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RESEARCH PAPER

Skull Triangles: Flinders Petrie, Race Theory and Biometrics

Debbie Challis*

In 1902 the Egyptian archaeologist William Matthew Flinders Petrie published a graph of triangles indicating skull size, shape and 'racial ability'. In the same year a paper on Naqada crania that had been excavated by Petrie's team in 1894–5 was published in the anthropometric journal *Biometrika*, which played an important part in the methodology of cranial measuring in biometrics and helped establish Karl Pearson's biometric laboratory at University College London. Cicely D. Fawcett's and Alice Lee's paper on the variation and correlation of the human skull used the Naqada crania to argue for a controlled system of measurement of skull size and shape to establish homogeneous racial groups, patterns of migration and evolutionary development. Their work was more cautious in tone and judgement than Petrie's pronouncements on the racial origins of the early Egyptians but both the graph and the paper illustrated shared ideas about skull size, shape, statistical analysis and the ability and need to define 'race'. This paper explores how Petrie shared his archaeological work with a broad number of people and disciplines, including statistics and biometrics, and the context for measuring and analysing skulls at the turn of the twentieth century.

The archaeologist William Matthew Flinders Petrie's belief in biological determinism and racial hierarchy was informed by earlier ideas and current developments in anthropometrics and eugenics. The combination of international agreements on measurements and collection of data from skulls alongside Galton's sophisticated statistical analysis led to a greater importance placed on anthropometric measurements and the potential of this to plot human evolutionary development. In 1902 Petrie published a graph in *Man* (a journal published by the Anthropological Institute of Great Britain and Ireland) showing the cranial sizes of various groups of people from skulls in the collection of the Royal College of Surgeons, London. This paper 'On the Use of Diagrams' was an exercise in the applied use of three-dimensional graphs through the mapping of triangles of three indices of skull sizes on a diagram of climate and intelligence of races (**Fig. 1**). The triangular measurements were taken from the dimensions of skulls – capacity, width and height – and these were also illustrated in the paper (**Fig. 2**). This 3-D diagram visualises the statistics of skull measuring as well as racist assumptions around skulls, brain size and intellectual ability. Petrie's diagram utilised Lamarkian ideas about climate and environment affecting biological difference in human beings as well as reflecting established racially determinist views of civilization and intelligence.

The graph vividly illustrates Petrie's ideas about biological racial difference in a hierarchy that matched brain size and skull shape to assumptions about intelligence. The emphasis on skulls as the main indicators of this supposed biological difference was typical of Petrie's ideas

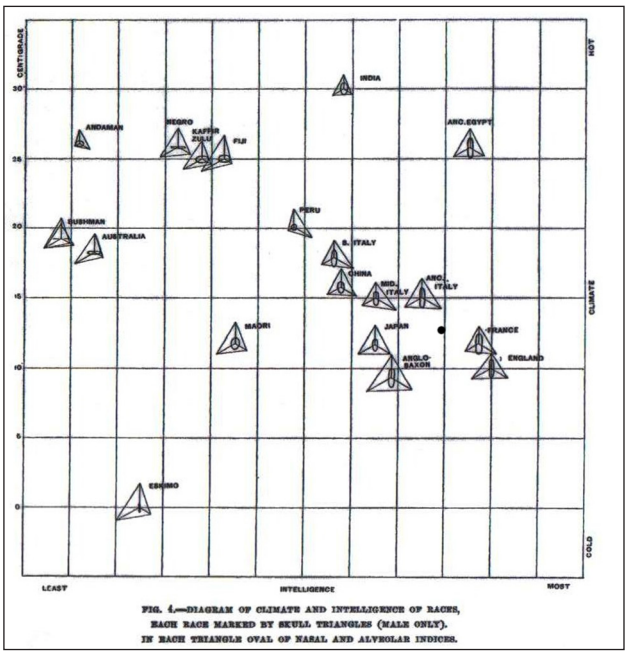

FIG. 4.—DIAGRAM OF CLIMATE AND INTELLIGENCE OF RACES, EACH RACE MARKED BY SKULL TRIANGLES (MALE ONLY). IN EACH TRIANGLE OVAL OF NASAL AND ALVEOLAR INDICES.

Figure 1: Petrie (1902), 'Diagram of Climate and Intelligence of Races, each race marked by skull triangles (male only) in race triangle oval of nasal and alveolar indices.'

