23rd 1862, which accompanies item 3.[6]
3. The detailed Report of the post-mortem examination of the skull and brain of George Combe, dated 23rd August 1862. This manuscript covers 94 pages, excluding the index.[7]
4. Letter from Dr John Struthers* to Charles Gibbon Esq, the author of *The Life of George Combe*, dated 17th January 1878.[8]

These documents not only provide information on the exact timing of the events associated with the anatomical examination of the skull and brain of George Combe, but they also supply unique and hitherto unpublished insight into

*John (later Sir John) Struthers (1823–1899) graduated MD Edinburgh in 1845. When he took on the responsibility of writing the Report, he was a teacher of anatomy in the extra-mural school in Edinburgh and an assistant surgeon to the Royal Infirmary. In 1863, he was appointed to the chair of anatomy in Aberdeen, and abandoned surgery. He published many papers on human and comparative anatomy, a valuable *Historical Sketch of the Edinburgh Anatomical School*,[9] and numerous reports dealing with the improvement of teaching in the Scottish Universities. He retired in 1889, and was knighted in 1898 for services to the Royal College of Surgeons of Edinburgh (he had been their President from 1895–1897)[10, 11].

Combe's attitude to his legal and phrenological work, as well as his attitude to children and their response to him. The latter information is at considerable variance with that provided by Gibbon in his biography. These notes also indicate the problems George frequently encountered when in the company of others. This unpublished information provides the basis for the following account.

Instructions to Struthers on how the post-mortem examination on George Combe's brain should be performed

According to Struthers,[8] he had had a long interview with George Combe some months before his death. Apparently, Combe had already sought advice from Professor Syme* as to whom he should entrust with the examination of his brain post-mortem, and Syme had recommended Struthers. During the interview, Combe asked Struthers if he had much experience in comparing the anatomical features of heads with their owners' characters, and on hearing that Struthers' objections to phrenology were mainly anatomical and physiological, remarked that Struthers' opinion 'could be of no value in that regard'. Combe then read out the manuscript he had prepared[4] containing instructions for Struthers with points for him to look for during the examination of his brain. The instructions also contain observations on Combe's phrenological character, as well as recording other autobiographical details, some of which have not previously been published. A selection of paragraphs from this document follows, in order to provide a flavour of its contents, and to show how a phrenologist compared character with the external features of the head and brain.

Aspects of Combe's personality and beliefs revealed in his writings

Combe's observations on *Alimentativeness* and *Love of Life*, for example, are of some interest, as they shed new insight into his personality. He believed that his *Alimentativeness* was feeble, and that he was in a constant state of agitation and insecurity. 'At no period have I had any feeling of having a *hold on life*. On the contrary, from youth upwards I could form no scheme with pleasure or confidence that required ten or fifteen years to mature it. Two years were the maximum I allowed myself to calculate on; and in my profession, this feeling of having only a feeble hold on life, had me to keep up all my clients' business *completed to the hour*. The consciousness of death as an impending event, was present to me in all days and years, and after I got rid of Calvinism, it never marred but often enhanced my enjoyment by giving a relish to virtuous pleasure while it lasted'.

'There are several organs in the anterior lobe palpably deficient on my skull—viz. *Number*, & I have never been able to learn the multiplication table; & *Tune*. I have *perception* of melody, but no memory of notes, & could at no period of my life recall or hum the simplest tune. After the instrument ceased to sound, nothing remained except the intellectual fact that I heard such & such a tune, & that it made such & such an impression; but the *impression* did not remain. The impression, however, was so distinct while the instrument was sounding, that I could analyse the character of the music, and tell whether in the composer or performer it indicated sentiment, propensity, reflecting intellect, or other qualities'.

*James Syme (1799–1870) succeeded James Russell to the chair of clinical surgery at Edinburgh in 1833. He held this post for 36 years except for a period of 6 months in 1848 when he was professor of surgery at University College, London. He was one of the most distinguished and courageous operating surgeons of his time.[10]

'*Form* & *Colouring*, and *Size* are not large, and *Constructiveness* is well marked but not large. These defects with deficient *Imitation* made me incapable of learning to draw, although I tried to learn; & I had a very indistinct memory of forms. I never could recall a map; or a face, fully *i.e.*, in all its parts. But altho' I experienced very great difficulties in distinguishing the size & position of organs when I began the study of Phrenology, very extensive practice, aided by a minute knowledge of the place in which each organ indicated itself on the skull, and by long years of observation, I became capable of estimating the forms & proportions of the different parts of the head, & of *recollecting* them, with tolerable success, so much so, that if an individual had interested me, I recollected his head long after I had forgotten his face'.

