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How the Use by Eugenicists of Family Trees and Other Genealogical Technologies Informed and Reflected Discourses on Race and Race Crossing during the Era of Moral Condemnation: Mixed-Race in 1920s and 1930s Britain

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Abstract: In the 1920s and 30s, significant empirical studies were undertaken on mixed-race ('hybrid') populations in Britain's seaport communities. The physical anthropologists Rachel Fleming and Kenneth Little drew on the methods of anthropometry, while social scientist Muriel Fletcher's morally condemnatory tract belongs to the genre of racial hygiene. Whether through professional relationships, the conduct of their work, or means of disseminating their findings, they all aligned themselves with the eugenics movement and all made use of pedigree charts or other genealogical tools for tracing ancestry and investigating the inheritance of traits. These variously depicted family members' races, sometimes fractionated, biological events, and social circumstances which were not part of genealogy's traditional family tree lexicon. These design features informed and reflected prevailing conceptualisations of race as genetic and biological difference, skin colour as a visible marker, and cultural characteristics as immutable and hereditable. It is clear, however, that Fleming and Little did not subscribe to contemporary views that population mixing produced adverse biological consequences. Indeed, Fleming actively defended such marriages, and both avoided simplistic, ill-informed judgements about human heredity. Following the devastating consequences of Nazi racial doctrines, anthropologists and biologists largely supported the 1951 UNESCO view that there was no evidence of disadvantageous effects produced by 'race crossing'.

Keywords: mixed-race; hybrids; genealogy; pedigree chart; eugenics; anthropometry

1. Introduction

In the first half of the twentieth century, processes of biological inheritance and their consequences lay at the heart of eugenic work, including that on 'race crossing' (Bland 2007). This made the tools of genealogists of immediate relevance. Bashford and Levine (2010, p. 10) have written: 'One of the commonest images in eugenic publications was the family tree, the "pedigree chart", which tracked the history of talented families, defective families, racially hybrid families, or of leprous, tubercular, epileptic, criminal, and alcoholic families'. Citing the work of Pauline Mazumdar (1992), they argue that the pedigree chart was 'both the research and propaganda methodology of eugenics, especially in its early years' (Bashford and Levine 2010, p. 10). Resta (1993, p. 236) observes that 'the pedigree's use and development is coincidental with the rise of human genetics and eugenics'. These charts were a staple amongst the technologies that eugenicists brought to bear on their work. As Figure 1 shows, eugenics rose in its popularity from 1900 to a peak in the late 1920s, thereafter declining to 1970. In the first half of the century, the late 1920s and early 30s also saw peak usage of the terms 'genealogical tree' (and also 'family tree'). These decades were the heyday of the Eugenics Society, the membership of this

British organization peaking at around 800 in the 1930s. They witnessed the last phase of the colonial empire, to be followed by its relinquishment in the 1950s and early 1960s, the advent of large-scale black immigration to Britain after the Second World War, and the rise of 'race relations' as an area of study (Rich 1990).

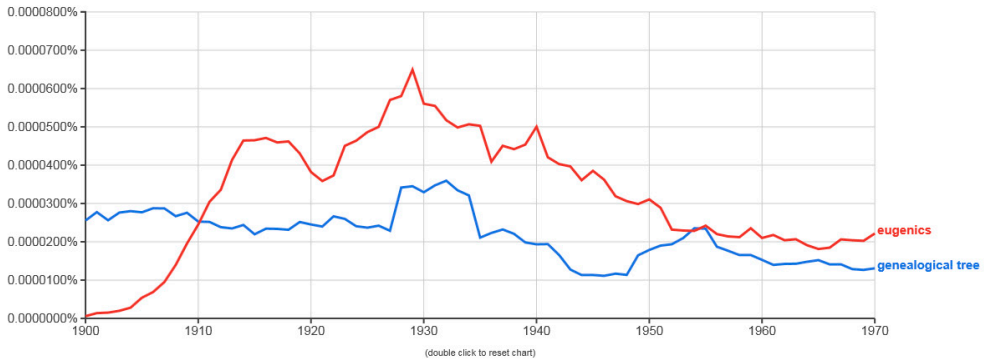


Figure 1. Trend in the use of 'eugenics' and 'genealogical tree' in Google Ngrams. Note: The graph shows the frequency of these keywords in a given year as a proportion of the total number of words in the database for that year. Source: Google Ngrams for the years 1900–1970 from the corpus of books 'British English (2009)' (published in Great Britain in the English language), with a smoothing of 3. Generated via Google Ngram Viewer: https://books.google.com/ngrams. For additional technical information on the process of graphing Ngrams, see (Michel et al. 2010). Quantitative Analysis of Culture Using Millions of Digitized Books. Science. Supporting Online Material (Published 16 December 2010. DOI:10.1126/science.1199644/DC1).

It did not escape the notice of anthropologists Herbert J Fleure, Rachel M Fleming, and Kenneth L Little at this time that the presence of long-established communities of Africans, Chinese, and Arabs in Britain's major seaports of Liverpool and Cardiff presented an excellent opportunity to study their mixed ('hybrid') populations. The key methodology they chose to measure human heredity was anthropometry, the obtaining of systematic measurements of the human body, pioneered by Francis Galton in the anthropometrical laboratory he set up in 1884. These included specific racial markers like skin, hair, and eye colour and nasal breadth in then termed 'Anglo-Negroid' and the Mongolian (epicanthic) fold in 'Anglo-Chinese' children. Such work opened the door to the infamous racial hygiene report of social science-trained Muriel Fletcher. Pedigree charts were used by these investigators to characterize family histories and deduce patterns of inheritance.

2. Genealogical Technologies

The popularity and usage of genealogical trees or pedigree charts is reflected in the publication by eugenic organizations and their supporters of guides to their construction over the period 1910 to the mid-1930s. These were different from the usual guides in that they explicitly targeted eugenicists and 'medical men', clearly indicating the utility of the charts for eugenic work and guidance on how they could be annotated with eugenic information. Further, there was a move towards pedigree chart standardisation, with notable initiatives being undertaken in 1913 and 1926, again with a view to facilitating the collection and recording of eugenic information.

The first attempt to standardize pedigree charts for eugenic purposes was undertaken in 1913 by the Research Committee of the Eugenics Education Society, including AM Carr-Saunders, an eminent biologist, sociologist, and later Director of the London School of Economics, and published in *The Eugenics Review* (Anon. 1913). The characteristics of the scheme included the statement that: 'When the inheritance of any particular character, pathological or otherwise, is being investigated, its distribution in the family may be represented by blacking in the symbols denoting the individuals who exhibit it'. Capital letters written inside the symbol could be used to denote 'certain particular

conditions' specified in a schedule and comprising 'tuberculosis, insane, feeble-minded, idiot or imbecile, epileptic, syphilitic, alcoholic, criminal, blind, deaf mute, cancer (including sarcoma), and condition unknown'.