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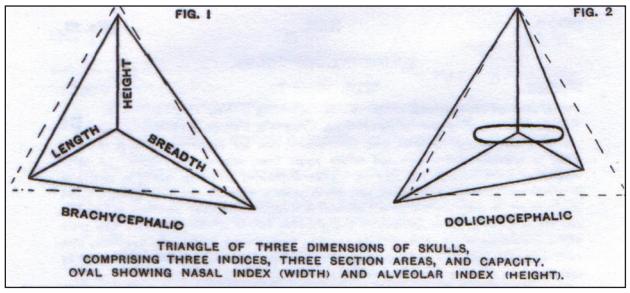

Figure 2: Petrie (1902), 'Triangle of three dimensions of skulls comprising three indices, three section areas and capacity, oval showing nasal index (width) and alveolar index (height).'

around race but far from unique to him. However, what was unique was Petrie's relationship with the polymath scientist Francis Galton, statistician Karl Pearson and his contribution to the establishment of biometrics as a tool of scientific analysis at University College London (UCL). This paper considers Petrie's contribution to the formation of the biometrics laboratory at UCL through his collection of skulls from Naqada for Pearson at UCL in 1894–95 and the analysis of those crania, which was published the same year as Petrie's three-dimensional graph of skull sizes, by Alice Lee and Cicely Fawcett in the new journal *Biometrika*. Both publications offer a complementary yet different interpretation of skull size and shape; the emphasis in both was on the utility of statistics and visual forms of analysis rather than racial theory. Yet both offer an insight to attitudes to the construction of race and race theory and its impact on the practice of archaeology at the turn of the twentieth century.

Skull Collecting: Context

The importance of skulls for showing facial characteristics and head shape as well as brain capacity began to be stressed in the last quarter of the eighteenth century. Johann Friedrich Blumenbach proposed five different types of humans in 1776 in *On the Genesis of the Native Varieties of Humans:* Caucasian, Mongol, Ethiopian, American and Malayan. Blumenbach defined Caucasian as people west of the Caucasus mountains and based them on what he considered to be the most beautiful skull shape – the Circassian Georgian (Meijer 1999: 169). At the same time, the Swiss clergyman and poet Johann Casper Lavater 'rediscovered' physiognomy from antiquity and created an anthology of facial types in silhouette that purported to show inward behaviours and emotions (Swain 2007). Lavater's anthology of facial types created a 'nexus of racial and visual typology' and reused the 'facial angle' measured by the Dutch physician and anatomist Petrus Camper (Bindman 2002: 123). Camper's angle showed the profiles of the forehead, brow, nose, mouth and chin of different faces, notably comparing the face of the ancient Greek sculpture *Apollo Belvedere* to that of a Black African man. Camper's aim was to stress the similarity between both as he was a monogenecist (all races were part of one human species). By the time the anatomist Georges Cuvier reinterpreted Camper's angle it was used to determine cranium size for humans and animals and considered to reflect 'the development of internal faculties under self-control' (Meijer 1999: 175).

Franz Joseph Gall and his student Johann Gaspar Spurzheim became famous for applying the physiognomic principles of Lavater to reading inherent moral traits of the heads of individuals. The practice of phrenology had a sensationally successful and popular period in the 1810s to 1830s and George Coombe and his brother Andrew, both physicians, established a leading phrenological society in Edinburgh (Kemp and Wallace 2000: 111). As a result of the physiognomic principles of phrenology, casts of heads of notable individuals and death masks of criminals were collected. Although, phrenology was scientifically derided by the mid nineteenth-century, collecting casts, skulls and making head measurements of people was not. The brain capacity of the skull and features that determined facial characteristics were still considered essential for defining human difference and so collections of phrenological interest were deemed useful to anthropometric science. For example Thomas Henry Huxley advocated the utility of anthropometrics while dismissing the phenological use of the skull in a paper read to the Ethnological Society in 1870, in which he identified five main races: Austroloid, Negroid, Xanthochroi (fair whites of Europe), Melanochroi (dark whites of Europe, North Africa, Asia Minor and Brahmin Indians) and Mongloid (peoples of Asia, Polynesia and the Americas). Huxley's classification system was based on physical characteristics that included skull size as one of a number of anthropometric measurements (Lorimer 1988: 412–13). Huxley, though making value-laden judgements, did not place different racial groups in a hierarchy as Petrie did, which is illustrative of Petrie's ideas about race and acceptance of racial determinism more generally by the 1900s.

