The Scottish Society of the History of Medicine

(Founded April, 1948)

REPORT OF
PROCEEDINGS

SESSION 1992 - 93 and 1993 - 94

The Scottish Society of the History of Medicine

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THE FORTY FOURTH ANNUAL GENERAL MEETING

The Forty Fourth Annual General Meeting was held at the Royal Botanic Garden, Edinburgh on 7th November 1992. It was attended by 68 Members or guests and the President, Mr J. S. G. Blair was in the chair. The minutes of the Forty Third Meeting were approved and the Treasurer's report was accepted. Two grants had been made from the Guthrie Trust, £500 to Dr. Michael Williams towards the publication of his biography of Dr. J. J. R. Macleod and £400 to Dr. David Smith towards the publication of a biography of Professor Robert Garry. A further £7,000 had been made available as pump-priming for the 1994 International Congress in Glasgow.

The following Office Bearers were elected: President Mr J. S. G. Blair, Vice-President Dr. Elizabeth Rose, Hon. Secretaries Miss Fiona Watson and Mrs Brenda White, Treasurer Dr. Martin Eastwood, Auditor Dr. N. H. Gordon, Editor of Proceedings Dr. David Wright. Three new council members were elected, Dr. Isobel Alexander, Dr. John Simpson and Dr. J. B. Wilson, to replace Dr. John Forrester, Dr. Joan McAlpine and Dr. Harold Swan whose terms of office had expired. The outgoing members were warmly thanked for their contributions.

THE ONE HUNDRED AND THIRTY SEVENTH ORDINARY MEETING

This meeting directly followed the Forty Fourth Annual General Meeting at the Royal Botanic Garden, Edinburgh. The President introduced Professor R. I. McCallum who talked on Antimony in Medicine.

ANTIMONY IN MEDICINE

Antimony: 1477. [ad.med. L *antimonium, prob. ad. Arab]. In pop. etym.= (antimoine* monk's-bane). A brittle metallic elementary body, of bright bluish-white colour and flaky crystalline texture. Symbol Sb *(stibium).* a, *Alchem* and *Pharm.* Orig. applied to the native trisulphide (called also *gray antimony,* or *stibnite),* the στιμμι, *stibium* of the ancients, and al *koh'l* of the Arabs (see ALCOHOL); the *antimonium, proteus, leo ruber* etc. of the alchemists. b. *Chem.* The simple element (called earlier *Regulus* of Antimony). 1788.
Shorter Oxford English Dictionary, 1933.

Although antimony (Fig. 1) was well known in ancient times and was almost a household word in the 16th to 18th centuries in Western Europe it is now quite unfamiliar to most people.

The discovery in 1877 of a fragment of metallic antimony at Girsu (now Telloh, Tello or Tell Luh) (1), between the rivers Tigris and Euphrates in south east Iraq is evidence that the

Sumerians of about 3000 BC could not only produce pure metal from the ore but could make it into a vessel, something which is difficult to achieve today.

This specimen is in the Louvre and is now in about 4 pieces, and it is impossible to guess what it might have been. It is labelled: "Antimonie: fragment paraissent provenir d'un vase moulure fondu en forme. Pièce très rare, unique mème (Berthelot). Bourrelet 7/8 mm". The surface of the material is a bronze colour, yellowish in part. Tiny flecks of bright crystalline material can be seen in it. Berthelot who analysed the material in 1887 considered it to be pure antimony (2).

Analysis in 1970-71 at the Louvre Laboratory showed that it contained a little arsenic, iron, lead, tin etc; the patina was an oxide of antimony. Pure antimony metal is extremely brittle, and this specimen is no exception. Further analysis of the material was carried out in the museum laboratory in 1975 (3) which confirmed that although the material of which it is composed is very pure antimony it does contain small amounts of other elements (copper, tin, zinc, silver, bismuth, nickel, cobalt, iron, molybdenum etc), as shown by by emission spectrography in ultraviolet, and absorption spectrophotometry. The pattern of impurities was related to those found in antimony ore from the Azerbaijan region.

These methods of analysis of metals were not of course available to Berthelot but nevertheless his view that the specimen was composed of a pure metal still stands.

The sulphide which is the most common natural compound was used by the ancient Egyptians as an eye salve and for ulcers. It also had limited use as a cosmetic, and probably is still so used in the Middle East, but lead sulphide was the usual material.

It is often assumed that eye paint in the Old Testament implies the use of antimony. In the Latin Bible (4) the word stibium is used in describing the painting of the eyes or face (eg in Ezekiel 23.40; Jeremiah 4.30). In the second book of Kings (9.30) Jezebel "depinxit oculos suos stibio et ornavit caput suum". There and in Jeremiah the Hebrew word puch is used to describe eye-paint and has been interpreted as antimony although what it was actually made of is not clear. Puch is also used in Isaiah (54.11) in connection with building. In Ezekiel the word used is Kohol (5) like the Arabic kohl for antimony. In the Septuagint both words are given as stimmi. Job (42.13) named his third daughter Keren Happuch which is translated as cornu stibii (horn of eye paint) in the Vulgate, but the phrase is again not specific.

In view of the large deposits of antimony ores (stibnite Sb_2S_3 and some valentinite and cervantite) in the Hunan, Kwangsi, Kwantung and Yunnan Provinces in China it would be surprising if antimony compounds had not been used medicinally. This point is made repeatedly by Needham (6). In fact the references to antimony as a medicinal substance in medieval Chinese alchemical writings are sparse before 1590, when Li Shih Chan lists "hsi lin chih" as a Persian silver ore, and seems to use it for trachoma, as an emetic, and for infantile convulsions.

Internal use of antimony compounds, although almost certainly known earlier, began with John of Rupescissa in the 14th century, and was popularised by Paracelsus and his followers from the 16th century on. Its use as an everyday medicine was concentrated in the 17th to the early part of the 19th century.

JOHN OF RUPESCISSA (?1300-1362)

The earliest systematic medical chemistry of antimony is set out in De Consideratione Quintae Essentiae (7), which is regarded as an authentic work of John of Rupescissa, probably written in 1351-2 (8). It was translated into English, Italian, and Swedish, and in the 16th century into French and Latin. It circulated in numerous manuscript forms and the text was subject to alterations by others soon after it appeared; it was confused with work by Lull or Roger Bacon (8).

Copies of Rupescissa's alchemical works are easy to find in libraries such as those of the Royal Colleges of Physicians, sometimes bound up with other texts of alchemical writers.

Jean de Roquetaillade as he is also known, as well as Juan de Rocatallada, Johan de Rochafist, Joannes Repetissa; Juan de Pera-Tallada, Juan de Ribatallada, Jean Rochetaillade, Johan de Roccatagliada, Johannes de Rupaciza (9), was probably born to a well-to-do family in the village of Marcolès south of Aurillac in the province of Auvergne (10). Thus he was not a Catalan like the alchemists Arnold of Villanova and Raymond Lull, as is sometimes claimed.

The Cantal region in which he lived was then the principle source of antimony in western Europe. Deposits in the form of veins of stibnite were present in that area and in the central plateau of France, most importantly at Freycenet, Licoulne, Puy-de-Dôme, Cantal and Haute Loire.

Not much is known about him. He was a student at Toulouse in 1315-20, and joined the Franciscans there in 1332. His reputation rests mainly on his theology, but he was also an alchemist and physician.

There are two places called Roquetaillade in France but it has been argued convincingly (10) that his name is derived not from a place but from his favourite verse in the Bible. This is in the book of Daniel, chapter 2, verse 34 in which is described the destruction of the idol with the feet of clay and iron by a rock mysteriously cut out, which later becomes a mountain: "Videbas ita, donc abscissus est lapis de monte sine manibus, et percussit statuam in pedibus eius ferreis et fictibilibus, et comminuit eos" (In the Authorised Version: Thou sawest till that a stone was cut out without hands, which smote the image upon his feet that were of iron and clay, and brake them to pieces).

Thus the names Rupescissa and Roquetaillade can be derived from lapis (or rupes (fr roche)=steep rock) abscissa. This fits in well with his reputation as a severe critic of the church which brought him into conflict with the ecclesiastical authorities. He was an apocalyptic preacher and opponent of corruption in the church, which led to his imprisonment by the church authorities during which he wrote out a number of the prophecies which he had made since 1325.

Rupescissa has been described as a gold-making alchemist (11), but his De Consideratione Quintae Essentiae is basically in praise of alcohol. It is in two books, one on canons, the second canon being on aqua ardens or alcohol; and the other on remedies, mainly on how to prolong life by staving off corruption. The concept of the quintessence moves from alcohol to other sources including metals, and he is particularly enthusiastic about the quintessence of antimony. The fifth essence can be also obtained from all things, including vitriol, gold, and mercury.

The idea of quintessence as the substance of heavenly bodies latent in everything or as the purest and most perfect form of anything is said to go back to Aristotle (384-322 BC) or to Pythagoras (540-510 BC) but according to Erastus (Thomas Lieber, 1523-1583) in an attack on Paracelsus the latter's quintessence is not that of Aristotle (12).

Thorndike (9) gives the Latin text of De Consideratione Quintae Essentiae and a translation "On the consideration of the Fifth Essence" as follows:

"Pulverise the mineral antimony until it is imperceptible to the touch and put it in the best distilled vinegar until the vinegar is coloured red. This done, remove the coloured vinegar in another vase and pour it on more vinegar until, over a slight fire, it too is coloured, when it should be removed. And keep that up until the vinegar no longer is coloured. Then put all the vinegar which has coloured into a still, and first the vinegar will rise. Then you will see a stupendous miracle, because through the beak of the alembic you will see as it were a thousand particles of the blessed mineral descend in ruby drops like blood.