'By experience I learned that in listening to a public speaker on a subject which I knew, I could follow his discourse, & analyse it, as he proceeded, & stand up & answer him on the spot, if I differed from him, in cases where my anterior lobe was larger than his. Where his was the larger, he took full possession of mine, & I could not reply without time for digestion & reflection'.

'At no period of my life was *reading* easy or agreeable to me. I never could study law, chemistry, or Anatomy from *Books*, until I had heard lectures on them & seen demonstrations. I could not read history, except by an effort, & so forth. When I found a work that interested me much by its subject & style, I read it with such concentrated earnest attention, that my pulse fell, & digestion was greatly impeded. There were very few such works'.

'On the contrary, I had a vivid *internal intellectual* life. I observed things, or rather processes, actions, character, & all phenomena that stood related to *Eventuality, Comparison & Causality*, mental & physical. I thought on these, & all my works are spontaneous evolutions of thought founded on materials thus gathered, & on my own consciousness. My brain was an overflowing fountain of thought. The hour of dressing in the morning elaborated thought more than I had time to write out during the day in my scanty leisure from business; & during my hour's walk before dinner, the same intense thinking went on. '*The Constitution of Man*'[2] & '*Moral Philosophy*'[12] were written under such circumstances. Mr H. C. Watson said truly that I was a good teacher but a bad learner'.

'My pulse rose in composition & my digestion increased and this power of spontaneous thinking & writing continues with me now in my 70th year, much impaired but by far the strongest of my mental characteristics. Feeling is greatly blunted; Memory is in decay; & also the vivacity & copiousness of my spontaneous intellectual suggestions are greatly diminished, but these remain stronger than all other mental powers, save *Benevolence*, which is still active & tolerably energetic'.

'The causes of these peculiarities are clearly constitutional, but are unknown to myself. The organ of *Concentrativeness* is largely developed. I discovered the function of this part of the brain. The metaphysical analysis of it is difficult, but of the quality itself as attached to that part, I have seen overwhelming evidence. I have long been able to predict whether the organ is very large or very small in an educated man from his discourse or writing, without seeing the organ; & on examination afterwards found my diagnosis correct'.

'This difficulty in reading may have had two assistant sources—Small *Form* & each making observation of the letters in a short time fatiguing, and the internal spontaneous activity repelling the intrusion of external impressions; for in receiving the latter the brain is especially *passive*'.

'The cerebellum should be normally developed, & the organ of *Adhesiveness* is large, & from boy-hood I was attached to & the friend, but never the seducer, of the other sex. I never had the desire for having children, and no interest in them when very young, had not the natural language of *Philoprogenitiveness*, & frightened them even with the kindest of intentions. I married late & my wife was in her 39th year. We had no children. She lamented this, but it never grieved me. In me *Philoprogenitiveness* is decidedly deficient. When my hat passes *Concentrativeness* it falls down & takes an awkward position, rubbing on the neck of my coat. When this organ is large, the hat rests on it, & sits up off the collar of the coat, as at present made'.

Struthers' agreement to undertake the post-mortem

Struthers was undoubtedly much impressed by Combe's cool personality when they met.[8] He was flattered to have been selected by Syme as the most suitable person to undertake the examination, and was keen to produce a meticulously detailed and authoritative document. Indeed, he recalled remarking to Combe during the interview in the Phrenological Museum that he 'considered it a high compliment that he should entrust the duty to me although aware that I did not receive his phrenological system'. While this may have been technically correct, it is interesting that much of the terminology used in the descriptive account of the brain in the Report is almost indistinguishable from that used by Combe in his account of the anatomical features of his brother Andrew's brain.[5] The possibility exists therefore that Struthers, while publicly stressing his disdain for phrenology, may have become subconsciously, either before or during the preparation of the Report, sympathetic to the subject. Equally, he may have been so disinterested, that he just copied Combe's terminology.