There was a further move towards pedigree chart standardisation in the mid-1920s, coordinated by some of the leading eugenicists of the day. Maria A van Herwerden, of the Embryology Laboratory, University of Utrecht, Netherlands, took the initiative. At meetings of the International Commission of Eugenics in Milan and London in 1924 and 1925, she brought forward a memorandum on standardization which resulted in the appointment of a committee. Its 1926 report emphasised the desirability of a uniform system of standardized symbols and references 'for genetic research as well as for university instruction' (Anon. 1926a). Eugenics was an international movement with a desire for cross-national comparability in chart preparation: 'Doubtless in many different countries instructors in heredity have experienced a difficulty in the lack of standardized references. This is sufficient reason for seeking a uniform system of symbols'.

At the London meeting and on the resolution of Charles B Davenport (the prominent American eugenicist and biologist), the standardized chart was unanimously agreed. Consent was also given to print and distribute the report through a committee comprising van Herwerden and Harry H Laughlin (another leading American eugenicist and zealot at this time and Superintendent of the Eugenics Record Office throughout its existence (1910–1939)). The Committee recommended its general use by 'students of eugenics in all countries' and its printing in the principal international journals on heredity and eugenics.

The committee reviewed the most widely used systems for constructing pedigree charts, drawing on the essential features of the standardised chart widely used in research that originated with a 1910 committee of the American Breeders' Association, the first national membership-based organization promoting genetic and eugenic research in the United States (Kimmelman 1983), whose system was widely used in research. It also replicated some of the key features of the 1913 standardized pedigree chart but used a different nomenclature.

Its chief characteristics were: males represented by squares, females by circles, sex unknown by diamonds, and stillbirth or miscarriage by a heavy black dot; horizontal lines joining the centre of symbols, right and left, indicating marriage and vertical lines descending from a marriage line indicating offspring (several children in the same family are indicated by their respective 'descent lines' from a horizontal 'fraternity line', which latter is, in turn, joined above by a vertical 'descent line' with the 'marriage line' of the parents); the rectangular system of indicating connections is preserved as consistently as possible; the generations are designated by Roman numerals placed at the left of the horizontal row in which the symbols for the members of the particular generation are charted; and the individuals in the particular generation, both blood kin and kin by marriage, are designated serially, from left to right, by Arabic numerals.

Again, this pedigree chart was tied to eugenic work through the provision to annotate the chart with particular traits or characteristics: 'For each pedigree chart, the investigator should devise, for the particular traits or characteristics to be listed, a system of appropriate signs or letters to . . . be placed near the symbol which represents the particular individual; a legend or explanation of the standard symbols, and of the special signs or letters which are selected for describing persons and traits on the particular chart, should accompany each pedigree chart constructed; and the pedigree chart shows family connections, gives the family distribution of the outstanding traits under consideration, and serves as an index to the detailed histories and descriptions of the particular person'.

The publication of the standardized chart was followed by the efforts of a number of eugenicists to produce guides on how to construct family trees for eugenic purposes. David Starr Jordan and Sarah Louise Kimball published in the USA *Your Family Tree*, subtitled an essay on 'scientific aspects of genealogy' (Jordan and Kimball 1929). It contained a plea for eugenic genealogy and presented numerous illustrious family trees, including Jordan's own, intended to illustrate the virtues of 'superior blood' (Weil 2013, p. 122). Jordan had been a founder member and chairman of the Committee on

Eugenics formed in 1906 within the American Breeders' Association. In 1928 he served on the initial board of trustees of the Human Betterment Foundation, a eugenics organization that advocated compulsory sterilization legislation in the United States.

The Eugenics Society (1931) published a booklet in London, *How to Prepare a Family Pedigree* (*with charts and specialist forms*), 'mainly designed for medical men who have to deal with distinct pathological abnormalities' as well as 'other responsible persons' (Anon. 1931). It consisted of a full explanation of the symbols and methods ('genetical, not genealogical') of plotting a pedigree, a specimen family tree, and a blank chart. The Eugenics Society claimed that 'especially valuable use could be made of it by relieving officers, members of public assistance and mental welfare committees, and the like'. The booklet and accompanying notes introduced a variety of symbols, such as still-births, miscarriages, deaths in infancy, non-identical/identical twins, and legitimate/illegitimate unions, which Little (Little 2010, p. 128) has commented ' . . . marked biological and social events which were not part of the traditional visual lexicon of genealogy . . . As such, whilst they were not ostensibly aimed at creating a collection of scientific data, these schedules introduced a new level of anthropological and scientific abstraction into the field of family history'. The Society also published a book for the purpose of 'enabling ordinary individuals to keep a record of their own pedigrees' but not designed for scientific analysis.

Three years later Max Kässbacher (1934) published *Die genealogischen Methoden als Grundlage der menschlichen Erb* (Genealogical methods as a basis for studies of heredity, race and constitution), stating in the book's forward that: 'The genealogical methods are and will remain the basis of all scientific work in the field of genealogy and genetics; without the methods of family history research an investigation of hereditary and racial types is impossible'. Kässbacher was a scientific collaborator at the Anatomical Institute, University of Heidelberg, and did much to promote genealogical methods as the basis of research in anthropology and human heredity. In 1930 he wrote in *Human Biology*: 'Anthropology and the doctrine of heredity are today inseparable notions. Both sciences, however, in order to accomplish a truly beneficial work, require a third science, that of genealogy. Anthropology without genealogy is at the present day unthinkable' (Kässbacher 1930).

In addition to pedigree charts, other contributions were added to the eugenicists' toolkit of technologies, including guidance on the 'metrical characters' to be measured in anthropometric studies (the use of which also peaked between 1920 and the mid-30s) and the documentation and recording of the traits or characteristics mentioned in the standardised charts. Work undertaken by a specially tasked committee during 1902–08 resulted in a full description of the measurements and observations of metrical characteristics tabled at the British Association (Dublin) in 1908 (British Association for the Advancement of Science 1909). This was used by the British physical anthropologist Kenneth Little in his study of racial mixture in Britain (Little 1942), though the use of these metrical characters in an inter-racial context was not without its detractors, notably, Beatrice L Stevenson (1916) in her critique of socio-anthropometry.