Skull measuring was given greater scientific importance by biologists such as Professor William F. Flower (Director of the Natural History Departments of the British Museum in South Kensington) in stressing 'the role of geographical isolation in the development of particular racial traits, including "intellectual and moral qualities"' (Lorimer 1988: 419). Flower, though questioning the value of craniology without reference to other anthropometric measurements, helped define craniological practice in Britain, particularly through the development of measuring equipment, such as callipers and a stress on consistent practice. The anthropologist Paul Broca published a guide for craniologists for measuring skulls in 1875, for which he measured 1,500 skulls and gave guidelines on what measurements to take and how to describe them (Fabian 2010: 191). Physical differences in skulls were given additional value in terms of defining moral, social and racial characteristics. Francis Galton's composite photographs of the faces of criminals were an attempt, like Broca with his skull measurements, to obtain a graphic representation of variation in the face. These physical characteristics were then mapped to behaviour and 'evolutionary

development of different population groups' (Kwint and Windgate 2012: 42).

A consistent practice of craniology was discussed at various scientific forums of which one of the most important was the Anthropological Institute (AI) in Britain, which had been formed from the Anthropological Society and English Ethnographic Society in 1871. Although having a declining membership in the late nineteenth-century, the AI simultaneously retained and increased members who had a biological and medical backgrounds (Lorimer 1988: 407). The AI stressed comparative anatomy as the main marker of racial difference creating, as Douglas Lorimer has argued, a disconnection between cultural anthropology, which referred and deferred to physical anthropology, while physical anthropology scarcely considered cultural anthropological evidence (Lorimer 1988). Comparative anatomy and craniometry was important internationally and national and international accords on measurements and methodologies were reached. In 1882 the 'Frankfort Craniometric Agreement' was agreed by the Congress of the German Anthropological Society based on a scheme drawn up by Professors Kollman, Ranke and Virchow. The anthropologist and medical doctor J. G. Garson, who had trained in Austria and Germany, presented a paper on this agreement to the Anthropological Institute in early 1884 though he criticised the Agreement for ignoring the work of Paul Broca (Garson 1885). The accord signalled new international agreements for measuring of skulls which reflected the professionalisation of emerging disciplines (anthropology, archaeology, biological sciences etc) as well as the importance credited to skull size and shape. In 1886 'a new international agreement on the cephalic index led to greater certainty about skull measurements' (Lorimer 1988: 421). The close intertwining of archaeology and anthropology at this period is well known. What has been less commented on are the significant connections between biometrics and comparative anatomy with archaeology and anthropology. For a fuller understanding of the influences behind Petrie's 'skull triangles' we need to explore connections between the birth of 'biostatistics', racial determinism and development of archaeology more carefully.

Data and Evolutionary Statistics

Francis Galton was one of the founders of bio-statistics through his search for the laws of heredity and the statistical applications he developed to illustrate data (Cowan 1972: 509). Galton worked on inheritance patterns in peas, recording data using a quincum lattice model, on which he delivered a presentation to the Royal Institution in 1877 (Porter 1986: 281). A quincunx or "Galton board" is a triangular array of pegs. Balls are dropped onto the top peg and bounce their way down and are collected in little bins at the bottom. There should be an equal chance of bouncing left or right so the balls produce the 'bell-shaped' curve of normal distribution. This machine demonstrated the law of error and normal distribution which could be applied to the analysis of data. Galton's work on the statistics of inheritance was a political and social goal as he 'sincerely believed that statistics could be used to construct the perfect eugenic state' (Cowan 1972: 510). Galton accumulated anthropometric data from people visiting his lab at the International Health Exhibition in 1884 at South Kensington (known as the 'Healtheries' and in the space that was the precursor to the Science Museum). He also advertised for and obtained data on several generations of families by post. He took measurements, such as height, going across generations to ascertain variation and norm. Galton recorded head shape and features, not just the size, and this close attention to the shape of the head was similar to Cesare Lombroso's measurements of criminals at around the same time (Porter 1986: 290). The publication of these results in *National Inheritance* in 1889 was the launch, as Galton pointed out in his 1907 Herbert Spencer Lecture at Oxford, of biometric methods. Essentially Galton was practicing a form of craniology on living people, which would influence measuring crania of the dead.