Which blessed liquor keep by itself in a strong glass bottle tightly sealed, because it is a treasure which the whole world cannot equal. Behold a miracle ! Forsooth the great sweetness of antimony so that it surpasses the sweetness of honey. And I declare by God's love that the human intellect can scarcely believe the virtue and worth of this water or fifth essence of antimony. And Aristotle in his book, Secret of Secrets, says that it is its lead. Believe me that never in nature was there a greater secret. For all men have toiled to sublimate the spirits of minerals and never had the fifth essence of the aforesaid antimony. In short I never would be able to express the half of this discovery. For it takes away pain from wounds and heals marvellously. Its virtue is incorruptible, miraculous, and useful beyond measure. Forty days it needs to putrefy in dung in a sealed bottle and then it works marvels."

This was probably antimony trisulphide (kermes mineral); acetic acid (vinegar) was usually employed in the process, but urine and sugar were also used.

This passage was also translated by the physician and naturalist Sir Hans Sloan (1660-1753) who had studied in Paris and Montpellier, and it is in manuscript in the British Museum (13).

It appears that John of Rupescissa's role in initiating the oral use of medicinal antimony has been overshadowed by attribution of his authorship of the treatise on the fifth essence to Raymond Lull, whose name carried more weight (14), and perhaps by the greater notoriety of Paracelsus at a later date.

PARACELSUS AND ANTIMONY

Paracelsus (Theophrastus Bombast von Hohenheim; 1493-1541) probably derived his interest in antimony from Rupescissa and like him was concerned with distillation. Use of the mineral antimony fitted in with his advocacy of chemical remedies rather than galenicals. At least nine different antimony preparations are given in his Opera Omnia (15) which was published after he had died. Antimony was promoted by his followers Libavius (1540-1616), Heinrich Khunrath (1560-1605), Raimundo Minderer (1570-1621), Adrian Mynsicht (1603-1638??), Oswald Croll (c1560-1609), Joseph Du Chesne (Quercetanus, 1521-1609) and many others.

The number of antimony preparations in the 16th and early 17th centuries was large (Table 1) and it is not surprising that there was abuse by orthodox practitioners and especially by quacks, who often included antimony in their secret remedies.

TABLE 1

ANTIMONY PREPARATIONS (From Wootton (5), and others):

Martial Regulus of antimony (impure gold)	Stibnite fused with iron
(Lunar) Butter of antimony	Trichloride, from stibnite and corrosive sublimate. A translucent fatty mass.
Cinnabar of antimony	Small reddish needles prepared from butter of antimony
Algaroth's powder=(pulvis angelicus, mercurium vitae, mercury of life)	white oxychloride emetic made from butter of antimony by Victor Algarotti (Algorethus ?1620s), a physician of Verona, for which he won 1000 gold pieces

Powder of Projection	Produced in the Philosophic Egg (an oval glass vessel) containing sublimed butter of antimony, and heated on a sand bath for months
Antimony glance	grey antimony sulphide
Glass of antimony	fused oxysulphide and silica
Liver of antimony	mainly sulphide
Crocus metallorum (saffron of the metals) (Powder of Ruland, Martin Ruland 1532-1602)	mainly Sb and Na sulphide
(Argentine) flowers of antimony (Van Helmont)	crystalline trioxide
Mineral bezoar (antidote)	regulus (metal) heated with nitric acid, to give the metal and antimonious acid
Diaphoretic antimony Dr Bates recipe, The Countess of Kent powder (16)	suboxide, from sulphide and nitre (potassium antimoniate)
Pilulae perpetuae	the family remedy: regulus in pill form, recovered and reused
Tincture (Huxham)	Salt of tartar and antimony melted together from which with spirit of wine is drawn a red liquor (Pomet)
Poudre des Chartres	the same, a popular remedy in France for ague, smallpox, dropsy, syphilis and other diseases
Lilium Paracelsi	alloys of antimony, iron, copper, and tin. Also in "theriacal elixir".
Golden sulphuret of antimony (antimonial panacea)	from the liquor after precipitation of kermes mineral; further precipitate by adding hydrochloric acid to give protosulphide and persulphide of antimony with sulphur.
Tartar emetic	Described by Adrian Mynsicht, 1631. The Earl of Warwicke's powder ?
Kermes mineral	Glauber c 1651: antimony oxide cream of tartar and hydrogen sulphide, giving an orange red powder (40% oxide

	with hydrated antimony sulphide, and some sodium or potassium sulphide)
Plummer's powder (Aethiops medicinalis) Plummer's pill (Pil Hydrarg Subchlor Co) 1724	golden sulphuret with calomel, and guiacum, made up in treacle. Andrew Plummer (1698-1756) was Professor of Chemistry at Edinburgh 1726-40
Dr James's powder	Patented in 1747 as a secret remedy. Contained algaroth powder, antimonial calx and lime. Mainly antimony oxide.
Feltz's Solution	arsenic, sarsaparilla, isinglas, sulphide of antimony. Recommended for secondary and tertiary syphilis (Rayer; Lancereaux)
Fothergill's Pill	Diaphoretic antimony, aloes, scammony and colocynth.
Antihecticum Poterii	1666 Pierre Potier of Anjou; tin and antimony oxidised with nitre
Spilsbury's Drops	Antimony sulphide, corrosive sublimate, gentian root, orange peel, shavings of red Saunders (sandal wood)

Effects of Antimony Compounds by Mouth

The effects of Antimony given internally were summarised in 1571 (17) as "Vomare, cacare, sudare", and illustrated explicitly by Barlet (Fig. 2) in 1657. (18) Confusion between metallic antimony and lead because of their superficially similar appearance, and between the toxic effects of lead and arsenic which are associated with antimony in ores has often complicated descriptions of the effects of antimony compounds.

Paris v Montpellier

In the middle of the 16th century arguments over the use of antimony, which were evident before then, became caught up in a quarrel between the medical faculty of Montpellier (not far geographically from sources of stibnite to the north) which favoured iatrochemistry, and that of Paris, a bulwark of medical conservatism, which followed rigidly the teaching of Galen (19). Behind the arguments over the use of antimony was the breaking by Montpellier graduates of the monopoly which the Paris faculty had over medical practice in that city, and personal feuds between Paris physicians.

The official ban lasted until 1666 (although antimony was still used in spite of it) when it was lifted following the successful use of tartar emetic in the treatment of King Louis XIV's typhoid fever.

BASIL VALENTINE

The best known and most influential book on antimony, with which both Francis Bacon and Isaac Newton were familiar, is The Triumphal Chariot of Antimony, first published in German in 1604. An English edition (Fig. 3) appeared in 1678 (20). The book is a heavily pietistic polemic written to counteract the reputation which antimony had acquired as a poison. To be carried in a triumphant chariot was in times past granted to monarchs and powerful heroes after victory in battle, and such will be the reward of the man who masters the use of antimony.

It is an important source of information on alchemy and antimony in particular, and Partington (12) discusses in detail its authorship and content. Much of what is in it was well known when it appeared, and while it claims to have been written in the 14th century by Basil Valentine, a Benedictine monk, there are a number of anachronisms which suggest that it was written much later. It is now accepted that the author was Johann Thölde, a councillor and salt boiler from Frankenhausen in Thuringia. Alexander Suchten refers to Basilius Valentinus in Antimonium Mysteria Gemina, also published in 1604 (21), which has an introduction by Thölde.

The Triumphal Chariot of Antimony in setting out what is necessary for the pious spagyrist to know, has a philosophical introduction, invoking God, prayer, and spiritual contemplation. It divides diseases into internal and external ones. All things contain their own operative and vivicative spirits, and "Metals and all Minerals, are endued and possessed with their own incomprehensible Spirit, in which, the power and virtue of all their possible effects, consists".

There are two kinds of antimony: one containing much mercury, and the other much sulphur; the former being more fit for medicine and alchemy than the latter which is not as friendly to gold. In antimony one finds "mercury, sulphur and salt, the three great principles of health. Mercury is in the regulus, sulphur in the red colour, and salt in the black earth which remains". In its preparation these must be separated and then united again. Mercury and sulphur in this context are not to be taken literally as substances in today's terms but are representative of alchemical qualities.

Far from disguising or passing over the toxic nature of antimony the point is repeatedly made that it can be poisonous if not properly used, but if properly used is a potent medicine. Antimony ". . . is Venome and a most swift poison, also it is void of Venome and a most excellent Medicine; whether it be used outwardly or inwardly". This Paracelcian outlook and the need for correct preparation and dosage is repeatedly stressed; any potent medicine can be a poison if misused. "The volatile part of it is not void of Venome, but the fixed is free from all venenosity". The good must be separated from the evil in using antimony.

Proper preparation, and the correct dose are insisted upon, no doubt bearing in mind the maxim of Paracelsus defining a poison, which might well have been written with antimony in mind: "Alle Ding sind Gifft un nichts ist ohne Gifft. Allein die Dosis macht, dass ein Ding kein gifft ist" (All things are poisons, and nothing is without poison. Only the dose makes that a thing is not a poison).

Antimony not only purifies gold, and frees it from all foreign matter "but it does the same for animal bodies, as regards both men and brutes".

Many doctors will seek primarily riches rather than showing the wonderful works of God and his glory in the use of antimony. The ignorance of physicians and "gown doctors" and of apothecaries about the preparation and use of antimony is heavily criticised.