A number of eugenics organizations, including the Galton Laboratory and the US Race Betterment Foundation and Eugenics Record Office (ERO), issued forms for collecting trait data. Those of the ERO to standardize the collection of trait information included: the 'Record of Family Traits' which coordinated a detailed family genealogy with a long list of medical conditions, physical characteristics, mental, and temperamental qualities, and the 'Single-Trait Sheet' and 'Family-Tree Folder', designed to focus on particular traits common to the members of a family[1]. An Individual Analysis Card was intended to give detailed information for each family member in a pedigree and an 'analytical index' allowed the study of the hereditary transmission of the 'inborn traits' of American families. The ERO also published a number of guides to standardize the collection of trait information: *The Trait Book* (Davenport 1912a), a catalogue of physical behavioral attributes, leading to a numbered taxonomy

[1] See: http://www.eugenicsarchive.org/html/eugenics/static/themes/18.html.

of hereditary features; *The Family-History Book* (Davenport 1912b), providing field investigators with information on interview techniques; and *How to Make a Eugenical Family Study* (Davenport and Laughlin 1915), with directions for using accepted symbols to depict family traits on a pedigree chart.

Finally, attempts were made by eugenicists in Europe and the USA in the 1920s to requisition identity and civil registration processes to serve as sources of eugenic information. At the Winderen Laboratory, Oslo, Jon Alfred Mjöen and Jon Bö designed a system of obligatory biological registration called the 'Norwegian Identity Book' in 1924 (Mjöen and Bö 1924). It was intended to be a bulwark against the 'anti-social race-elements (that) inflict great damage on the community... (and) they infect society biologically and morally'. The collection of a range of information was proposed, including 'identity marks', such as hand-surface and finger-prints. The identity book would, on the death of the holder, be returned to the biological registration office so that 'the material thereby collected will serve for the guidance of genealogists, race-biologists and race hygienists, of doctors and statisticians'.

In 1925 the American Association for Advancement of Science appointed a Committee on Public Records of Facts of Significance in Race Betterment in USA that recommended more complete records for applicants for marriage licenses (Anon. 1926b). Facts to be certified by a physician included race; colour of skin, hair and eyes; head form; height; chest expansion; the physical condition of the applicant; physical peculiarity and disease; and results of one or more mental tests. It was noted that the committee 'have not decided whether further exact physical data such as finger prints should be given by physician'.

3. Case Studies of the Eugenic Use of Genealogical Technologies in Studies of Mixed-Race

How genealogical trees were customised or annotated for eugenic purposes, including which traits or characteristics were specified, varied across users and their disciplines. The number of single traits or characteristics that were measured in families and children using these genealogical tools and their taxonomies was substantial. In addition to those listed in the 1913 standardised family tree, they could include a wide range of measurements of physical and mental attributes, indicators of disease, and disease itself. Amongst British eugenicists, physical anthropologists tended in their studies of mixed race children to focus on 'metrical characters', such as skin colour, hair colour and texture, colour and shape of eyes, head shape, lips, nose, and limbs, while social scientists directed their interest to social characteristics such as whether the unions and their children were legitimate, how many family members lived in poverty, and the employability of the children. Eugenicists from mainland Europe, especially those from Nordic countries who were attached to biological laboratories with competencies in such measurements, showed a particular interest in indicators of disease, such as the size and function of inner organs, lung volume, muscular strength, prevalence of diabetes, 'luxation coxae congenitae', and resistance to tuberculosis and other diseases. Some of this work was illustrated by genealogical trees across three generations showing which of Nordic-Lapp race 'crosses' suffered diabetes and 'cretinism' (Mjöen 1931). British eugenicists mostly avoided this subject area, whether out of fear of stigmatising those described or lack of expertise.

3.1. Muriel Fletcher's 1930 Study of the 'Half-Caste' Population of Liverpool

One of the most explicit uses in Britain of the genealogical tree to illustrate eugenic principles and racial types was by Muriel E Fletcher (1930) in her *Report on an Investigation into the Colour Problem in Liverpool and other Ports*. Her report is perhaps best located in the 'race hygiene' genre and she exhibited material on 'half-caste' families in Liverpool at the Third International Congress of Eugenics in New York in 1932. In her chapter on 'The Family' she includes a pull-out plate of four family trees to illustrate 'the instability of the family'. These family trees are annotated with a variety of eugenic information (Figure 2).