The evolutionary biologist Walter Weldon and the mathematician Karl Pearson, both at UCL, were heavily influenced by Galton's statistical methods and their potential within the biological sciences (Porter 1986: 297). The 1890s saw a significant growth in work around statistics as providing evidence for evolutionary change and a committee was set up by the Royal Society, which for a while included both Pearson and Weldon (Porter 2004: 228). At the same time there was an increasing gulf between biometricians, who concentrated on data collection and analysis to observe variation and norms, and more orthodox biologists, who concentrated on cell structure and close observation of living organisms. The 1900s rediscovery of Mendel's laws on inheritance effectively increased difference in opinion. (Mendel's Laws had been first presented in the 1860s and, like Galton, Mendel used sophisticated mathematics based on observations of peas but concentrated on units passed, what became 'genes', from a parent to off-spring and stressed the great variability involved).

The journal *Biometrika* was founded in 1901 by Weldon and Pearson to present anthropometric and statistical research; its opening editorial 'launched a campaign for the qualitative study of evolution against the old-school biologists' (Porter 1986: 306). Galton was a consulting editor until his death in 1911 and Pearson wrote to Galton in January 1902 that '*Biometrika* and Biometrics are certainly making the biologists wild' (Pearson to Galton: 28 January 1902, UCL Special Collections; Magnello 1999: 99). The journal also reflected the difference between The Biometric Laboratory, UCL and The Francis Galton (later National) Eugenics Laboratory, University of London, with the latter more concerned with collecting family health records than statistical analysis (Porter 2004: 280). Both laboratories shared an interest in defining racial difference through different statistical methodologies and data collection. When Pearson later became director of both laboratories, he used letters headed with the names of both institutions and a quote from Galton himself: 'Until the phenomena of any branch of science have been

submitted to measurement and number it cannot assume the status and dignity of a science'. Petrie's skull triangles and the analysis of the Naqada crania by Fawcett and Lee should be placed into this combative competitiveness within science disciplines and the growth of statistical thinking.

Petrie's interest in and use of applied mathematics and statistics is well known; one of his earliest published papers 'On Metrology and Geometry in Ancient Remains' in 1879 stressed the importance of accurate measurements in ancient societies and aligned practical numerical ability with racial capacity (Petrie 1879; Stevenson 2012). Petrie's patronage by Galton had developed from Galton's recognition of his mathematical prowess. His later friendship with Pearson meant that he had access to key figures who were analysing big data within the emerging science of statistics. Arguably these forms of illustrating and observing patterns of data influenced Petrie's most famous work on putting early Egyptian pottery in sequential date. *Migrations*, Petrie's 1906 Huxley Lecture for the Anthropological Institute of Great Britain and Ireland, not only illustrated Petrie's eugenic ideas but also illustrated the development of statistics and its dialogue with other British scientific circles, including archaeology. By speaking on migration and inheritance, Petrie followed in the tradition of Galton's lecture in 1901 on 'The Possible Movement of the Human Breed under the existing Conditions of Law and Sentiment', Pearson in 1903 on 'On the Inheritance of the Mental and Moral Character' and John Beddoe in 1905 on 'Colour and Race'. In *Migrations* Petrie drew on measurements of crania and referred to portraits or faces on monuments or sculpture as evidence for migration and racial mixing; illustrating this with a diagram of cranial measurements plotting 'low' and 'high' racial groups (similar to that used in his 1902 graph).

A published appendix to the lecture considered 'The Interpretation of Curves' of graphs of skull measurements from across Egyptian history, in which Petrie concentrated on patterns and variability of curves, echoing Karl Pearson's work on the geometry of statistics and ways of mapping big data as outlined in his thirty-eight Gresham lectures in 1894 (Magnello 1996). Pearson argued that when there was an irregular curve, a break from the normal measurement, that it showed signs of evolutionary development but this depended on the collection and plotting of large amounts of data (Porter 2004: 239). Like Pearson, Petrie attempted to put in practice a 'visual and graphical' statistical study of race which could be curated for pedagogic purposes (Perry & Challis 2013). Petrie and Pearson had become colleagues at UCL as well as neighbours in Hampstead in 1892 (Porter 2004: 263). In 1901, shortly after agreeing to provide a 'statement' on Naqada for the Fawcett and Lee publication, Petrie invited Pearson to his house to socialise with other like-minded people, such as Galton, and promised to 'talk shop' with no 'useless socialities' (Petrie to Pearson, 1 October 1901, UCL Special Collections). Exploring the personal and institutional relationships between Petrie, Pearson and his coworkers offers an insight into the crossovers between the fledgling disciplines of anthropology, archaeology and statistics.