ANTIMONY CUPS

In 1637 a Minora Comitia was held in the College House of the London Physicians (23), attended by the President (Dr. Simeon Fox), Dr. Argent, Dr. Harvey, Dr. Fludd, Dr. Hodson, Dr. Ramsey, Dr. Clarke, Dr. Wright, Dr. Spicer, Dr. Oxenbridge, Dr. Catcher, Dr. Smith, Dr. Hamey, and Dr. Rant. It was reported:

"Dr. Fludd enformed that in Gunpowder Alley at the sign of the Megpy antimoniall cups are to be sold with that inscription upon the signe. he asked the price, and they asked Is. Effects of the said Cupp. Sir Nathaniel Kitch died of a vomit made by the antimoniall, the last Sommer. reported by the President. The lady Ayme Blunt died of the same medicine in Charterhouse yard the same sommer. reported by Dr. Wright. Another case of the same kynd was reported by Dr. Harvey."

The cups or goblets were made of pure antimony, and their brittleness protected with a leather case. Wine was left in the cup overnight and drunk the following morning by which time a variable amount of an organic antimony compound (probably a tartrate) had been formed.

In 1642 the first full description of the use of antimony cups was given by John Evans who claimed to be a minister of religion. He aroused considerable resentment by his exclusive claims and self advertisement in "The Universall Medicine or the Virtues of my magneticall or antimonial cup" (23). The use of the word magneticall is explained in the text, in which the discovery of antimony is ascribed to Geber (702 - 765 A.D.), King of Arabia who, Evans says, called it magnesia "for as the magnes draweth iron to it with the one point and expelleth it with the other; so this magnetically extracteth to and expelleth from the stomach, whatsoever within the whole body of man, is found to be offensive to Nature or contrary to the health and good constitution of the body". Geber or Jebir, possibly a mythical character is regarded as the founder of alchemy.

Burton (24) in the Anatomy of Melancholy (1658) refers to magnetical cures. Bailey's Dictionary explains that "Magnesia opalina (among chymists) is a sort of Crocus Metallorum or Liver of Antimony" (25).

Evans provoked the wrath of Theodore Turquet de Mayerne (1573-1655), a Montpellier graduate who had been driven from Paris for using antimony, and had established himself successfully in London. Evans used Mayerne's name without permission, including it in a list of "those ancient philosophers and learned physicians who have written of the cardinal virtues of the antimoniall cup". Mayerne was no doubt likely to be particularly sensitive to this issue, and as a result copies of The Universall Medicine were destroyed on the order of the Archbishop of Canterbury. The English bishops had the right to licence medical practitioners based on an act of parliament of 1511, which lasted up to the mid 18th century.

Evans was also criticised by James Primrose (26) a Scot, and a Montpellier graduate. Primrose prescribed antimony but objected to the use of the cup because as he says "I have known many who by the infusion of it have been grievously tormented, and some that have dyed . . .". He quotes the view of Paracelsus that "As that antimony refined gold, so by the same reason it purifies the body of man" but continues in his own words, "he must be voyd of reason, who will think this comparison true and right"!

All the cups whose whereabouts in the British Isles are known are in London: in the Royal College of Physicians, the Science Museum and the Victoria and Albert Museum. They were exhibited together at the Royal College of Physicians of London in January 1977. In most cases there is little or no information on provenance. These cups have been described in detail elsewhere (27).

Cups in other European countries are hard to find. There are two in the Netherlands but I have not identified any in France or Germany or in eastern European countries.

A cup in Basel in the Schweizerisches Pharmacie-historisches Museum (Apothekenmuseum) is not recorded in the literature. The museum is in the centre of the old town of Basel, in a 14th century house in which Erasmus lived and which Paracelsus is said to have visited often professionally during his stay in Basel. It has a wide range of fascinating exhibits relating to alchemy.

The cup was presented to the museum in 1924/5 by its founder J. A. Häfliger, a pharmacist and Professor of the History of Pharmacy but there is no record of its provenance. It is unusual in that it is neat and bowl shaped rather than the commoner deep cup, and is the smallest such cup that I have seen, being only 3 cm high and 5 cm in diameter (Fig. 4). Like virtually all such cups it has been broken (into about 5 pieces) and repaired, and also chipped at the base, showing the typical crystalline surface which suggests that it is made of a pure antimony. The rim of the cup is intact, and there is no evidence of use. On the base are scratched the letters RES.

In the museum are also a number of exhibits of antimony preparations described in the alchemical literature, and formerly used in medicine, including some pilulae perpetuae which are listed in 18th century pharmacopoeias but seemed most unlikely to have survived anywhere. Other antimony medicaments in the museum are: hepar antimony, cerussa antimonii (oxide), crocus metallicus, stibium diaphoreticum, bezoar mineralis pulv., regulus (small craggy bits), aethiops antimonii (Hg & Sb), stibium oxydatum (album), stibium sulfur. aur., vitrum antimonii, calcaria sulfo stibiatum (Hoffmann's geschwefelter antimon Kalk), and a specimen of natural stibnite in sheaves of crystals, with a white oxide efflorescence on it.

There are also examples of Homöopathische Reise-apotheken which are small travelling dispensaries containing amongst other medicaments antimony preparations (antim. crud.). There was also a 19th century drug jar labelled stib. pur.

Other items include an engraving of a wolf with the alchemical symbol for antimony in its mouth (antimony is sometimes depicted as a grey wolf), with the inscription: Antimon. Stibium. Spies-Glass; and there are plates of Basil Valentine and Paracelsus.

An antimony cup is in the pharmacy of Alexander VII (Fabio Chigi, 1599-1667), the 236th Pope, in his Palace at Ariccia (28) some miles south of Rome on the Appian Way. The palace was renovated for him by Bernini who built the church and two fountains opposite it on the other side of a square.

The pharmacy is in a well preserved room and is in fact a magnificently ornate large cupboard in walnut set into a wall, with the Chigi star and coat of arms at the top. The upper part of the front pulls down and slides into the cabinet to make a work surface. It contains a number of labelled ceramic jars, some metal drug containers and the antimony cup.

The cup (Fig. 5) is in good condition in spite of a large piece of the rim being missing, and there is a small loose fragment of this about 1cm in diameter. The cup itself is about 7.5 cm in diameter and about 3.75 cm deep. It is a larger version of the Basel cup, being also bowl-shaped and shallow. There is also a sheet of printed instructions but there is no evidence that the cup has been used. A letter written in 1941 from a sick man asks if he could use the cup for the treatment of his illness; this request was not granted.

Modern Therapeutic Use of Antimony

Antimony compounds were widely used in the 18th and early 19th centuries in the treatment of fevers, and then their use gradually declined. They are still used therapeutically, but now in rather different forms to those of the 16th to 19th centuries. Tartar emetic has been for a long time used in tropical diseases but the margin between the therapeutic and the toxic dose is narrow; symptoms in order of frequency are cough, nausea, dizziness, weakness and vomiting. Sodium antimony tartrate is less toxic than the potassium compound.

In 1907 (29) antimony was tried in the treatment of trypanosomiasis alternately with arsenic, and it has also been given hypodermically for syphilis and intravenously for yaws. Antimonial compounds were used for the first time in the treatment of bilharzia in Khartoum in 1920.

Currently cutaneous and visceral leishmaniasis are treated with sodium stibogluconate (Pentostam) intravenously or intramuscularly in daily doses of 20 mg antimony/Kg for 3-4 weeks. The efficacy and toxicity (T wave changes in the electrocardiogram, and muscular aches) depend entirely on the antimony content. Pentavalent antimony compounds are still very effective in all forms of leishmaniasis (30). Malaise, anorexia, myalgia and arthralgia may occur during treatment, as do elevated serum transaminase, mild leucopenia and a flattened T-wave, all of which return to normal on cessation of treatment.

The increasing prevalence of schistosomiasis, which in tropical Africa is related to new irrigation systems, has been met with treatment by the antimonial preparations niridazole (Ambilhar) and hycanthone (Etrenol), but while they are effective they are toxic so that new less toxic drugs are being sought (31).

Press reports in 1985 (32) described the experimental use in patients with AIDS of a drug called HPA-23. This had been developed in Paris and used unsuccessfully for virus disease of the nervous system ten years previously in the Pasteur Institute. The drug was stated to contain antimony, tungsten and sodium; it was given intravenously and had side effects of severe headaches and intolerance of light.

Antimony in very small doses is used by homeopaths and anthroposophists (disciples of Rudolf Steiner).

Pharmacological Effects of Antimony

Much more is known now about the way in which antimony compounds affect the human body. Antimony behaves to some extent like arsenic although it is less toxic. Antimony compounds are only slowly absorbed from the gut and are irritant. The trivalent compounds bind to red cells and are excreted more slowly than pentavalent compounds which do not, and are more highly concentrated in plasma and more rapidly excreted by the kidneys. Thus the pentavalent compounds are less toxic than the trivalent. Antimony compounds have a cumulative toxic effect on the heart with bradycardia and reversible electrocardiographic changes (33).

Modern pharmacological research has established that organic trivalent antimonials selectively inhibit the phosphorylation of fructose-6 phosphate by adenosine triphosphate, which is catalysed by the enzyme phosphofructokinase. This is possibly the effect in schistosomes. They also bind sulphhydrile in the serum and interfere with protein and carbohydrate metabolism and the production of glycogen by the liver.

Intravenous injection of antimony isotopes Sb^{124} and Sb^{122} in tartar emetic to human volunteers (34) in doses varying from 0.253 to 1.6 mg/Sb per kilo body weight, showed a very rapid fall in blood antimony levels due to elimination in the urine (80%) and faeces (20%). The compound antimony-a, a'-dimercapto-potassium succinate (antimony tartrate in which the oxygen atoms of the hydroxyl group are replaced by sulphur) is one fiftieth as toxic as tartar emetic itself.