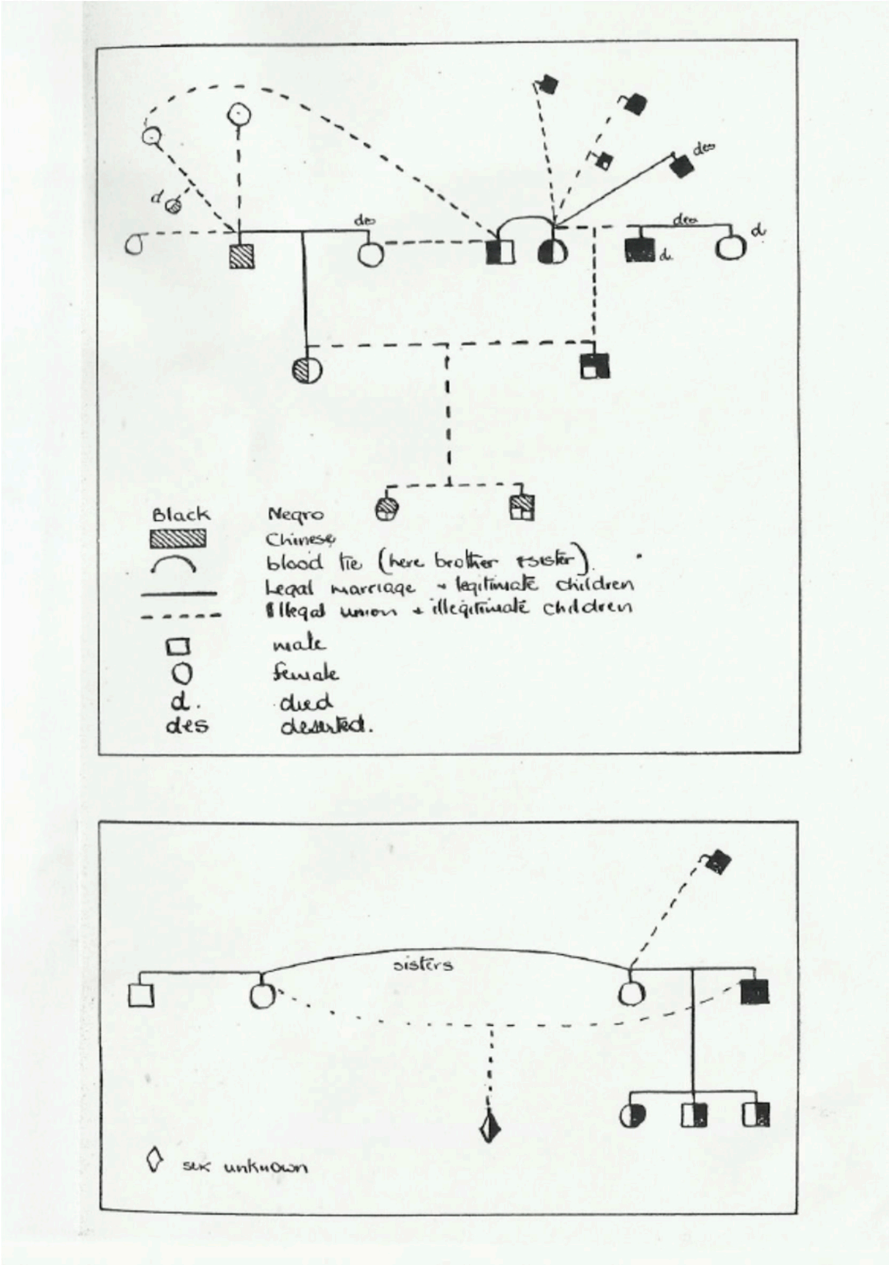


Figure 2. Genealogical trees illustrating 'the instability of the family'. Source: From a set of four trees in M.E. Fletcher (Fletcher 1930).

They use different shading to show the family members' races (e.g., 'Negro', 'Chinese', 'White', or 'Anglo-Negroid'), drawing on one of the provisions of the 1913 standardization of pedigrees, that: 'any conditions may be indicated according to the discretion of the recorder by blacking in a part of the symbols'. This infilling was used to indicate the fractionation of individuals' races presented in the male and female symbols. For example, a 'half-caste' male shows a square half black; a male who was three-quarters black and a quarter white is shown through quadrantal colouring. The expression of a person's race in terms of fractions was common practice at this time.

Fletcher also follows the Eugenic Education Society's convention of using a continuous horizontal coupling line in the case of 'legitimate marriages' and a broken or dotted line when the union is an 'irregular' one. She terms these unions 'legal marriage' and, somewhat provocatively and inaccurately, 'illegal union', respectively. Such lines connecting to children and between siblings are also used to

show 'legitimate children' and 'illegitimate children'. She uses solid curved diagonal (blood tie) lines, known as 'sibship coupling bars' or 'fraternity lines', to show individuals with both parents in common (here brother and sister and sisters) and annotations to indicate whether the partners in such unions had suffered 'desertion' (revealed more frequently to be the male and minority racial partner in these trees), or death.

The significance of her choice of characteristics depicted in these family trees becomes apparent in her description of the families, comprising 82 'Anglo-Negro' cases—'having negro blood in them'—where children were present, sampled from 450 'half-caste' families about which she was notified. With respect to fractionation, she refers to 'half-caste' no fewer than 88 times (and to 'coloured' 223 times and 'negro' 22 times) in her report. She also uses 'blood' as a proxy for race on a number of occasions and quotes from Rachael Fleming's findings on the physical characters of her sample of 'hybrid' children to add to her generally abject account. She is particularly concerned about the 'legitimacy' of the unions and their offspring, using the term around a dozen times, and notes that in a number of cases the father has deserted the family. There is also a limited focus on disease in the 'coloured' and 'half-caste' population, with the report mentioning 'venereal disease', 'syphilis', and 'tuberculosis'. Counts were provided of the number of family members living below the poverty line in a sample of families and there is extensive discussion of the employability of the female 'half-castes'.

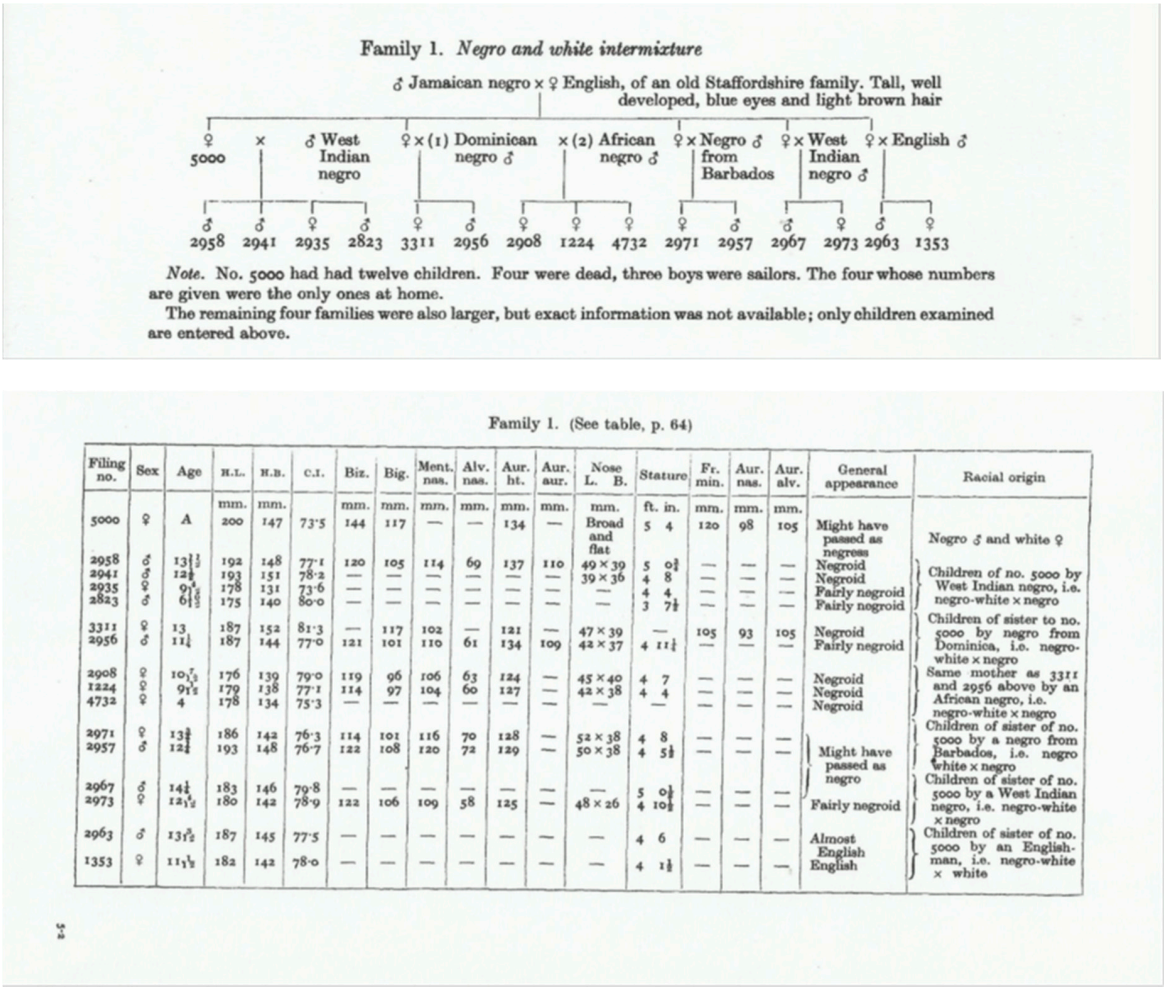
3.2. Rachel Fleming's Studies of the Anthropometry of 'Hybrids' in British Ports