Naqada Crania Collected

Karl Pearson considered that skulls were the most useful tool in defining racial differences. In the 1890s he corresponded with the anthropologist Franz Boas on the supposed differences between the 'civilised' white race skulls and the 'uncivilised' American Indian skulls that Boas had collected (Porter 2004: 263). Pearson sent out a request for about 100 skulls from a 'homogenous race' for research, to which Petrie responded (Magnello, 1999: 99). Petrie was willing to put aside skulls from his forthcoming excavation at Naqada in 1894 but pointed out that this would be expensive as skulls were fragile and needed careful packing to be transported back to England. The collection and transportation of the skulls were funded and brought to England by Pearson's brother, Arthur Pearson-Gee in person (Lee and Fawcett 1902: 411). Shortly before leaving for Egypt, Petrie also met Pearson's colleague Weldon and agreed to work for the 'variation committee' (it is unclear if this a separate committee at UCL or the evolution committee at the Royal Society referred to earlier) (Petrie to Pearson: 3 November 1894).

Petrie's letter to Pearson gives an indication of how the skulls were stored and the infamous working conditions on Petrie excavations:

> When I began here I stacked skulls and bones on a broad shelf in my bedroom, with a pleasingly perfect [word illegible] lying below. Soon I had to stack them in boxes to await packing. Then they overflowed and formed a heap, which encroached on our courtyard until I could hardly get into my room. Now the heap is extending daily and threatening to cut off the entrance to our visitors' room. The skulls were laid on shelves across the end of the court, but have now filled all the ornamental opening of the brickwall. And still everyday more some in.' (Petrie to Pearson, 1 February 1895, UCL Special Collections).

Petrie also referred to a 'cannibal race occupying Upper Egypt about 3000 BC' that was hitherto unknown and identified it as a separate race due to the finds of pottery and manner of burial. Petrie described the skulls as 'very fine, orthogonal, with small hook noses and strong brows' and similar to 'Libyans'. This became Petrie's New Race or 'NR'.

When examining the skulls in England, Pearson cautioned Petrie that the 'smallness of the variability' may not indicate a New Race, as Petrie had implied, but nevertheless thought the numbers correlated with skull measurements of modern Parisians, German Bavarian peasants and Libyans (Pearson to Petrie, PMA: undated). At this point, Pearson had been working on Paul Broca's skull measurements of Parisians and Professor J. Ranke's measurements of '900 Bavarian peasant skulls' in order to find a measure of the 'constancy of race' (Magnello 1999: 95). Pearson suggested the Royal College of Surgeons in London or

the Natural History Museum as potential homes for the skulls, since the latter had the 'beginnings of a collection of negroes and others', for value to anthropological study (Pearson to Petrie, PMA: 17 June 1895). Pearson arranged for Professor George Dancer Thane to temporarily look after the skeletons in the gallery of the anatomical museum at UCL while Warren Thompson completed measurements. He despaired of finding a sufficient collection of Egyptian skulls to compare with the New Race (Pearson to Petrie PMA: 11 August 1895) but calculated the cephalic indices of the skulls and compared them on his scale of civilisation and skull size:

> This list shows your Libyans very near the bottom in both cases. I do not lay much stress on position of ancient British, Gauls, Scandinavians and Swiss (Pitt dwellers) as I have only been able to get the measurements of a very few skulls, but the general result seems to indicate a fairly close relationship to the Egyptians and singularly low place on a scale which appears to conform somewhat to the scale of civilisation of modern race, i.e. German near the top and aboriginal near the bottom. (Pearson to Petrie, PMEA: 12 August 1895)

Pearson's reading of 'German near the top and aboriginal near the bottom' on 'the scale of civilisation' mirrors Petrie's assumptions in his later triangle graph. Petrie was pleased that Pearson had found 'a well-marked peculiarity of the NR to work from' as the very small variability points to the 'homogeneity of the race' (Petrie to Pearson, 13 August 1895). Pearson later published these findings and measurements of Naqada, modern French and German crania in 'Mathematical Contributions to the Theory of Evolution: Regression, Heredity and Pannixia' a year later (Pearson 1896).