Antimony in Scotland

The best known early alchemist from Scotland is Michael Scott (c1200-1292), mathematician and reputed magician (35), but it was under James the IVth (1473-1513) that alchemy flourished. His chief associate in alchemical studies was John Damian who came from Italy or France, and was physician to the royal household in 1501-2 and Abbot of Tungland in Galloway in 1504. Damian helped James to establish laboratory furnaces in Edinburgh and in Stirling Castle (36).

Damian's work on the quintessence involved large amounts of whisky as well as gold and silver. Bishop John Leslie (1527-1596) remarked: "Maister John causet the King believe that he be multiplyinge, and utheris his inventions, wold make fine gold of other metal, quhilk sience be callit the Quintessence; whereupon the king made great cost, but all in vain". Damian attempted to fly from Stirling Castle to France with the aid of artificial wings but fell and broke a thigh bone.

Antimony compounds were likely to be used medicinally in Scotland at least from the time of Paracelsus because of the direct links with continental Europe and the education of many Scottish doctors at universities in France, the Netherlands and Italy. Primrose (26), a Scot, was a Montpellier graduate who prescribed antimony.

The Pharmacopoeia Collegii Regii Medicorum Edinburg (37) published in 1699 contained five antimony preparations (crocus metallorum, antimonium diaphoreticum, butyrum antimonii, cinnabaris antimonii and vinum emeticum). Further editions were published in 1732 and 1735 by which time there were 14 preparations; however, the English edition of 1841 contained only five. The Pharmacopoeia Edinburghensis or the Dispensatory of the Royal College of Physicians in Edinburgh contained antimonials (38) such as crocus metallorum, and listed 12 preparations altogether, derived from Wilson (39).

Andrew Plummer (1698-1756) who gave his name to a powder and pill containing antimony and mercury (Table 1), studied at Edinburgh University, and at Leyden under Boerhaave, becoming MD in 1722. He was interested in chemistry and pharmacy and was professor of chemistry and medicine in Edinburgh from 1726 to 1740. He grew medicinal plants in the garden of the College of Physicians but latterly devoted himself entirely to chemistry (40).

William Cullen (1710-1790) a highly esteemed physician in his day, founder of the Glasgow medical school where he was professor of medicine, and later professor of chemistry in Edinburgh, was "an enthusiastic chemist" (40). In his account book kept when he was at Hamilton between 1737 and 1741, he records drugs obtained from the Chymicall Laboratory at Edinburgh which included tinctura antimonalis.

Cullen (41) gives much space to this "celebrated medicine", especially as an emetic and diaphoretic. He refers to butter of antimony as one of the strongest caustics known so that it was rarely employed because it tended to spread beyond the area intended for it. Antimony is the metallic emetic "now most commonly employed" and is one of the safest and most manageable. He is dubious about the use of crude antimony (sulphide). He refers to the calcination of crude antimony and other methods to make it milder, and mentions kermes mineral, crocus metallorum and other preparations such as antimonium diaphoreticum. The emetic tartar is safe and effectual.

In the Second Earl of Hopetoun's medicine list for February and March 1751, which can be seen at Hopetoun House near Edinburgh (fig. 6), there are entries of purchases of diaphoretic antimony 1 oz. 6d; antimoniated nitre 1 oz. 1/- and nitriated diaphoretic antimony 1 oz. 5d, showing that at least in aristocratic households antimony was in regular use at that time.

James Gregory (1753-1821) the son of the Professor of Practice of Medicine John Gregory (1724-1773) is well known for his mixture containing magnesia, rhubarb and ginger. He became Professor of Institutes of Medicine at Edinburgh in 1776, and succeeded Cullen in the chair of the Practice of Medicine in 1790. Gregory believed in attacking disease by free blood letting, the cold effusion, brisk purging, frequent blisters, and vomits of tartar emetic (40).

Dr. Andrew Duncan senior used antimony compounds in his teaching ward in the Royal Infirmary in 1795 (42), as an emetic, diaphoretic, and as a circulatory stimulant. Antimonium crudum (sulphide) was used in a quarter of all treatments, and tartar emetic in quartan fever. However the use of mercury pills and bleeding was much greater.

Andrew Duncan Junior incorporated material from the London Pharmacopoeia of 1791 and that of Dublin of 1794 in the 1803 edition of The Edinburgh New Dispensatory (1753) in which he gives Dr. Black's Table of the Preparations of Antimony from crude antimony and the regulus. Joseph Black (1728-1799) in his Lectures in Chemistry in 1787 included antimony (43).

In The Edinburgh Medical and Physical Dictionary published in 1807 (44) for which "The great luminaries of the Edinburgh School . . . have been . . consulted", there are seven pages on antimony preparations.

Scotland participated too in the Victorian vogue for deliberate poisoning with antimony. In 1865 Dr. Pritchard, an Englishman who had practised medicine in Glasgow since 1860, was convicted of killing his mother in law and his wife with antimony, in addition to opium and aconite in the case of the former. The manager of the Glasgow Apothecaries Company said that Pritchard bought more antimony tartrate from him over two or three months than all the rest of the doctors in Glasgow (45). Pritchard's wife had an estimated 10 grains of antimony in her body after death (46).

Antimony Mining in Scotland

Antimony sulphide ore was discovered in Eskdale, Dumfriesshire in 1788 (47) or perhaps earlier in 1760 (48).

From 1790 to 1798 the Louisa Mine, about a mile up the Glenshanna Burn, reached from Glendinning Farm, about 12 miles northwest of Langholm, Dumfriesshire was an important source of antimony. It employed 40 miners (49) and each was given grazing for a cow and hay in winter.

Sir James Johnstone had been looking for lead in the grounds of Glendinning in Dumfriesshire for 30 years and found antimony, but it was not regularly worked until 1793. The mine was run by the Westerall Mining Company which was owned by Sir James.

According to the Rev James Green (48), the antimony ore was in pockets in greywacke but the vein seldom exceeded 20 inches in thickness, and contained blende, calcareous spar and quartz. In addition to stibnite, galena, jamesonite, zinc blende and a little copper pyrites, there is some kermesite, valentinite and cervantite. Between 1793 and 1798 the output was 100 tons, and between 1888 and 1891 it was 88½ tons. The ore yielded 50% antimony.

At least three levels were driven in the mine connected by shafts and winzes. A smelter was built to produce the sulphide of antimony and regulus. The ore was crushed and washed and put into a perforated earthen pot which was placed in another pot as a receiver. Several sets of these were put into a furnace, in which the sulphide passed through to the lower pot. This material in turn could be crushed, washed and put in a crucible with iron and an alkaline flux and then fired, during which the iron sulphide separated and rose to the top of the metal.

This was all poured into a cast iron cone in which the metal was parted from the iron sulphide. The metal was crushed again and refurnaced with alkaline and then poured into a conical vessel to give regulus with a starry surface and "little shining veins, or threads like needles, and is brittle as glass." The mine was reopened in 1888 and worked until 1891.

In spite of difficulties in transporting materials and an ore of low purity, mining and smelting continued sporadically until the early 1920s, and there are still people who remember it.

Jamestown, including a school, was built for the miners below the farm in 1792. A library was provided in 1795, to which Thomas Telford gifted books and an endowment of £3000. The library (now Westerkirk Parish Library) containing 15000 volumes was transferred to a building beside the school when the mine closed and is now in a former school at Bentpath, Dumfriesshire.

Other deposits of antimony ore have been found at Knipes, three miles SSE of New Cumnock, and at Harehill; it is also present in the Strontian area. Antimony for medicinal use is more likely to have come from the continent, for example Hungary, than from local sources.

There was also interest in the chemistry of antimony. Jamesonite ($Pb_2.Sb_2.S_5$), mined in Cornwall, is named after the geologist Robert Jameson (1772-1854) who was born in Leith and studied at Edinburgh and Freiburg. He was professor of Natural History at Edinburgh from 1804.

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FIGURES (see centre pages)

1. Stibnite (antimony sulphide) specimen showing crystalline formation.

2. Annibel Barlet 1657 (18). The effects of antimony. Barlet describes antimony as a remedy rarely required, with variable effects in the body, and to be used with prudence. By permission of the Wellcome Institute Library, London.

3. The Triumphal Chariot of Antimony. Basil Valentine. Title page of English edition 1678. Courtesy of Royal College of Physicians of London.

4. Antimony Cup, Basel. Courtesy of Schweizerisches Pharmacie-historisches Museum (Apothekenmuseum).

5. Antimony cup and instructions for use, in Pope Alexander Chigi's Pharmacy, Ariccia. Courtesy, Municipality of Ariccia.

6. The Second Earl of Hopetoun's medicine list, 1751. Courtesy of Trustees, Hopetoun House.

Professor McCallum's paper was followed by one from Dr. A. R. Butler who talked on Traditional Chinese Herbal Medicine.

TRADITIONAL CHINESE HERBAL MEDICINE

There is much current interest in alternative or complementary medicine; one of the most captivating alternatives is traditional Chinese medicine, now respectable enough to be known by its initials (TCM). The theoretical basis of TCM is derived largely from Daoist (or Taoist) thought but some elements of TCM existed before the emergence of Daoism and so the link is not absolute. The term *dao* means simply 'the Way' and the aim of a Daoist was, and still is, to live in complete harmony with the natural order. The term harmony is crucial to an understanding of the Daoist's view of the world and probably arose as a reaction to the continual tumult and conflict which has characterised Chinese society for thousands of years. Within the most refined forms of Daoism harmony with the natural order was achieved by study, meditation, and various breathing exercises akin to yoga.