He also wished to make clear to Gibbon 'the very great regard I have for the memory of Mr Combe, and the very high estimate I have of the value of his writings. As a boy I was a reader of his *Constitution of Man*, and although too young then to appreciate it fully, I have come since to see that he was a clear thinker in advance of his age'. It is also likely that Struthers felt a deep-seated obligation to George Combe, because of the high regard he felt towards his brother Andrew as he states in the same letter to Gibbon, 'I am indebted ... to Dr Andrew Combe, for I believe it was reading his *Physiology*[13] which first gave me the desire to study Medicine'.

It is an interesting question why such a distinguished and busy anatomist and surgeon, such as Struthers, should have been prepared to devote so much time and effort in the preparation of the post-mortem examination of the brain of Combe, particularly because, as Combe had been aware, he was far from sympathetic to the basic tenets of phrenology, and that the readership of the Report was likely to be extremely limited, being restricted to the Henderson Trustees and probably very few others.

Burial of the body and subsequent post-mortem examination of the head

If it is assumed that the body reached Edinburgh on Tuesday evening, the cast of the head must have been prepared on either the Wednesday or Thursday of

that week. According to Struthers,[8] 'the head was removed from the body where Mr Combe died and was sent to Edinburgh to me', and transferred to his anatomical rooms at Surgeons' Hall. The headless body was then buried in the Dean Cemetery on the Friday. Struthers was away in the North of England when he received notification of Combe's death but returned to Edinburgh as quickly as he was able, arriving on the Sunday. As his servant had the keys to his rooms, Struthers had to enter them through the window. He then immediately proceeded with the examination of the head.

Struthers opened the skull to expose the brain, and at this stage called in a modeller to make the first of several casts during the course of the post-mortem. The first cast was made before the brain was removed from the base of the skull, the second was after the brain had been removed from the cranium. Since the first opportunity to examine the brain only occurred some days after death, and the weather was on the warm side, the brain was found to be too soft to be preserved. The brain was weighed after its basal convolutions had been superficially examined, and the second cast then made. Struthers noted in the letter to Gibbon 'I recollect that it was not a heavy brain. Mr Combe was old enough to have lost several ounces of brain by weight with advancing years, and his head was, as he himself remarked, not a large one'.

As an interesting aside, Struthers recalled that during his long interview with Combe, the latter was particularly self-conscious, and that 'when in the presence of one with a larger forehead than his (Combe's) he felt that he could not debate with him, or words to that effect'. Struthers continues 'I am not aware that the fact of Mr Combe's brain not being a large one goes against the phrenological system which he advocated, as localisation of faculty is one of its essentials, as indeed it must be of any reasonable system of cerebral physiology'.

Report on the post-mortem examination

Struthers worked uninterruptedly, making copious notes as he progressed, until his meticulous examination of the brain was completed. It is unclear how long this took. The notes that he made at this time, formed the basis of his Report,[7] completed on 23rd August 1862, and submitted with the skull and an accompanying brief explanatory letter[6] to Robert Cox.

In his letter to Cox, Struthers apologises for the inordinate delay in the preparation of the Report; he had found it more difficult than he had expected. It appears that a major reason for the delay was the fact that Struthers thought it essential to insert additional remarks and explanation, by reference to the features observed in other brains and skulls. He remained in Edinburgh for 10 days longer than he had anticipated in order to complete the definitive version of the Report, and the additional observations were only completed a matter of a few days before the Report was submitted, when he was in his country residence.

The skull and brain-cast were delivered to Cox by Struthers' servant, accompanied by a copy of Combe's *System of Phrenology*[14] which Struthers had previously borrowed from Cox. Combe's written instructions to Struthers[3] were placed in the box beside the skull. In his letter, Struthers suggested that 'the brain-cast would be the better of being painted (a light cream colour), care being taken not to allow the paint to fill up the furrows. The ink lines may be removed from the skull if you wish, but it can do no harm, and may be useful, to allow them to remain'.