While Petrie was working on his excavation report on Naqada, in which he outlined his New Race theory, these letters show that he was discussing this theory in context of the skulls found and biometric measuring. His published excavation report repeated his assertion to Pearson that the skulls had a 'marked type with massive brows, deep-cut bridge to the nose and a short but very prominent nose' (Petrie 1896: 35). He compared some of the skulls, 'selected to illustrate the profiles' of the face, to a cast he had taken in 1887 of the facial profile of a Libyan chief (*Racial Photographs* no. 157) from the front of the temple of Medinet Habu. Petrie stated that the diagrams of the skulls series were based on measurements by friends (almost definitely Pearson and Thane) and showed that the capacity was 'less than that of European, Mongol or Egyptian' people, comparing them to the skulls from Hindu Indians he had seen (Petrie 1896: 51). Petrie plotted the size of the skulls on curve graphs in order to graphically compare the measurements against other races (Petrie 1896: Plate LXXXIV). The skull shape and face type that Petrie thought similar to ancient Libyans was in accordance with philologist's A. H. Sayce's proposal that the Amorites from Palestine and Syria were the same race as the ancient Libyans, as suggested in their depiction on Egyptian monuments. Following Sayce, Petrie argued that the New Race were of the same stock and had invaded from the East with connections to the Red Sea and Mediterranean and possibly to Phoenician traders (Petrie 1896: 54).

This New Race theory was famously over thrown by Jacques de Morgan, who excavated at Naqada after Petrie left in 1897, discovering the royal tomb of Queen Neithhotep from Dynasty 1 (Hoffman 1980: 107). Petrie excavated at Abadiyeh and Hu in 1898 and 1899 and finds in these predynastic cemetery sites appeared to convince Petrie that de Morgan was right. In an address 'On our present knowledge of the Early Egyptians' to the Anthropological Institute in 1899, Petrie spoke on and exhibited material that had 'at first been temporarily assigned to a New Race, but further research' had shown that the objects were pre-dynastic and dated to about 5,000 BC (Petrie 1899: 202). Petrie still considered the objects to show a wide difference due to the entry of a different race between 5,000 BC and 4,000 BC. Petrie published a correction slip to the Naqada and Ballas excavation report in 1901, which accepted that the objects described as belonging to the New Race 'are similar to those of the early dynasties' and pushed back dates for stone vases and realigned Dynasty 7 and 8 to 'predynastic' (Spencer 2011: 19). Petrie's correction may also have been due to the evidence before his own eyes while he was putting together seriation as it took Petrie years to fully develop a system of classifying pottery around 'various combinations of ware, form and decoration' which he based on material found at Naqada and announced in 1901 (Patch 2011: 18). However, the Naqada skulls were still to play a further part in the advocacy of biometric data for understanding evolutionary development and inheritance.

Naqada Crania Measured

Ernest Warren, assistant professor of Zoology at UCL, presented findings from examining the skeletons from the 'Naqada race' at the Royal Society on 3 June 1897. Warren based his results on 400 skeletons of the New Race found at Naqada and made 14 key observations around his measurements. Overall, Warren found a correlation in limb length between the New Race to Negro skeletons but noted 'that the sacral and scapular indices were nearly identical with Europeans' (Warren 1897: 401). Warren just examined the bones of the skeletons; evidently leaving the skulls to Pearson. Today, of course, the skeleton and skull are not considered so distinctly and, as Kwint and Wingate point out, 'the brain [and head] is no more a discrete organ than Europe is geologically a "continent"' (Kwint & Wingate 2013: 196). The Naqada skulls had become part of the fledgling Biometric Laboratory at UCL where Pearson as gradually putting together a team of trained staff and volunteers, many of whom were women. This laboratory was later funded by The Worshipful Company of Drapers and should not be confused with the Eugenics Laboraory, which was founded by Galton in 1904 and only came under the directorship of Karl Pearson in 1907 (Magnello 1999b: 123).

Alice Lee and Cicely Fawcett were two of Pearson's co-workers (sometimes called 'computers') at the Biometric Laboratory, which became a 'centre for training post-graduate workers in a branch of exact science' (Pearson 1938: 164). Pearson took an active interest in the research of his co-workers and supported their training and academic careers. Pearson advised Alice Lee to approach Galton informally before being examined for her DSc at the University of London (Bedford College).

> Mr Francis Galton is a delightful old gentleman and an afternoon with him is a real treat. Only show him that you are enthusiastic about your work and speak loud to him for he is very hard of hearing. He is not at all an ogre.
>
> Next as for Sir William Turner, he is the man who has argued from the absolute size of men's and women's [skulls] as to [intelligence] etc . . . Point out humorously to Mr Galton where he comes on your list. Don't do it, however, as if you objected to him as an examiner. (Pearson to Lee, 1899 Pearson Papers 11/2/10/11 UCL Special Collections)

Pearson refers to Sir William Turner Thiselton-Dyer, director of the Royal Botanic Gardens, who was well known for having a poor assessment of women's intellectual abilities. Pearson, like Petrie, on the other hand cultivated female mathematicians as assistants in his laboratories. (Pearson had founded the radical Men and Women 's Club to debate wider issues around marriage and sexuality in the 1880s.)