For Daoists illness and disease were thought to be caused by disharmony within the body. A cure was effected when harmony was restored. The efforts of a physician practising TCM are directed towards that end. However, the physician describes the diseased or disharmonious condition in ways which are alien to Western thought. The body contains *yin* and *yang* (complementary properties such as dark/light or female/male) and an imbalance between *yin* and *yang* results in sickness. For example, insomnia would be described as *yang* (the male, active principle) being unable to enter *yin* (the female, quiescent principle). A cure is brought about when the *yin/yang* balance is restored. Also the human body is thought to contain a non-material fluid *qi* which, in health, flows harmoniously around the body to accompany all movement, be it walking or rejoicing. If *qi* is lost or is deficient in an organ, ill health quickly follows. Also, it is thought that the body contains organs for which there is no material evidence. The best known is the 'triple burner' but possibly more important are the 'meridians' or channels criss-crossing the body into which acupuncture needles are inserted.

The diagnostic techniques of TCM are, of course, low tech. Taking the pulse is treated far more seriously than in Western medicine and a Chinese physician may recognise up to 18 different forms of pulse. Once the cause of the sickness has been ascertained ('e.g. the liver is deficient in *yang*') a therapy is prescribed.

Acupuncture is by the far the best known of Chinese therapies and it has been practised in China for hundreds of years. The Chinese term for an acupuncture needle is 'a celestial lancet' and the name suggests an almost mystical quality. Anaesthesia by acupuncture is a fairly recent innovation and not used all that extensively.

A less well known therapy of TCM is herbal medicine, older and much more widely used than acupuncture. In its use of herbal remedies, of course, TCM is no different from primitive forms of medicine throughout the world and Western medicine until fairly recently. Even as sophisticated a cure as the penicillins is still, in essence, a herbal remedy. The distinguishing feature of herbalism within TCM is that the cures have been documented and published many

times throughout Chinese history in books known as *bencao*. The scientific sophistication of Chinese society, the early invention of printing in China (around 800 AD) and the unique flora of China makes the *bencao* profitable reading in the search for medical cures. This is powerfully exemplified in the appearance of a new drug for the treatment of malaria.

The resurgence of malaria is a matter of grave concern to medical authorities throughout tropical parts of the world. Over a million children a year in Africa alone now die of malaria and the malarial parasite in many localities has become resistant to chloroquinine. The attempt to eradicate malaria by killing or removing breeding habitats of the mosquito has been unsuccessful because of the dangers of using DDT and the enormous cost of draining marshes.

The classical cure for malaria in TCM is a plant called *Dichroa febrifuga (changshan* in Chinese). This was examined during World War II in an effort to find a substitute for quinine (a South American herbal remedy) when the Japanese cut off supplies from Java. Although effective, the herb is also a powerful emetic and its clinical use was thought impossible. Another cure for fevers described many times in *bencao* is the plant *Artemisia annua.* The Chinese name for the plant is *qinghao.* In the early 1970s a group of Chinese scientists (during the Cultural Revolution Chinese scientific publications rarely carried the names of individuals) extracted the active principle from *qinghao,* purified it, and determined its chemical structure. It is a tricyclic sesquiterpene with an unusual feature: a transannular peroxide bridge. This appears to be unprecedented for a substance of plant origin. The systematic name for the compound is 3,6,9-trimethyl-9,10b-epidioxyperhydropyrano[4.3.2-*jk*]benzoxepin-2-one, inconveniently complex for general use and it is generally known by its Chinese name of *qinghaosu,* or extract of *qinghao. Qinghaosu* is highly effective against the malarial parasite, particularly *Plasmodium falciparum* which causes the most serious form of malaria. *Plasmodium* resistant to chloroquinine is quickly killed by *qinghaosu* and there is great hope that the resurgence of malaria can be contained. *Qinghaosu* should be generally available by 1995 and chemical modification of *qinghaosu* will probably produce an even more effective antimalarial drug.

Can we hope that further study of the *bencao* will yield more valuable lead compounds of plant origin? One of the problems with herbal medicine in general, and even the *bencao,* is that a herb is often credited with curing a whole range of disease conditions, a situation which cannot possibly be correct. *Qinghao,* it is claimed in some editions of the *bencao,* cures contagion of the blood, women's diseases and dysentery, as well as fevers associated with malaria. There is no evidence that any of these, apart from the last, are correct claims. So there was, possibly, an element of luck in testing *qinghaosu* against the malarial parasite. Curiously the first mention of the medical properties of *qinghao* occurs in a very old Chinese medical manual *(zhouhou beigi fang* or *Handbook of Prescriptions for Emergency Treatment* of 340 AD) where it is quoted as a cure for haemorrhoids. Recent work has shown that this is, in fact, correct. The cure of haemorrhoids and malaria makes a perhaps unexpected combination for a single drug. Clearly the *bencao* must be approached with some caution but the *qinghaosu* story indicates that it contains valuable and unexpected observations.

A number of useful lead compounds, now regularly used in clinical practice, have come from Western herbal medicine and it is not surprising that the same is true for Chinese herbal medicine. But what we are now doing with Chinese herbal medicine seems remote from the Daoist notion of restoring bodily harmony. A Chinese physician would rarely prescribe a single herb as a cure; it is much more likely to be a combination of herbs. In the 'Barefoot Doctors' Manual', a book which did much to improve basic health care in China, the treatment for malaria is a combination of *dihuang, maidong,* forsythia, *huanglian,* and *bayou san* with *qinghao.* The additional herbs are chosen according to certain principles and it seems reasonable to assume that their value is some form of synergism which enhances the therapeutic action of *qinghaosu.* The idea of synergism has been little explored by Western pharmacology but it, rather than the unique flora of China, may be responsible for the success

of Chinese herbal remedies. The Chinese claim that their approach to health is more holistic than Western medicine's, and the synergism mentioned above may appear only when administered to whole animals. This makes its study a matter of great difficulty. Thus, there may remain at the heart of Chinese herbal medicine a mystery not really susceptible to examination by experimentation.

THE ONE HUNDRED AND THIRTY EIGHTH ORDINARY MEETING

This meeting took place in the King Khalid Symposium Hall of the Royal College of Surgeons of Edinburgh on 13 March 1993. The President, Mr J. S. G. Blair, was in the chair and there were 77 members or guests present. The first paper, on Dr. Johnson and Medicine, was given by Dr. Brian Ashworth. This paper was subsequently published and is now printed by kind permission of the Editor of The Proceedings of the Royal College of Physicians of Edinburgh. It appeared in 1993 in Volume 23, pages 668-671.

SAMUEL JOHNSON, HIS HEALTH AND THE DOCTORS

Samuel Johnson is the best documented figure in English Literature not only from his own writings and those of Boswell, (1) who created a new form of biography, but by contemporaries such as Mrs Thrale and Fanny Burney. New biographies have continued to appear, notably in recent years those of Jackson Bate (2) with an emphasis on motivation and psychology and of John Wain (3) who came from a similar cultural background to that of Johnson. The medical aspects have been discussed recently by Wiltshire. (4)

Johnson was sympathetic towards doctors and said that they 'did more good to mankind without a prospect of reward than any other profession of men whatever'. He also observed that 'health is the basis of all happiness this world gives'. He is of interest as a friend of doctors and he came to know a surprisingly large number, by reason of his own illnesses, because of his knowledge of medicine, science and psychology, as a 'dabbler in physic' and as a moralist with trenchant views based on a strong Christian religious faith. As a Stoic, life for him consisted of minimising pain rather than the pursuit of pleasure.

Johnson lived through most of the eighteenth century. He was born in Lichfield in 1709 where his father was a bookseller and he attended the school there. His general practitioner, Dr. Samuel Swinfen, was also his godfather and a graduate of Pembroke College, Oxford. This was probably the reason for Johnson's sojourn at the same College from 1728. He was poor, unhappy and left without a degree. In 1735 he married, his wife was 20 years older and she died in 1752. Shortly after the marriage he started a school at Edial near Lichfield but this failed and he found his way to London. As a freelance journalist he contributed regular articles to the Adventurer, Idler, and Rambler and some medical biographies; notably one of Boerhaave. (5) In 1755 his Dictionary was published in two volumes and in the same year he was granted an MA at Oxford. In 1762 he was awarded a state pension of £300/year. In due course honorary doctorates came from Dublin (LLD 1765) and Oxford (DCL 1775). His other books included the *Journey to the Western Isles* (1775) based on a hundred days in Scotland with Boswell, and *Lives of the Poets* which is perhaps his best work. He died in London at the age of 75.

Mark Akenside (1721-70) was included in the *Lives of the Poets.* He had studied medicine in Edinburgh and Leiden and his thesis 'on the origin and growth of the human foetus' was dedicated to Richard Mead. Akenside became a physician to Queen Charlotte in 1761. He was not Johnson's personal physician but was known to him. Johnson tried treatment with ipecacuanha which Akenside had advised for asthma but did not obtain relief. (6) The essay in the *Lives of the Poets* included a comment which was quoted by Osler in his book

Aequanimitas; 'A physician in a great city seems to be the mere plaything of fortune; his degree of reputation is for the most part totally casual; they that employ him know not his excellence; they that reject him know not his deficience'. (7)

The eighteenth century was a period of medical enlightenment. Major hospitals were built in the cities including some with special purposes such as Queen Charlotte's Hospital for Women. It was a time of outstanding clinical teachers. Inoculation against smallpox was introduced. The man-midwife appeared amidst controversy, the Barbers and the Surgeons separated but Apothecaries and also quacks remained. William Hunter had set up the Windmill School in London where dissection of corpses was practiced and organised professional training began.