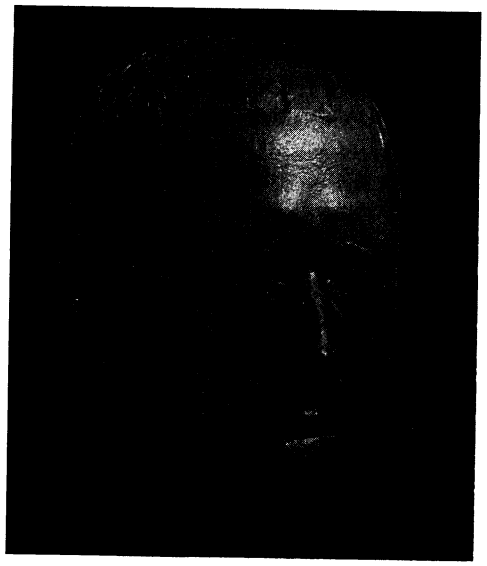

FIGURE 2

Life mask of George Combe, prepared in 1824, when he was 36. From the Henderson Trust Collection, department of anatomy, University of Edinburgh.

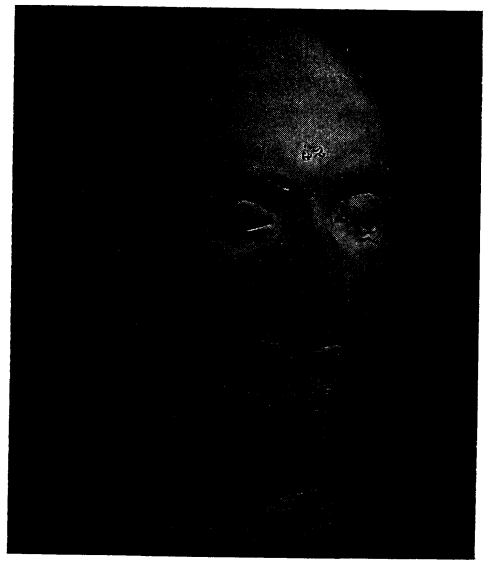

FIGURE 3

Death mask of George Combe, aged 70. From the Henderson Trust Collection, department of anatomy, University of Edinburgh.

Although the death mask, brain-cast, the skull and cast of the skull of Andrew Combe are still in the Henderson Trust Collection in the department of anatomy, University of Edinburgh,[5] it is unfortunate that only the life mask of George made when he was 36, in 1824 (Fig 2), and the death mask (Fig 3) survive, the various casts of the brain and skull having been lost over the intervening years.

The detailed findings

It is of interest that the first 61 of the 94 pages of the Report relate to the detailed description of the skull. Most of the section headings are self-explanatory and are as follows:

i. Natural position of the skull.
ii. Lines and Planes to assist measurement. Most of this section is taken up in defining the various horizontal and vertical Lines and Planes, so that others could repeat his measurements, should the need arise.
iii. Measurements of Cranium as a whole. All values in this and subsequent sections are given in fractions of an inch, to an accuracy usually of either one-eighth or one-tenth of an inch; more rarely, measurements were made to one-third, one-sixth, or one-twelfth of an inch.
iv. Measurements of the several regions—Frontal region; Middle region; Occipital region. These were made with the aid of the various vertical and horizontal Lines and Planes, as described previously.
v. The interior of the Cranium—Thickness. Cavity as a whole, & its several regions.
vi. Outside of the Base of the skull.
vii. Face, orbits, zygomatic fossae, nose.
viii. Capacity of the Cranium and its various chambers and regions, in cubic inches. 'This was ascertained by filling the cavity or its separate parts with small shot (No. 12 shot), the various foramina except the foramen magnum having been stopped with cotton, and then measuring the shot carefully in a graduated jar'.
ix. Weight of the skull. The weight of the entire skull is given as 30 1/4 ounces, while

that of the skull cap is given as 15 1/4 ounces. This is followed by the following comment: 'Although the weight is diminished by the loss of all but the six front teeth of the lower jaw & subsequent alveolar absorption, the skull is a heavy one. The skull cap is not only thicker than the average but is remarkably heavy for its thickness. It is heavier than any skull cap in my museum, although several of these are as low cut, & some thicker than it'.