At her home in Hampstead, Fawcett measured in detail the skulls Petrie sent from Naqada between 1898–1900 while Lee carried out laborious calculations (Fawcett to Pearson: Pearson Papers, UCL Special Collections). These measurements and findings were published in 1902 in *Biometrika* as 'A Second Study of the Variation and Correlation of the Human Skull with special reference to the Naqada Crania'. Fawcett began the paper with cautions about using limited measurements of crania to categorise race and stressed the need for large amounts of data (Fawcett 1902: 409). A statement from Petrie on the Naqada Race showed little caution, however, as, he dated the Naqadan burials to the predynastic period and stated that the skulls show little in common with the early dynastic peoples. Instead he still compared them to the faces of Libyans that he had made from casts of from monuments in his 1886–87 *Racial Photographs* expedition as he had done in his excavation report (Fawcett 1902: 412). Petrie's statement on the 'race' of these skulls is undermined by the conclusions of the article; as we shall see.

Like Pearson, Fawcett used the system of measurements defined under the Frankfurt accord and detailed the laboratory conditions, instruments used and various techniques for measuring parts of the skull (Fawcett 1902: 419). Thirty different ways were used for measuring skull capacity by four different observers: Fawcett herself, Herbert Thompson, Mr Quibell – an Egyptologist measuring in the field – and Professor Thane at UCL when the skulls arrived (Fawcett 1902: 421). All this data indicated no discernible difference in skull capacity and features between skulls from Thebes dating from around 1500 BCE in the collections of the German Anthropological Institute at Leipzig and the Naqada skulls. Comparisons were also made with Randall-Maciver's measurements from skulls from an early dynastic cemetery at Abydos, though his methodology was considered sloppy, and with modern Egyptians collected from a cemetery near Cairo that were 'almost certainly Copt' (Fawcett 1902: 425). They were also compared with 'negro' skulls but found as 'distinct from the Negro as it [the Egyptian skull] is today' (Fawcett 1902: 432). In comparison and the use of terms such as primitive or superior in civilisation recourse is always made to the 'European skull', which is the 'standard', and so differences become 'race features'. Much of the paper is concerned with masses of technical detail and data. Essentially Fawcett concluded that modern statistical analysis was needed for proper craniology; the Naqada skulls appeared to be racially homogeneous; some features indicated primitive characters, others civilised; they belonged to substantially same race over 8,000 years with some divergence in characteristics but found difficulty in assessing interracial variance. Notably, there was no distinct different race or comparison with the 'Libyans' that Petrie had claimed.

Thirty of the skulls measured were photographed for the publication. (**Fig. 3**). This process caused Pearson great anxiety as the quality of the prints of the photographs was so poor that his numbering system could not be seen on the skull. He wrote to Galton that 'I particularly want this first craniological paper to be a success [in *Biometrika*] as it should bring us new subscribers and the Royal Society is paying for it' (Pearson to Galton, September 1902, UCL Special Collections). Weldon did not want to publish the article at all due to the poor quality of the prints and so Pearson asked Galton to step in and mediate as to whether not to publish or publish with 'provisional' written against the photographs. Galton agreed with Pearson that getting a detailed craniological paper into the world of scientific debate was important and that the photographs can be fixed later (Pearson to Galton, 22 September 1902, f. 580). The 'Naqada paper' created 'a good flutter' among the craniologists – nationally and internationally. It may have contributed to the awarding of £1,000 to the Biometrics Laboratory from the Worshipful Drapers Company in 1903, which enabled Pearson to appoint Alice Lee as a computator as well as pay for further work by a microcopist on Ancient Egyptian teeth (Pearson 1904; 254). The Drapers' grant continued for almost three decades. This paper cemented the importance of skulls in biometric work and illustrated the concerns with defining race scientifically in the early years of the twentieth century, whether in statistics, anthropology or archaeology.