Johnson was a man of penetrating intellect and wit, a patriot, a citizen who took responsibilities seriously, a good conversationalist who tended to dominate and 'talk to win', an eccentric, and also a man of compassion. Lord David Cecil remarked that he showed the unusual feature of being both sensible and odd. (8) He also had a sense of humour.

DOCTOR FRIENDS

Among his school friends was Edmund Hector who became a surgeon in Birmingham and they maintained contact throughout his life. Dr. Thomas Lawrence (1711-83), President of the Royal College of Physicians of London from 1769-76, was his physician for some years and Johnson said that he was one of the best men that he had known. Lawrence was not a fashionable physician and later in life drifted into obscurity. He was a man of strict piety and profound learning, well versed in the classics, and also a cellist. He was followed by Dr. Richard Brocklesby, an Edinburgh graduate and an MD of Leiden, who was a successful practitioner and offered Johnson both an apartment in his own house and an annuity to winter abroad. Dr. William Heberden was a contemporary and known physician, also a Fellow of the Royal Society who first described angina pectoris. Dr. William Cullen (1710-90) in Edinburgh was an almost exact contemporary and they met when Johnson came to the city. Cullen dined with Boswell and Johnson and discussed the problems of sleep and sleepwalking. (1)

Another friend was Dr. John Arbuthnot, an Aberdeen graduate who was the first to obtain the St Andrews MD degree by thesis. He was a physician to Queen Anne. Johnson spoke of him as 'the most universal genius, being an excellent physician, a man of deep learning, and a man of much humour'. (1)

Robert Levet, an unqualified practitioner who lived in Johnson's house for 20 years was respected by him but was not held in high esteem by others. He had started work as a waiter in Paris and made contact with some surgeons by showing an interest in their conversation. They helped him to obtain some medical experience and subsequently in London he attended lectures at the Windmill School.

William Hunter (1718-1783) who had established the school of anatomy in Great Windmill Street (1768) was a graduate of Glasgow University. He had served an apprenticeship with William Cullen in his practice at Hamilton. Later he moved to London and became a physician to Queen Charlotte's Hospital for Women. In 1768 Hunter became professor of anatomy at the Royal Academy. Johnson had known him and he acted as intermediary by presenting a copy of *The Journey to the Western Isles* to King George III. (9)

JOHNSON'S ILLNESS

His birth was said to be complicated. At the age of two he developed scrofula (a form of lymphoid tuberculosis) and this was associated with inflammation of the eye which recurred. He was taken to receive the Royal Touch from Queen Anne. This ceremony had been started by Edward the Confessor and had been held in 1667 in Lichfield. Although revived by Queen Anne, it lapsed after her death.

Johnson had a melancholy disposition, was introspective and prone to depression with severe episodes at the ages of 20, 55, and 57. He remarked that it should be diverted by every means except drinking. He had a voracious appetite and gained weight in later life which it has been suggested was an expression of bulimia. (10) He was prone to bronchitis and asthma and had occasional attacks of gout. When late in life he developed a mild stroke which affected his speech and caused facial weakness, he realised what had happened and became very anxious that his understanding should be spared. In a letter to Mrs Thrale two days after the stroke he states that he composed a prayer in Latin verse which reassured him that his faculties were unaffected. (11) He went on to recover in the course of a few weeks but had some difficulty in writing. He underwent blood-letting and made use of mercury and opium in modest dosage. He developed cardiac failure but was apparently not given digitalis although it was in use.

Johnson was a large man and well proportioned, but was clumsy and awkward with jerking movements of his limbs. He made curious noises, talked to himself, dressed in a slovenly fashion and was not regarded as socially acceptable. In Edinburgh Boswell was accused of walking with a bear. Other features included facial grimacing, mouth opening, eye blinking, lip twitching, and ritual walking with counting of the steps. He was never known to swear. He clearly showed obsessive-compulsive traits and it has been claimed that he suffered from the syndrome of Gilles de la Tourette. This rare syndrome which always presents in childhood is characterised by bizzare involuntary movements later combined with the voicing of obscenities. Johnson himself said that his odd movements were just a bad habit. Sir Joshua Reynolds who painted no less than eight portraits of Johnson commented that he was able to sit still when asked to do so. Whether he was affected with this syndrome really hinges on what is accepted as the criteria for the diagnosis and the requirement for making it. There has been dispute; Russell Brain (12) favoured a psychological explanation for Johnson's peculiarities but the more recent writings of Murray, (13) Lees (14) and Sacks (15) support the diagnosis of Tourette syndrome. The portraits of Johnson show a persisting head tilt to the right. It has been suggested that this was a compensatory posture because of a palsy of the superior oblique muscle. (16) Johnson had poor vision in one eye but there is no record of double vision which could have been a factor leading to this posture.

Johnson was well informed about medicine. He appreciated the difference between haemoptysis and haematemesis, pointing out the frothiness of blood coming from the lung. He also distinguished bronchial asthma from cardiac asthma, and had probably suffered from both conditions. He was ready to dispute with doctors about the diagnosis or treatment of his own or other peoples illness and state his views on effective therapy. He found that he could not control his intake of alcohol and in later life he abandoned it. Tea drinking was defended and he consumed large quantities. He criticised severely vivisection which, in his time, was a barbaric procedure carried out without the use of anaesthetic and often not well planned or conclusive.

MORALITY, PSYCHIATRY AND RELIGION

Themes of physical and psychological suffering and its alleviation pervade his writings. He felt strongly that the patient should be told what was wrong but was not entirely consistent in this attitude. He was considerably upset when, at his own request, Mrs Thrale spelt out to him the prognosis following an illness. But he said 'I deny the lawfulness of telling a lie to a sick man for fear of alarming him' and clearly favoured autonomy over paternalism. However, few can match his courage. When confronted with his terminal illness he said 'I will be conquered, I will not capitulate'. He regarded courage as the first of the virtues on which all the others depended. His death was from cardiac and renal failure; the autopsy also demonstrated marked pulmonary emphysema. The brain was not examined.

Johnson thought much about psychological problems and such concepts as repression, which had been mentioned in 1621 by Burton in his *Anatomy of Melancholy.* He spoke also of a sense

of inner resistance and said that 'no man was ever wicked without secret discontent'. He was a man of strong compassion as is illustrated by his household which included Robert Levet, Mrs Desmoulins the daughter of Dr. Swinfen, the blind Anna Williams whose father was a medical practitioner in Wales, and his black servant Francis Barber.

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Dr. Ashworth's papers was followed by one from Dr. David Heppell on the Anatomy of the Mermaid.

THE ANATOMY OF THE MERMAID

INTRODUCTION

The mermaid is a creature familiar to most of the maritime cultures of the world. The name 'mermaid' has, however, been applied to a variety of different entities, ranging from Asian fishtailed gods and the seductresses of classical mythology to marine mammals, malformed human foetuses and man-made composites brought to Europe as exotic curios. This contribution is an attempt to unravel some of the many strands which make up the mermaid's anatomy, with a brief look at some other aspects of medical interest, including psychology, folk medicine and respiratory physiology.

EXTERNAL MORPHOLOGY OF THE MERMAID

Our traditional image of the mermaid is well known, and no one would mistake one wherever she might appear. Conventionally she is depicted as a beautiful woman above the waist and a fish below. The males (mermen) are either less common or, more likely, have provided less inspiration to the artist. Until such time as we have access to living specimens in an aquarium, our study of the mermaid's anatomy must remain incomplete, and we shall have to content ourselves with dissecting the mermaid of our imagination, and teasing out the strands that collectively make up this enduring image. We can, however, examine what evidence there is, accumulated from sightings and strandings, and specimens preserved in museums.

In northern Europe the mermaid can trace her pedigree from various freshwater spirits, nixes and Rhine maidens, while further south her ancestors were the classical Sirens that distracted seafarers by their sweet singing – beings that were originally more bird than fish. In medieval times the mermaid often retained her wings even after she had gained her fishy tail. Despite a considerable variation in her structural details, she became a significant cultural stereotype.

The mermaid with a comb and a glass in her hand appears to be a very ancient iconographic convention, as she appears thus on a sixth-century Pictish stone at Meigle, in Perthshire, and the comb and glass motif is known from several other such stones. This image is not uncommon in church, where it probably symbolizes both the vanity of women and the weakmindedness of men. The mermaid was also a symbol of lust and wantonness, which perhaps explains her great popularity as an inn sign in England. That symbolism was certainly not lost on Mary Queen of Scots in 1567, when handbills posted up in Edinburgh, implicating her and the Earl of Bothwell in the murder of Lord Darnley, portrayed her as a mermaid, crowned and naked to the waist.

MARITAL STRESS SYNDROME

Since childhood we are aware that there are mighty few tales of mermaids, or of mermen, that have a happy ending. The unnatural love of a human for a mermaid, or of a mermaid or merman for a human, is foredoomed, as in Hans Andersen's classic story of 'The Little Mermaid' who, having fallen in love with a prince she once saved from drowning, is granted mortal form at the price of having her tongue cut out and her beautiful voice silenced for ever. When the prince eventually marries another her body returns to the sea and dissolves into foam.

This theme, of romance and even marriage between mortals and merfolk, is a recurring one, particularly in the folklore of Ireland and the west of Scotland. It often has the loss of a magic cap or other garment, without which the mermaid cannot return to the sea, as a key element of the story. The couple usually live happily together with their children for a long time until the magic cap is eventually discovered, whereupon the mermaid returns to the sea, leaving the husband and children to mourn her sudden departure. Almost identical tales are also known from Japan.