This is followed by 23 pages of detailed description of the brain, divided into the following sections:

i. Mode of taking cast. Order of examination, &c.
ii. Weight of the brain. Struthers estimated that Combe's brain, with the pia mater, weighed 46 ounces: 7 drachms (avoirdupois). Taking into account the fact that the brain decreases in weight during the latter part of adult life, he calculated that the brain would have weighed during the prime of life about 49 ounces: 7 drachms, almost identical to the value of the average weight of the male brain of 49 1/2 ounces, as given in the 1856 edition of Quain's Anatomy.[15] Struthers was of the view that the weight of Combe's brain was in fact a little on the low side, because he believed that the average weight given in the literature was 'for the most part been taken from persons who have found their way into hospitals and poor-houses'. Consequently ... 'the average is probably below that of the brains of the better classes of society, in whom, I believe the brain will average somewhat higher, partly from inheritance partly from education'.
iii. Base of the brain—Anterior Lobe; Middle Lobe; Posterior Lobe.
iv. Upper view of the brain—Arrangement, breadth, & depth of the convolutions, thickness of the grey matter, &c.
v. Convolutions in the Median Fissure.
vi. Note on depth of convolutions & thickness of grey matter generally, in this brain.
vii. The Cerebellum.
viii. Medulla Oblongata.

With regard to iv above, the Report is of considerable interest, because it is here that a dramatic change occurs in the author's terminology. In all previous parts, the terminology used is strictly anatomical, whereas in the first subsection entitled '(a) Arrangement of the convolutions', where a comparison is made between the features of the brain and the brain-cast, Struthers states (Report, pages 72/73) that 'Comparing the brain with the bust, these two convolutions would include *Eventuality*; *Comparison* and the inner half of *Causality*; *Benevolence* and the inner part of *Imitation* (or a broad *Benevolence*) and the greater part of *Veneration*'. After this brief diversion into phrenological terminology, the text reverts for a further page to anatomical terminology, before lapsing once more (Report, page 74) into phrenological terminology, though it has to be admitted, this only occurs when the author is describing the features of the brain-cast.

Thus, 'Returning to the middle of the top of the brain, there is still below No. 15 (*Firmness*) of the Bust, a median convolution ...', and 'Behind this, at No. 10 (*Self-Esteem*) there is a deep central hollow on the cast which seemed at least partly natural in the brain ..., and situated under the outer part of *Self-Esteem* and inner part of *Love of Approbation* on the bust'.

Struthers continues ... 'The above account of the arrangement of the convolutions is taken partly from notes made during the dissection and partly from the cast. The cast has especially supplied the description of the convolutions on the top view, but it also shows well the arrangement of the convolutions on the undersurface of the anterior and middle lobes'. On Report, page 76–77, he continues in the same vein ... 'My notes on the position of the convolutions under particular "organs" were made with a Bust from the Phrenological Museum before me (on which I had previously marked the various planes already described), and according to my most careful estimate, but the hemispheres were so soft at this time that I cannot vouch for the accuracy. The brain was not only soft, but had had a cast made from it, & had then lain on its top while I examined the base, and during the night. Consequently, the convolutions on the top were flattened and somewhat displaced, so that I could not be absolutely certain as to their relation to the particular "organs" on the Bust'. Similar reservations are expressed on two further occasions on the same page (page 77), and again on the next page.

In a note associated with a section on the 'Thickness of the grey matter', in relation to

'Convolutions of the Great Median Fissure', Struthers states that 'The particular function of these convolutions is not recognised in the phrenological system ... The effect of their greater development must either be to cause lateral enlargement in the direction of the lateral organs, or upward enlargement, pushing up the convolutions which lie along each side of the middle line, under *Eventuality, Comparison, Benevolence, Veneration, Firmness, Self-Esteem, Inhabitiveness, Concentrativeness, & Philoprogenitiveness* ...'. Because of the very poor state of preservation of the brain, no attempt was made at any stage to dissect it.

This is followed by 9 pages of text entitled 'Measurements and observations directed by Mr Combe in the Written paper left by him', the measurements being made either with a tape or callipers. While a considerable number of the readings are described as being 'from the head', it is unclear whether they are taken directly from the head before the dissection was undertaken, from the skull, or from the death mask. Typical of the measurements taken are as follows: 'With tape, from *Destructiveness* over *Veneration* to *Destructiveness*'; 'With callipers from *Cautiousness* to *Cautiousness*', and 'Height with callipers from lower edge of *Individuality* to middle of *Benevolence*'.