Rachel M Fleming was the most active of contributors of anthropometric studies of 'hybrids' in British seaports in the 1920s and 30s, publishing two papers (Fleming 1927, 1939), both informed by genealogical methods including the 'F1' and 'F2' taxonomy (see below). In 1927 she wrote: 'An important scientific aspect of the work is the effort to record ancestry, and so to work out to some extent the heredity of the child and its relation to each of its parents' (Fleming 1927, p. 295). In her later study she made extensive use of community informants in her anthropometric investigations, noting that: 'It would have been quite impossible to obtain the family history and genealogy of these cases without the generous help of teachers, social workers, district nurses, doctors and missionaries in the districts visited; the police and immigration officers also helped' (Fleming 1939, p. 55).

Her first study of mixed-race children in seaport towns was undertaken at the suggestion of the Eugenics Society and published in its journal. It was primarily descriptive, without recourse to use of the 1908 guidance and with no indication of the number of cases. Fleming uses a variety of terms to describe these children—'of mixed parentage', 'coloured and white', 'of English and foreign parentage', 'negro and white ancestry', and 'Chinese and white'—but occasionally slips into the language of blood to describe race, as in 'English blood' and 'half-caste blood' (Fleming 1927, p. 300). With the help of HJ Fleure, her mentor, she measured a number of characteristics in her Chinese and white and 'negro and white' samples, including skin colour, eye colour, hair, nose, lips, head shape, and limbs. Fleming (1927, p. 300) also observed disharmonies in the children she studied: 'The negro side of the ancestry tends to be very apparent in both F1 and F2 generations. Skin, eye and hair colour are not all inherited together, but vary most curiously and unexpectedly, giving the children at times a most disharmonic appearance'. However, her approach was not just a focused biological one in which she looked at physical characters amongst the offspring: she also comments on their social situation but not in the morally condemnatory tones of Fletcher. She also steers clear of the debates about the biological consequences of race mixing that were particularly heated in the USA, noting only that: 'It seems useless to argue the pros and cons of the "advisability" of an interracial cross, since our Imperial Commercial system is linking all possible races in our seaport towns, and has been doing so for some generations' (Fleming 1927, p. 301).

In her descriptive 1939 paper, she reported around ten measurements on 36 'crosses' (and in a few cases their parents) of White women with Chinese, Japanese, 'negro', Filipino, and Malay men, taken in their homes, schools, and welfare clinics. In addition observations on eyes, skin, hair,

nose, lips, and parietals were presented on 119 Chinese-White children and on 110 'Anglo-negroid' children, as well as on over 60 'back crosses'. Her account was supported by genealogical trees for eight mixed families, five showing three generations and the remainder four generations (Figure 3). These depicted gender, labelled the race of the parents/grandparents—using terms like 'English♀', '♂Dominican negro', '♂African negro', '♂Negro × ♀Spanish', '♂West Indian negro × ♀English', and '♂Filipino × ♀Malay-Chinese'—and showed the ages and reference numbers of the children who were her cases. Fleming again resorts on occasion to the language of blood (as in 'English blood', 'full negro blood', 'full white blood', 'incoming blood' in cases of 'back-crossing', 'European blood', 'Somali blood', and 'Greek blood'). She reports on any disharmonies she finds in her observations, including examples of 'a feature common in cases of Anglo-negro intermixture—marked disharmony of the jaws' (pp. 64, 68, 70, 72, 77, 78), and 'disharmonic' eye diversity in one of her Chinese-White crosses ('one orbit was Chinese in shape, the eye dark opaque brown and the Mongolian fold marked. The other orbit was English in type, eye colour the grey with a brown net so common in English people, and there was no Mongolian fold' (p. 59)). Once again, no comment was made on the advisability of race mixing. This study of 'crosses' in Cardiff and Liverpool was her last contribution on hybridisation, a field first suggested to her by HJ Fleure.



Family 1. *Negro and white intermixture*

♂ Jamaican negro × ♀ English, of an old Staffordshire family. Tall, well developed, blue eyes and light brown hair

♀ 5000 × ♂ West Indian negro | ♀ × (1) ♂ Dominican negro | × (2) ♂ African negro | ♀ × ♂ Negro from Barbados | ♀ × ♂ West Indian negro | ♀ × ♂ English

♂ 2958 ♂ 2941 ♀ 2935 ♂ 2823 | ♀ 3311 ♂ 2956 | ♀ 2908 ♀ 1224 ♀ 4732 | ♀ 2971 ♂ 2957 | ♂ 2967 ♀ 2973 | ♂ 2963 ♀ 1353

Note. No. 5000 had had twelve children. Four were dead, three boys were sailors. The four whose numbers are given were the only ones at home.

The remaining four families were also larger, but exact information was not available; only children examined are entered above.

Family 1. (See table, p. 64)