Some folklorists have subjected these tales to the methods of psychoanalysis and milked them for every drop of symbolic interpretation: the loss of the magic cap forcing the mermaid unwillingly into an unsuitable marriage reflecting the foredoomed shotgun weddings of Irish or Scottish rural society. That the male and female protagonists in the folk legend are totally and utterly incompatible is emphasized by the dramatic contrasts: he is human, she a supernatural being; he is domesticated, she is wild; he belongs to the land, she to the sea, and so on. Usually, but not always, the human is the male.

ALTERNATIVE MEDICINE

Scottish folklore mentions two mermaids who specialized in a cure for tuberculosis which they disclosed for the benefit of sufferers in their neighbourhood. One, living on the Galloway coast, heard a youth lamenting his sweetheart's approaching end, and sang to him:

'Wad ye let the bonnie May die i' yere hand,
An' the mugwort flowering i' the land?'

The lad took the hint, made an infusion of mugwort for the invalid, and the lass promptly recovered. The other mermaid who believed in the curative powers of mugwort (or 'muggons') had her home in the Firth of Clyde, above Port Glasgow. As the funeral cortège of a girl who had died of tuberculosis passed by, the mermaid lifted her head above the water and cried:

'If they would drink nettles in March
And eat muggons in May
Sae mony braw maidens
Wadna gang to the clay'.

After these incidents, mugwort became a favourite prescription for tuberculosis in herbal medicine. It is interesting that mugwort, recommended as a remedy by the mermaids, is known to botanists as *Artemisia vulgaris,* and therefore has an association with Artemis, a goddess sometimes depicted with a fish-tail.

SIGHTINGS AND STRANDINGS

Mermaids occur in the mythology of almost all maritime countries around the world, from China and Japan to Indonesia, the Indian Ocean, West Africa and North and South America. Accordingly, we would expect the mermaid tradition to go a long way back in time and to be reinforced over the centuries by chance encounters with unfamiliar marine creatures for which the mermaid is the closest stereotype. It has often been suggested that the most likely candidates for such confusion are the several warm Atlantic species of manatee and the Indo-Pacific dugong. These marine mammals are the sea-cows which comprise the order Sirenia, named from their supposed identity with the mythological sirens, and have occasionally been exhibited as mermaids even in recent times.

One of the best-known and much copied illustrations of a mermaid, said to have been drawn from life, was that published in 1717 in a book on the fishes and crustaceans of the Moluccas. The animal, nearly five feet (150cm) long with the proportions of an eel, had been caught five years earlier on the island of Buru. It was kept alive in a tank of water for four days, during which time it uttered occasional cries like those of a mouse, but would not eat the fish or shellfish it was offered. After its death, a few faeces similar to those of a cat were found in its tank. If this illustration was merely based on a captured dugong, it is difficult to explain the passable figure of a dugong which appears elsewhere in the same work. Other eighteenth-century illustrations of dugongs and manatees depicted perfectly recognisable likenesses of these animals and in some cases were scientifically more accurate than many which followed. In the early nineteenth century, Georges Cuvier, a celebrated French anatomist, believed they had breasts on the front of their chests, and often posed with the upper part of their body out of the water. Such was Cuvier's authority that this became the standard way of depicting these creatures, and only in recent years has it become accepted that there is no basis in zoology for these assertions. The mammae are axillary not pectoral, and Cuvier must have been influenced by his desire to explain away mermaids as inaccurate observations of manatees and dugongs. In fact, the similarity is not at all close.

Another defect of the manatee/dugong theory of mermaids is the number of sightings in northern waters, where those animals are supposed not to occur. The sea-cows are, in fact, not

totally absent, from European seas. A manatee was washed up dead at Newhaven in the autumn of 1785, from the liver of which a considerable quantity of oil was obtained, and there were other strandings in the eighteenth century at Dieppe and in Holland. Between 1797 and 1811 at least three mermaids were sighted off the Scottish coast, and Scottish folklore is richer than that of any other country in stories of mermaids. The giant Steller's sea-cow did live in Arctic waters, but is supposed to have been extinct since 1768, although there have been occasional reports – the most recent by Russian fishermen in 1977 – which may indicate that one or two small populations survived. In Steller's sea-cow the tail was fluked, as in the dugong and unlike in the manatees.

Possibly the most interesting account of the possible capture of a northern seacow is that reported by six fishermen from the Shetland island of Yell, in 1823. They described an animal which was about three feet (90cm) long, with the upper part of the body resembling a woman with protuberant mammae, small arms, and distinct, not webbed, fingers. The face was monkey-like, but with a mouth and lips like those of a human. A short but distinct neck, separated the head from the shoulders. On the top of the head, a few stiff, long bristles extending down to the shoulders could be raised or lowered like a crest. The lower part of the body was like a fish, with smooth, grey skin without scales or hair, and a fluked tail like that of a dog-fish.

This detailed description, which was subsequently sworn on affidavit, has been dismissed by some as a collective hallucination, but this seems to me unlikely as the men had the animal within their boat for about three hours before they released it because its cries were so piteous, and in the belief that it was unlucky to capture a mermaid. The Wernerian Natural History Society of Edinburgh offered a sizeable reward for the capture of another, but it went unclaimed. The detail of the unwebbed fingers is interesting. In the Shetlands there are families with a high incidence of syndactyly who claim descent from a mermaid married to her human captor.

A mermaid said to be about the size of a three-year-old child was seen by many islanders on the Hebridean island of Benbecula, about 1830. Children threw stones at it, but it avoided capture. Some days later, however, it was washed ashore dead. Crowds of people turned out to see it and, as the local factor was not sure whether or not mermaids have a soul, he ordered a shroud and coffin, and the creature was given a Christian burial. The grave is said to have been still marked in 1961, but I have not found any later account of it.

Some folkloric traditions derive the mermaid from ideas of enchanted humans, put under a spell for some misdeed, and in some some African and Indonesian cultures the dugong is similarly regarded as of human origin, with elaborate rituals associated with its capture, killing and eating. Some native cultures regard the dugong as half human. It is said to cry real tears which, if collected, are believed to be a very potent love charm. The taboos against women eating dugong flesh are reflected in certain folktales telling of women who have turned into dugongs after disobeying dietary taboos forbidding them to eat shark liver. In others they give birth to such hybrid entities as 'whale babies'. It is interesting to speculate on the possible origins of such beliefs and traditions. Could they have arisen from an observed increase in congenital anomalies resulting from eating food excessively rich in vitamin A?

REMARKABLE PHYSIOLOGY

Another element of the mermaid's identity may be derived from manhood initiation ceremonies, or from traditions of humans with remarkable gifts. One well-documented case is that of Nicolas, a Sicilian diver of the twelfth century whose extraordinary swimming abilities earned him the nickname of Nicolas the Fish. Many authors of the Middle Ages speak of him, though accounts vary in their details. He was said to have been able to stay under water for three quarters of an hour. Others claimed he could stay under water for a whole day without breathing. One writer claimed that Nicolas eventually acquired webbed feet and hands, and another that he grew fish scales.

Remarkable as Nicolas the Fish may have been, even stranger things have been reported. In 1932 a British official in Nigeria told about a whole village that was able to 'sleep' underwater while hiding out from the police. Then in 1934 the British anthropologist, Geoffrey Gorer, travelling in Senegal, heard that some fishermen could stay underwater indefinitely. He wrote: 'This power is confined to a few members of certain families; the greater number live near Saint Louis. I was sceptical of this claim and one of the divers appeared to demonstrate. I chose the place where he was to dive where the water was particularly limpid and asked him to stop at the bottom for twenty minutes. He stopped there for three quarters of an hour. I had him continuously in view and he had no apparatus of any kind; occasionally he would send up an air bubble to the surface. At the end of the period he came up to ask if he had stayed down long enough. To all my enquiries as to how he did it he replied that "he breathed like a fish" which didn't advance matters much. No importance is attached to this hereditary gift; it needs training to be developed. I only heard of these people by chance; for the Wolof they are completely ordinary.'

MUSEUM SPECIMENS

The pride of the Cabinet of Curiosities of the seventeenth-century Danish physician Thomas Bartholin was the hand of a merman. Another was in the collection of John Tradescant at Oxford. These were actually the preserved paddles of the Amazon dolphin, but for some reason Bartholin believed them to be from the same source as another of his 'mermaid' specimens. When he published a report on his dissection of this specimen, in his *Ungewöhnliche Anatomische Geschichte*, 1657, he confused the two together. The second specimen was actually a human foetus afflicted with sirenomelia, or 'mermaid syndrome'.

By the mid-eighteenth century various examples of such congenital deformities were being exhibited around the freak-shows of Europe, often embellished with a real fish's tail to make the resemblance to mermaids more convincing, and were objects of considerable curiosity to the paying public. They were given the name *Siren marina,* and were said to come from Brazil. Some found their way into the anatomical museums of the day. One at Leiden was seen by Linnaeus, who suspected it was a fake because its ears seemed to be too prominent for a sea-dwelling creature. Monstrous births threatened the dividing line between man and beast, as it was generally believed at that time that they were hybrid creatures resulting from intercourse with animals. Such anomalies were always given the greatest publicity, but the natural deformities were explained in terms of mythology.

Other specimens purporting to be mermen (more often than mermaids) have been made for more than three hundred years. The earliest, presumably of European or African manufacture, resemble those of the medieval carvings, and X-ray examination shows that little is natural apart from the fins. Others appeared to have been constructed by combining the rear end of a fish with the top half of a small monkey or baby ape. The most famous of these, exhibited in London in 1821, was later acquired by the showman Phineas T. Barnum and exhibited for many years at his American Museum as the 'Feejee Mermaid'. The only surviving example of this type known to me is at the Museum of Mankind, in London. Recent X-ray examination of that specimen has shown that the 'monkey' half is entirely modelled, apart from the jaw of a fish set into the head, and it is probable that, despite their monkey-like appearance, all such specimens were manufactured in the same way.