The *Concluding Note* is found on page 94, and runs as follows: 'If reference cannot be made to the skull & Brain-cast themselves in going over this Report, the reader should have a skull beside him, with the various lines and planes which I have described marked on it, and also in the interior of the same or another skull. If not a dissection, he should also have, beside him, at least, a cast of a brain. The same planes, especially the vertical planes, should also be marked on the phrenological bust. In marking the planes on a skull, chalk may be used until the lines are accurately determined on, when they may be drawn with the pen. The glass Craniometer which I have described will be found useful, indeed indispensable to accuracy and facility of measurement, and may be obtained from Mr Peter Stevenson, Philosophical Instrument Maker, Edinburgh, who made it for me according to my directions'. The Report is then signed 'John Struthers', and dated '23rd August 1862'.

Evaluation of Struthers' handwriting in the Report, and the terminology used for its various sections

While sentences, phrases and the occasional word, in the section on the Skull, have been scored out and rephrased, the impression is formed that this part of the Report came easily to Struthers. This contrasts with the section on the Brain, where paragraphs, phrases and words have frequently had to be deleted and rephrased, giving the impression that the author was on much less firm ground when writing this part of the Report. This impression is emphasised by the considerable number of occasions when the author appears to be apologising for the difficulties he encounters in taking the measurements and assessing the features of the brain, which was, for obvious reasons, in a rather poor state of preservation when the post-mortem was carried out.

One of the surprising features of the Report, is the considerable degree of familiarity apparently shown by Struthers in the use of phrenological terminology. As indicated above, only anatomical terminology is used in the descriptive account of the skull, though an increasing use of phrenological terminology is used in the section on the brain, sufficient indeed to give the impression that this seemed a natural way for the author to describe the brain, particularly the width and configuration of the convolutions.

While it is only possible to speculate, the increasing incidence of alterations and amendments to the text, and the deterioration in the handwriting between the initial section on the skull and the following one on the brain, suggests that the delay in the submission of the Report may be attributable to the uncertainty Struthers evidently felt in the preparation of the most critical part of the Report which was probably completed in a hurry shortly before the Report was submitted to Cox.

Between his anatomical teaching at Surgeons' Square and his surgical responsibilities in the Royal Infirmary, Struthers' spare time must have been limited. Despite this, it is still difficult to understand why it had taken him so long, almost four years to the day, between his gaining access to the head on Sunday 22nd August 1858 and 23rd August 1862, when he completed and submitted the post-mortem Report. From the correspondence it seems that pressure was put on him by Robert Cox to submit it. Struthers seems to suggest in his letter to Cox, dated 23rd August 1862,[6] submitted with the Report, that the latter was for a long time left in an incomplete state, and that a guilty conscience regarding his tardiness eventually drove him to complete it.

Absence of details of the post-mortem examination from the biography

It is particularly curious, that while Gibbon had read the post-mortem Report on the brain and indeed had written to Struthers in January 1878 to obtain clarification of certain points in it, he decided against including any reference to it in his thesis. There can be no doubt that Gibbon was well aware of the importance Combe had put on the outcome of this examination, and this material could easily have been inserted into an appropriate place in the biography, since this was still in preparation. In Struthers' response[8] to Gibbon's letter of enquiry, he indicated that while he was aware that an official biography of Combe was in preparation, he was unaware that Gibbon had been approached to write it.

Struthers also noted that he had planned to write to Sir James Coxe to indicate that if any aspect of his Report was to be published in the forthcoming biography, he wished to see the relevant section first.[8] But clearly events had moved more rapidly than he had anticipated and he believed that it would be essential to update the Report in the light of the great progress made during the 15 years since its preparation in grouping and naming the convolutions of the brain. He also believed that the Report would benefit from being considerably simplified.

CONCLUSIONS

There is no evidence in the Report or in the accompanying correspondence[6] that George's wish that a comparison be made between the features of his brain and that of his brother, Andrew, was ever carried out. Presumably Struthers' sole function was to provide the Henderson Trustees with the detailed measurements requested by George, and it would be left to others to make the necessary comparison when both sets of measurements were available side-by-side for analysis.

At the most basic level, the weights of the two brains were very different, even taking into account that there was a considerable difference in their age at time of death; Andrew's brain weighed 57 ounces,[4] George's a little over 46 ounces, but, according to Struthers, might have weighed, at most, a little over 49 ounces in his prime of life.