Discussion

In the same year that Petrie published the graph of triangles indicating skull size, shape and 'racial ability', the paper on Naqada crania in the anthropometric journal *Biometrika* was published, which played an important part

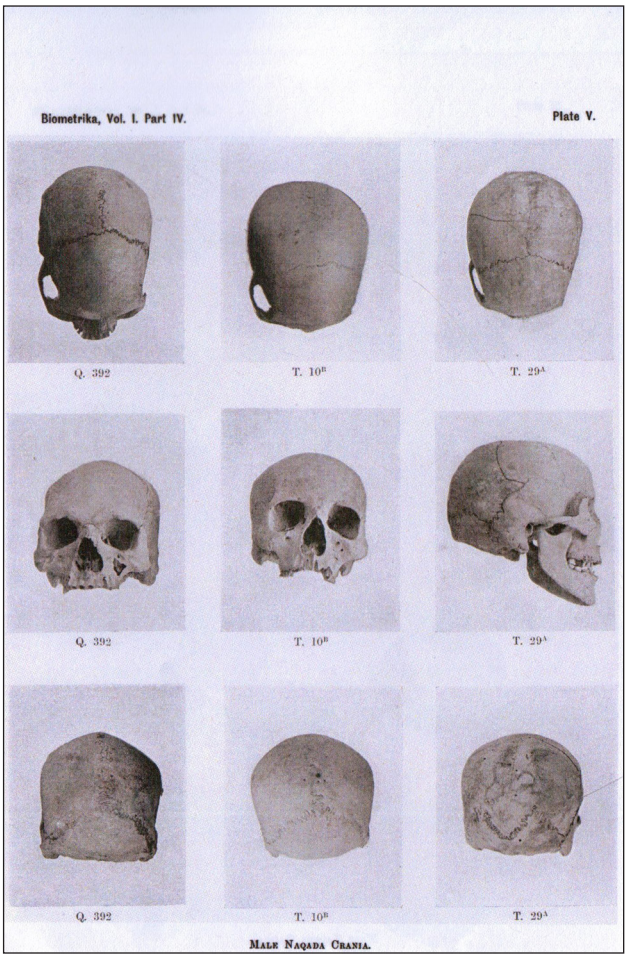

Figure 3: Fawcett with Lee (1902), 'Plate V. Male Naqada Crania.'

in the methodology of cranial measuring in biometrics and helped establish Pearson's biometric laboratory at UCL. Cicely D. Fawcett's and Alice Lee's paper on the variation and correlation of the human skull used the Naqada crania to argue for a controlled system of measurement of skull size and shape to establish homogeneous racial groups, patterns of migration and evolutionary development. Their work was more cautious in tone than Petrie's but illustrated shared ideas about skull size, shape and the ability to and need for defining 'race'. The dialogue between both people and different disciplines illustrates the strength of interest in racial theory and how interdisciplinary academia could be. Petrie's graph of skull triangles plotted against 'indicators of climate and intelligence' illustrated both established and cutting edge ideas of measuring supposed racial difference. These ideas were not confined to a few 'crackpots' at the turn of the century but were widely held by many and across many different fledgling academic disciplines.

However, Lee and Fawcett's conclusions about the skulls were different to those of Petrie's. Lee and Fawcett considered the Naqada skulls to share many features with later skulls found in Egypt from around 1500 BC, where as Petrie stuck to his belief that the Naqada skulls had distinctive features and were 'Libyan'. Fawcett and Lee refrained from pointing out this difference of opinion though the views were clear in their paper. Later archaeologists would not be so refrained. Gertrude Caton-Thompson, for example, would challenge Petrie's assumptions around racial theory and migration in the context of excavations of material from Badaria in the 1920s.* Ultimately genetic research within the biological sciences would disprove the existence of race as a scientific category. Cultural attitudes around 'race' and the racism illustrated in Petrie's skull triangles, unfortunately, continue to have a long and enduring legacy.

A coda to this narrative about skull measuring at the turn of the twentieth century is that when Pearson was retiring in 1932, he consolidated his collections and wrote to Petrie to check that the skulls could remain at UCL. Petrie confirmed that he sent the skulls for Pearson's personal use and due to the large numbers from one location wished 'therefore that these be here in the Galton anthropometric laboratory and not regarded as general anatomical material' (Petrie to Pearson, 24 November 1932). Thirty years later, Petrie still regarded them as important for racial categorising purposes. Pearson's collection of 7,000 skulls eventually went to the Duckworth Laboratory, now part of the Leverhulme Centre for Human Evolutionary Studies (LCHES), at the University of Cambridge (Pearson 1938, 215–6).

Competing Interests

The author declares that they have no competing interests.

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