Filing no.	Sex	Age	H.L.	H.B.	C.I.	Biz.	Big.	Ment. nas.	Alv. nas.	Aur. ht.	Aur. aur.	Nose L. B.	Stature	Fr. min.	Aur. nas.	Aur. alv.	General appearance	Racial origin
			mm.	mm.		mm.	mm.	mm.	mm.	mm.	mm.	mm.	ft. in.	mm.	mm.	mm.		
5000	♀	A	200	147	73·5	144	117	—	—	134	—	Broad and flat	5 4	120	98	105	Might have passed as negress	Negro ♂ and white ♀
2958	♂	13 3/12	192	148	77·1	120	105	114	69	137	110	49 × 39	5 0½	—	—	—	Negroid	Children of no. 5000 by West Indian negro, i.e. negro-white × negro
2941	♂	12½	193	151	78·2	—	—	—	—	—	—	39 × 36	4 8	—	—	—	Negroid	
2935	♀	9 4/12	178	131	73·6	—	—	—	—	—	—	—	4 4	—	—	—	Fairly negroid	
2823	♂	6 5/12	175	140	80·0	—	—	—	—	—	—	—	3 7½	—	—	—	Fairly negroid	
3311	♀	13	187	152	81·3	—	117	102	—	121	—	47 × 39	—	105	93	105	Negroid	Children of sister to no. 5000 by negro from Dominica, i.e. negro-white × negro
2956	♂	11¼	187	144	77·0	121	101	110	61	134	109	42 × 37	4 11½	—	—	—	Fairly negroid	
2908	♀	10 7/12	176	139	79·0	119	96	106	63	124	—	45 × 40	4 7	—	—	—	Negroid	Same mother as 3311 and 2956 above by an African negro, i.e. negro-white × negro
1224	♀	9 1/12	179	138	77·1	114	97	104	60	127	—	42 × 38	4 4	—	—	—	Negroid	
4732	♀	4	178	134	75·3	—	—	—	—	—	—	—	—	—	—	—	Negroid	
2971	♀	13¾	186	142	76·3	114	101	116	70	128	—	52 × 38	4 8	—	—	—	Might have passed as negro	Children of sister of no. 5000 by a negro from Barbados, i.e. negro white × negro
2957	♂	12¾	193	148	76·7	122	108	120	72	129	—	50 × 38	4 5½	—	—	—		
2967	♂	14¼	183	146	79·8	—	—	—	—	—	—	—	5 0½	—	—	—	Fairly negroid	Children of sister of no. 5000 by a West Indian negro, i.e. negro-white × negro
2973	♀	12 4/12	180	142	78·9	122	106	109	58	125	—	48 × 26	4 10½	—	—	—		
2963	♂	13 2/12	187	145	77·5	—	—	—	—	—	—	—	4 6	—	—	—	Almost English	Children of sister of no. 5000 by an Englishman, i.e. negro-white × white
1353	♀	11 1/12	182	142	78·0	—	—	—	—	—	—	—	4 1½	—	—	—	English	

Figure 3. Members of a large family of 'Negro and white intermixture' and measurements taken. Source: The family was observed by Rachel Fleming, see (Fleming 1939).

3.3. Kenneth Little's Study of Anthropological Characteristics of the 'Anglo-Negroid Cross'

Kenneth Little's short-lived engagement with anthropometry yielded one major government-funded study comprising the statistical analysis of the measurements of some 90 'Anglo-Negroid or Coloured' children and a smaller 'White' sample of 40 in Cardiff, published in the *Eugenics Review* in 1942. The paper focused narrowly on the measurement of 25 physical characters in these samples, drawing on the 1908 guidance. The data were stratified by measures of race ('Coloured' and 'White', the former being further divided using Herskovits' typology (see below)) without mention of blood fractionation or social characteristics of the cases, such as whether these children were illegitimate or not. Just a handful of 'dental anomalies' and lobeless ears were found but in both the White and 'hybrid' samples.

Little used some of the notation of pedigree charts (such as the 'F1' designator) without illustrating his case series with such charts. If the study had been triggered by the eugenicists' claim that there was greater variability in the 'hybrid' offspring than in the parents, its findings were uncertain, Little (1942, p. 120) concluding that 'On the subject of the variability of the respective groups little can as yet be said'. However, he suggests from evidence of increased development in the mixed-race sample that 'the possibilities of heterosis cannot be ignored' (that is, hybrid vigour). Despite reference to further studies of some eighty children of 'Anglo-Arab and Anglo-Mediterranean' heritage and an 'Anglo-Negroid' adult sample and questions that would await 'the test of more complete material', Little appears to have abruptly lost interest in anthropometry and published nothing more in this genre.

4. Intersections between Eugenicists' Use of Genealogical Technologies, Discourses on Race, and the Biological Consequences of 'Race Crossing'

The descriptive and expository studies of Fletcher, and Fleming and Little, belonged to genres of their time, to 'racial hygiene' and anthropometry, respectively. There were also important intersections with how race was conceptualised and described in the inter-war years.

4.1. Race as Genetic and Biological Difference

In the eugenic literature of this time the idea that race was transmitted genetically and biologically—'in the blood'—was its primary defining characteristic, as represented by blood quantums and the fractionation of race. Varying fractions of blood quantums were used as measures of race in both pedigree charts and in the nomenclature of hybridity, such as 'half-caste' (as in Fletcher's publication). Genealogy was central to this conceptualisation as descent or inheritance determined the fractions with respect to the metaphor of blood. Moreover, science was seen to confer a legitimacy on this practice both through the specification of exact proportions of blood and science's ostensible objectivity. This legitimacy enabled the language of fractions and blood quantums to be used in legal definitions of race, such as those used to define membership of Native American tribes.

The nomenclature for these 'biological essences' was based on the idea of pure blood (no admixture) and degrees of mixture or 'blood mixing' (Mjöen 1931, p. 31) conferred through parentage, grand-parentage, and more distant ancestry. From this there logically followed a language of fractions: 'full-blood' (Dickinson 1949, p. 83; Glass 1945, p. 67, 70; Eshleman 1940, p. 29), 'pure blood' (Fleming 1931, p. 277), or 'pure race' (Mjöen 1931, p. 31); 'half-blood' (Trevor 1938, pp. 25, 29; Glass 1945, p. 67) or 'half-breed' (Burnet 1959, p. 94; Dickinson 1949, p. 83; Fallaize 1925, p. 82; and Mjöen 1931, p. 38); 'three-quarter blood' (Glass 1945, p. 67); and 'between half and full blood' (Glass 1945, p. 69). Specific terms were sometimes used to describe these blood quantums, including 'quarter-caste' (Glass 1945, p. 67); 'half-caste' or 'mulatto', 'octoroon' (Reid 1923, p. 425), and 'quadroon' (Reid 1923, p. 425; Wilde 1916, p. 190). That science could be held to be unbiased made this language acceptable. Sometimes, other terms were used more generally to describe mixedness, such as 'mongrel' with its obviously pejorative connotations. Moreover, the favoured generic term, 'hybrids', was a label that referenced 'mixed blood' rather than mixed culture.

The nomenclature of fractionation in early twentieth century Britain was never as exact, keenly defined, or institutionalised as that used to describe racial mixture in the late 19th and early 20th century USA. The 1890 US Census was the only one to include the terms 'quadroon' and 'octoroon'. Enumerators' instructions specified: 'Be particularly careful to distinguish between blacks, mulattoes, quadroons, and octoroons. The word "black" should be used to describe those persons who have three-fourths or more black blood; "mulatto," those persons who have from three-eighths to five-eighths black blood; "quadroon," those persons who have one-fourth black blood; and "octoroon," those persons who have one-eighth or any trace of black blood' (U.S. Bureau of the Census 2002, p. 27). As Hochschild and Powell (Hochschild and Powell 2008) note, 'No instruction explained how to determine fractions of black blood' and the initiative was 'a failed experiment'. The census agency concluded that the figures were of little value. In Britain, by contrast, such language was more loosely used and not legally enforced, drawing its legitimacy from custom, including routine use in its colonies. This 'language of fractions' is redolent of that extensively used by colonial administrators, for example, in New Zealand, to define mixed people (Wanhalla 2010).