It is certainly extremely difficult to know how even an expert phrenologist would have interpreted the significance of the fractions of an inch difference observed between such calliper measurements of the skull as 'From *Philoprogenitiveness* to *Individuality*', or 'From ear to *Individuality*'. Furthermore, in his *Estimate of the development of the brain of Dr Andrew Combe*,[4] George Combe notes that the terms used to indicate the size of the various organs were either, small, moderate,

rather full, full, rather large or large. It is, therefore, difficult to see how a useful comparison between Struthers' comparatively accurate measurements and Combe's subjective judgements of size could easily be made.

In the case of Andrew Combe's organs, the descriptive terms used suggest that the dimensions of all of the organs were at the upper end of the range. The connections between the talents and disposition of Andrew as observed during life, were then discussed in relation to the development of his brain as observed at the post-mortem examination, but in such vague terms as to make any comparison between the features of his brain and those of George Combe almost impossible.

Now that all of the measurements of the two skulls and brains are available once more, there seems little to be gained by attempting to undertake the detailed comparison requested by George. Consequently, virtually all of the time, and undoubtedly also the anxiety, expended by Struthers on this exercise would seem to have been wasted. It is still difficult to know why Struthers should have taken on this thankless task. It is possible, though unlikely, that he was ambivalent towards phrenology and that, while publicly stressing his disdain for the subject, he might have retained some uncertainties. He was certainly much in awe of the abilities of both George and Andrew Combe, and had probably been flattered by the request. It is unlikely that, unless further correspondence between Struthers and Cox and/or Gibbon becomes available, this question can be answered.

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EIGHTY-EIGHT YEARS OF THIS AND THAT: PART II

C. A. Clarke, 43 Caldy Road, West Kirby, Wirral, Merseyside L48 2HF*

MORE ABOUT LEPIDOPTERA

The Clarke/Sheppard/Gill genetic collection[15]

A memento to Philip is the Clarke/Sheppard/Gill collection of butterflies (and a few moths) in the Natural History Museum in London. This was started in 1982 and consists of about 5,000 specimens in 132 drawers, and reprints of the papers which we wrote together. I can give further information to anyone who is interested—mimicry is a great feature of the collection.

Panaxia dominula, the Scarlet Tiger Moth

Philip left us a most fascinating and argumentative problem. The moth is found principally in colonies in the South of England and there are three genetically controlled forms, f. *typica* (one of the homozygotes) f. *medionigra* (the heterozygote) and f. *bimacula* (the other, rare, homozygote) (Fig. 6). All forms are recognisable but there is variability in the numbers of the three forms in different colonies. The moth had been one of E. B. Ford's pet subjects and there had been great controversy between him and R. A. Fisher on the one hand and Sewall Wright on the other. Is the variability of the proportions of the forms due to natural selection or to drift (i.e. migration or chance)?

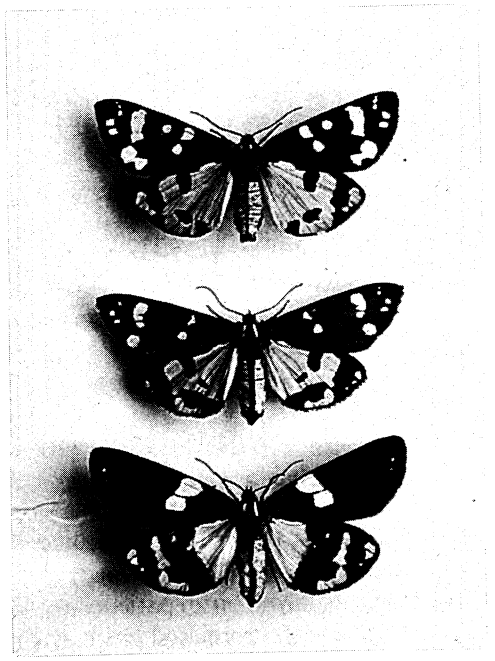

FIGURE 6

Three forms of the Scarlet Tiger Moth a. f. *typica* b. f. *medionigra* c. f. *bimacula*.

*Emeritus Professor of Medicine, University of Liverpool.