The clumsy lexicon of half-caste, quarter-caste, and the like was ill-adapted for use in fieldwork studies of 'hybrids' by eugenicists in the 1920s and 30s. Moreover, accurate information on such fractionation was often difficult to obtain or estimate in the field, as it had no doubt been for US Census enumerators. In Britain, most mixed-race children lived in seaport communities and their black fathers were frequently absent at sea. Further, accuracy depended on the person's knowledge of their parentage or more distant ancestry. In some studies, this ancestry was inferred from the person's appearance or derived from informants in the community. Alternative taxonomies or approaches were needed to describe and tabulate mixed-race in multiple case series (running into the hundreds in Fleming 1939 study). In 1930 Melville Herskovits proposed a classification (Herskovits 1930) more suited to such purposes, comprising the designations of NNW (subjects who on balance owed more to 'Negroid' than white ancestry, NWW (the converse), and NW, and used, for example, by Little (1942). Some studies, including Fleming's, used the notation 'F1' to denote an actual 'first cross' (the NW category) and 'F2' the second generation.

4.2. Skin Colour and Visibility

While biological race was the primordial category, skin colour and other characteristics of phenotype were needed as visible markers of difference in everyday settings. Skin colour conferred on race the signifier of recognition, both being categories and determinants of difference interpenetrating and substitutable for each other. Readily observable characteristics were prominent in the anthropometric studies of 'hybrid' children. Fleming (1927) accords particular attention to the differences or gradations in skin colour, reflecting its importance as a racial marker: 'distinctly negroid', 'some degree of negro colouring', 'specially dusky', and 'marked variations of intensity in pigmentation'. Hair was described as: 'negroid in type and in colour', 'hair English in type and colour', 'hair tight and frizzy', and 'partly woolly in type and partly straight'. With respect to general appearance of the 'Anglo-Negroid' hybrids, '43% immediately gave the impression of being distinctly negroid. 5% might have passed as English children, and the remainder were half-caste in appearance'.

4.3. Cultural Characteristics and Stereotyping

Race was equally defined by cultural characteristics. With respect to the 'coloured' seamen in Liverpool, Fletcher (1930)'s descriptors included 'moral degradation', 'excitability', 'promiscuous in his relations with white women', 'assertive', and 'somewhat conceited'. She described the white women in relationships with them as 'prostitutes', 'mentally weak', 'somewhat lazy', and 'hopeless and embittered'. The 'half-caste' children were said to be 'illegitimate', 'full of conflict', 'below average' (in intelligence), 'little regard for punctuality', 'easily tire', and 'lack the power of application'. Fletcher's close associates, notably, felt the need to deny prejudice: PM Roxby, chairman of the Liverpool Association for the Welfare of Half-Caste Children, declared 'No question of race prejudices

or discrimination is involved' (Fletcher 1930) while HJ Fleure (1930) pronounced that 'The absence of prejudice in the report is a most welcome feature'. This discourse of predispositions and moral failings substantially draws from the lexicon of stereotypes in colonial societies. These racialized distinctions became naturalised and normalized, ostensibly as fixed and immutable as skin colour itself and heritable through the blood.

4.4. The Consequences of Race Crossing

Views about the biological consequences of race crossing varied substantially, even across those contributing to the eugenics literature. While some saw the physical disharmonies they reported as a reason to oppose 'race crossing', others did not. Mjöen introduced his use of the terminology 'harmonic and disharmonic race crossings' at the 1921 International Congress of Eugenics at New York and later expanded upon it (Mjöen 1931): 'It is the mosaic heritance which gives rise to the series of disharmonies in hybrids. I speak of a "disharmonic" cross in the narrow sense when the offspring's adaptability and efficiency show a decrease in comparison with those of the parent stocks, as a result of special combinations of hereditary qualities. And in a wider sense I have introduced the term "disharmonic" for such crosses as produce unfavourable results even when compared with only one of the two parent races'. In the USA it was Charles Davenport and Edward M East who were most closely associated with the concept of the breakup of the harmony of the genotype through 'race crossing'.

Although Fleming (1927, 1939) highlighted examples of physical disharmonies in her Chinese-White and 'Anglo-negroid' crosses, including disharmonies of the eyes and jaw, she did so as matter-of-fact and without elaboration or comment, not as part of a discourse on the advisability of interracial marriages or union formation. Indeed, in more public venues, she argued vociferously against those who had condemned such unions, arguing in a speech to the British Commonwealth League in 1932 that 'there was nothing in anthropology or in biology to indicate that racial mixture was bad . . . but brought possibilities of effecting new capacities' (Anon. 1932). Little stayed close to the 1908 statistical measures of metrical characters and did not report 'disharmonies'. He also eschewed these heated debates about 'race crossing': 'Over questions relating to the 'quality' of racial characteristics, as well as to the genetical result of their mixture, many notable spears have been broken in the past by such scientists as Davenport, Mjoen, Fischer, Castle, etc. The not inconsiderable amount of controversy which arose over such theories and explanations as "blended inheritance", "harmonic and unharmonic features", "instability", etc., relating to hybrid populations, has but lately subsided and little would be gained in seeking to revive it' (Little 1941, p. 117).

Indeed, it is noteworthy that contemporaries of Fleming used her evidence base to both support and condemn such union formation, such was the precariousness of the evidence base on the biological consequences of race mixing. Fletcher (1930) quoted Fleming's 1927 findings on the 'Anglo-Negro' cross at length in her morally condemnatory report. Reginald Ruggles Gates' *Human Genetics* presented evidence on the disadvantageous biological consequences of race mixing, including 'a number of extraordinary cases of unilateral development of eye characters and disharmony of the jaws' (Gates 1946, p. 1358) in Fleming's 1939 article. Montagu (Montagu 1942, pp. 120, 127), on the other hand, used the fact that only one of 119 Chinese-White hybrids in the same study showed any evidence of asymmetric or disharmonious physical characteristics as evidence of an 'obviously extremely rare' occurrence.

4.5. The Lasting Imprint of Eugenics and Genealogical Technologies on Discourses on Race in the Later Twentieth and Twenty-First Centuries

The decades following the Second World War saw a marked decline in the popularity and influence of the eugenics movement and racial science and in the dwindling membership of the Eugenics Society as the full horrors of the Holocaust became known. Anthropometry as a sub-discipline of physical anthropology, perceived by some as a 'dead end', lost out to cultural anthropology and the rise in interest in race relations. The idea that racial intermarriage produced disharmonious offspring was soundly discredited by the UNESCO statements on race of 1950, 1951, 1964, and 1967.

Similarly, the apparatus of racial science, notably the use of blood quantums—terms like 'half-caste' and 'octoroon'—disappeared from the lexicon for describing mixed-race in an official context in Britain as new terminology to describe this population was developed. The UK Parliament's House of Commons abandoned the use of the term 'half-caste' in the early 1970s. Moreover, when the Secretary of State for the Home Department was asked 'if the ID codes for negroid types, including mulatto, octoroon, and quadroon have been removed from the pocket books issued to Metropolitan police officers', he replied that the pocket-book 'was updated in 1993 without these classifications', thereby removing the last vestiges of this lexicon. However, the language of fractions for describing racial/ethnic self-identity has persisted, around a quarter of respondents in a recent survey using the term 'half' (e.g., 'half Japanese, half English') and a small number more complex fractionated identities (Aspinall and Song 2013). Moreover, in the USA, many American Indian tribal governments and other American Indian organizations have continued to use blood quantums as a standard for membership. The use of race fractionation has also surfaced in some more technical demographic contexts, including initial discussions on population projections by ethnic group in Britain and a system of fractionated ancestries ('fractional assignment') in the USA for dividing multiracial respondents amongst the main race categories.

However, the use of genealogical trees retains a central place in the biological sciences, with increasingly sophisticated efforts at standardisation but divorced from earlier eugenic applications. Their use to track a person's race remains salient in the media, when that race is under public scrutiny. Following Prince Harry's engagement to Meghan Markle, the construction of Markle's family tree became an obsession with the popular press, with headline 'family tree' stories in the UK *Daily Express*, *Daily Mail*, and *The Times*. Investigations into Markle's racial background have fed into racist coverage of the couple in comment pieces and the social media. In her counter-narrative, Markle embraces her multiracial identity in *Elle Magazine* (July 2015)[2] ' . . . . To say who I am, to share where I'm from, to voice my pride in being a strong, confident mixed-race woman'.

A similar curiosity and public scrutiny has attended the introduction of novel 'genetic genealogy' technologies like DNA ancestry tests, especially when used for 'celebrity sequencing'. When condemned for saying of Africa: 'all our social policies are based on the fact that their intelligence is the same as ours—whereas all the testing says not really', *Nature*'s newsblog and the UK *The Times* and *Independent* revealed that 16% of the genes of James Watson (the co-discoverer of the structure of DNA while based at Cambridge) are from an ancestor of African descent. Here again, the potency and appeal of the estimate, as with blood fractionation, lies in its exactitude as a marker of ancestral descent, though in this case used to undercut racism.

In twenty first-century Britain, eugenic ideas have been recast in new but no less troubling ways, invoking a return to racial narratives rooted in biology, though disconnected from the appropriation of genealogical technologies that characterised the 1920s and 30s. The 'mixed-race' individual as extraordinary and exceptional is now the ascendant representation of 'mixedness' and a similar exceptionalism has been reported in the USA. This image melds the idea of the new 'transition generation' of today's youth (Prewitt 2013, p. 206) with notions of 'new . . . ', 'gifted . . . ', and 'special . . . '

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[2] See: https://www.elle.com/uk/life-and-culture/news/a26855/more-than-an-other/.

people (Channel Four Television Corporation 2009). 'Mixed' people are represented as more attractive, the so-called 'biracial beauty stereotype'. When Lewis (2010) found in psychological experiments that 'mixed-race' people were perceived as more attractive, he latched on to biological theories of 'hybrid vigour' or heterosis, the idea that outmarriage or exogamy yields enhancement in the offspring or 'heterozygote advantage', claiming: 'This result is seen as a perceptual demonstration of heterosis in humans—a biological process that may have implications far beyond just attractiveness' (p. 136). Indeed, Lewis suggests that hybrid vigour may also underpin success: 'There is further, albeit anecdotal, evidence that the impact of heterosis goes beyond just attractiveness. This comes from the observation that (mixed race people) are over-represented at the top level of a number of meritocratic professions (e.g., golf with Tiger Woods; acting with Halle Berry; Formula 1 racing with Lewis Hamilton; and, of course, politics with Barack Obama). Understanding the effect that heterosis has on the distribution of genetically determined performance might help to explain this over-representation' (Lewis 2010, p. 138).

This kind of thinking, 'betterness'/superiority based on physical attractiveness, facial symmetry, giftedness, psychological resilience, and other dimensions of ostensible heterozygote advantage raises the spectre of recreating a biologically determined racial hierarchy akin to the discredited race pseudoscience and eugenics of the past. Such a rank-order, with 'mixed race' at the top, brings to mind the essentialised race characteristics of bygone centuries, adding biological fitness, giftedness, and attractiveness to those of temperament, character, moral worth, and cranial capacity of past racial hierarchies. While ideas of 'hybrid vigour' were occasionally invoked in the 1920s and 30s, as seen, for example, in the writings of Kenneth Little, the predominant narrative amongst eugenicists was that of 'hybrid degeneracy'. Social attitudes to mixing have changed dramatically since the 1990s, yet it is clear that these racist stereotypes continue to influence the experiences of mixed-race people.

5. Conclusions

The studies by Fleming, Little, and Fletcher comprise a significant body of empirical work undertaken on 'hybrid' populations in Britain's seaport communities in the 1920s and 30s. While the physical anthropologists drew on the methods of anthropometry, Fletcher's morally condemnatory tract belongs to the genre of racial hygiene. They all aligned themselves with the eugenics movement, with respect to the methodologies they used, and the journals and conferences chosen to disseminate findings, and brought to bear on their work the respect of academic institutions or steering committees of the same. All three made use of pedigree charts or other genealogical tools for tracing ancestry and investigating the inheritance of traits. However, they represent the last of such writing, as anthropometry was already in decline in the 1930s and Fletcher's work outraged the communities she studied. It is clear, however, that Fleming and Little did not subscribe to contemporary views that population mixing produced adverse biological consequences and, in the case of Fleming, actively defended those marriages. There was also some acknowledgement, again in the case of Fleming, that environmental factors played their part in the disadvantaged circumstances of these 'hybrid' communities and that it was not a matter of simplistic, ill-informed judgement about human heredity. The intervention of the Second World War and its consequences impacted significantly on the broader body of opinion in Britain and the USA about the biological consequences of race mixing, with anthropologists and biologists largely aligning themselves with the UNESCO view that there was no evidence of such adverse consequences.

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