A later development, dating from about 1830-1850 was the manufacture of small mermaids displayed under glass domes. One such is in the wax museum at Brading, Isle of Wight. Apart from their vertical pose they are very similar in appearance to the so-called 'Japanese mermaid', an example of which was recently acquired by the National Museums of Scotland. X-ray examination has again shown some of the details of its structure – a fish's body mounted on a wooden core, with a modelled monkey-like thorax and head, in which fish jaws are set.

These specimens were obviously not made to conform to the European romanticized mermaid of seductive beauty, but belong rather to the world of imagined partly human creatures. It seems unlikely that they were merely made as a joke, but up till now their purpose and even their origin, for there is considerable doubt that they were made in Japan, remains unknown.

Since we acquired our specimen, I have been gathering information on other such specimens in museums and private collections for comparison, and have tracked down about two dozen specimens. They differ in size, from eight inches (20cm) to about three feet (90cm), but most are about the same size as ours (1 1/2 feet, or 45cm). Their general appearance is so similar that they must all have been made in one small area, possibly in a single village. They occur in both male and female form, each sex made consistently from a different fish. It is known that some fake mermaids were made by professional taxidermists last century, but very few seem to have survived. One merman in a private collection in the south of England is startlingly realistic, and still draws the paying crowds at the country fairs and antique shows, of Suffolk and Essex. It is quite distinct from the crude 'Japanese' type, and X-rays taken at Ipswich hospital showed it to be largely constructed from plaster. It seemed to be unique, but an old photograph sent to me from Queensland of a female mermaid in identical pose proved there had once been a pair, and indicated a probable Bristol origin in 1874.

CONCLUSION

Investigation of the anatomy of the mermaid and of mermaid lore has revealed a tangled web of stories, sightings and specimens of the most diverse nature, extending worldwide into the realms of folklore and legend, zoology and cryptozoology, anatomy, physiology, radiography and folk medicine, ethnography, social history and the history of science. The stereotype we know as the mermaid is surely a fit subject for further serious study.

THE ONE HUNDRED AND THIRTY NINTH ORDINARY MEETING

The One Hundred and Thirty Ninth Ordinary Meeting was held in Ninewells Hospital, Dundee, on May 22nd 1993. 41 members or guests attended and the President, Mr John Blair introduced Dr. D. Emslie Smith, who gave a talk illustrated by slides, on the History of Medicine represented in Heraldry.

THE HISTORY OF MEDICINE REPRESENTED IN HERALDRY

The first physician's name to come down to us is that of Imhotep, vizier to King Djoser of Lower Egypt. He was also the architect of the famous Step Pyramid at Saqquara about 2700 BC. His fame as a physician was so great that he was later deified. He appears as the dexter supporter of the Arms of the Institute of Health Service Management. (The dexter supporter is the figure, human or animal, supporting the shield on the right hand side as the shield's wearer would view it, i.e. the left hand side as someone else looks at the Arms. The equivalent on the other side is the sinister supporter.) In his left hand he languidly dangles an ankh and there are two other ankhs on the shield. They were of course ancient Egyptian symbols of life.

Some hundreds of years later in Assyria, the pomegranate was used for its medicinal properties (as an anthelminthic against tapeworms) and it is mentioned in the Egyptian "Papyrus Ebers". Pomegranates flowered and fruited in the garden of the Royal College of Physicians of London in the summer of 1990. They had been planted there because a pomegranate is an important charge on the shield on the Arms of the Royal College of Physicians of London granted in 1546 by King Henry VIII. It is uncertain why the pomegranate should appear in the College's Arms. In ancient Greece Persphone was bound to Hades because of the eating of a pomegranate. It is a significant plant in Judaism: the spit for the Paschal victim was made of pomegranate wood and pomegranate was the only fruit allowed in the Holy of Holies. In

Christian iconography it represents resurrection and immortality and so came to be the badge of the Holy Roman Emperor. Catherine of Aragon adopted it as her badge and after her marriage to Henry VIII in 1509 it entered Tudor Heraldry. Linacre, King Henry's physician, obtained a charter for the Royal College in 1518. It has recently been suggested that the pomegranate and the fleur de lys in the College's Arms are displayed together in amity as a symbol of its royal foundation.

Around 1230 BC the elaborate Jewish sanitary laws were formulated, as described in the Pentateuch. The Arms of the Royal Society of Medicine show the brazen serpent on a standard which Moses was directed to raise to cure the plague of fiery serpents, as related in the Book of Numbers.

The serene Olympian patron of medicine in ancient Greece was Phoebos Apollo, who overcame a serpent called Python at Delphi and set up his oracle there. The Arms of the Worshipful Society of Apothecaries of London, granted in 1617, show "Apollo the Inventor of Physic supplanting a Serpent". The Arms also contain the two kinds of horn with ancient mythical medicinal properties; both supporters are unicorns and the crest is a rhinoceros. These old Arms have a peer's helmet – an unusual distinction. One of Apollo's many sons was Asklepios. An ancient plaque from the Asklepieion at Epidaurus shows Asklepios with his rod and also other members of his family-his two sons Machaon and Podaleirios, and various daughters, the best known of whom are Hygeia and Panacea (all heal). In the Iliad, Homer mentions Asklepios and also Machaon and Podaleirios, as leaders of men and 30 ships from Trikka in Thessaly as well as in their capacity as doctors. Machaon healed Menelaos' arrow wound at the siege of Troy.

It is important to distinguish between the two symbols that are commonly confused – the Rod of Asklepios and the Caduceus of Hermes. Askepios' Rod (sometimes club-shaped), is typically shown as budded to denote vitality. A single harmless, healing serpent climbs up it. Interestingly, a paper in the Lancet (July 1992) from Italy reported the demonstration of epidermal growth factor in the salivary epithelium of one of the two species of the genus Elaphe which most probably played the role of sacred serpents in Southern Europe, but of course snakes are also chthonic beings kept in sacred pits and labyrinths. Hermes was a herald and his Caduceus was originally a vine branch whose tips were twisted in a loose knot. As time went on, the wings on his sandals were added and for some reason two snakes were made to entwine the herald's wand. Hermes (Mercury) was really concerned with trade, commerce and communications, but he made an entry into medicine at about the same time as alchemy; mercury (quicksilver) was an important substance for alchemists.

The Arms of the Royal College of Obstetricians and Gynaecologists show Asklepios and his rod and serpent as the sinister supporter. The complicated Arms of the Royal College of Surgeons of England show the shield supported on the right by Machaon holding the broken arrow he removed from Menelaos, while the sinister supporter is Podaleirios holding his father's rod. Asklepios' daughter Hygeia appears as the sinister supporter in the Arms of the Royal College of Physicians and Surgeons of Glasgow. As so often in Greek sculpture, she is feeding her snake from a golden cup. In the shield, the two blue quarters show her father's rod flanked on one side by a lancet (surgeons) and on the other side by the seed head of an opium poppy (physicians).

In the 5th century BC, Hippocrates, a member of an Asklepiad family, lived in Cos, and to this day there is an ancient plane tree there associated with the tree under which he is claimed to have taught. Hippocrates appears as the sinister supporter in the Arms of the Royal College of Surgeons of Edinburgh. Oddly, he wears a black bonnet. The other supporter is Asklepios crowned with the laurel of his father Apollo. The arms are rather gruesome, with a horizontal corpse on the shield which is bordered with old surgical instruments, described in the herald's blazon as "peculiar to the art". The Arms of the British Orthopaedic Association have reference

to Hippocratic methods. Hippocrates, the dexter supporter, carries a ladder from which a rung has been removed; it was used in a hippocratic method of reducing a dislocated shoulder. On the shield, an object like a table with ropes is the scamnum Hippocratis, a bench used in the reduction of fractures and dislocations until about 200 years ago. The crest is a deformed Plane tree, another allusion to Hippocrates, but taken from an early book on orthopaedic surgery by Andre (1741).

Roman medicine was dominated by Galen. Although born in Pergamon, where there is a spendid Asklepieion, he became physician to Marcus Aurelius. After him there were no great anatomists until Vesalius and no great physiologist until Harvey. He dominated medical teaching for centuries. He appears as the sinister supporter in the Arms of the Royal Pharmaceutical Society of Great Britain. The other supporter in these Arms is Avicenna (Ibn Sina), representing Arabic medicine. His "Canon" was the most famous medical text ever written. It was still required reading in the University of Vienna 500 years later. On the shield are represented an alembic (for distilling), an apothecary's scales and the aloes plant from which a purgative drug was obtained.

Galen gave his name to "galenicals", medicinal herbs or plants with medicinal properties. The Arms of the Association of Anaesthetists of Great Britain and Ireland show two galenicals. The crest is of two Mandrake plants (Mandragora): and conspicuous in the shield are two opium poppy heads. Mandragora contained a hyoscine like alkaloid which was a moderate narcotic – "nor poppy nor mandragora nor all the drowsy syrups of the world" (Othello). The flower of the opium poppy is conspicuous in the shield of the Arms of the Royal College of General Practitioners. To balance it on the other side of the shield is a blue gentian. Tincture of gentian used to be used to stimulate appetite, but the the gentian from which it was extracted was the Gentiana lutea which has a yellow flower. However, it is the business of Heralds to convey the essential properties of their symbols and the bright blue emphasises the "gentianness" of gentians in an unmistakeable manner.

Medieval medicine was dominated by the Church and by those in vows like the Knights Hospitallers. St. Luke, the beloved physician, has as his symbol an ox, as represented in the crest of the Bristol Royal Infirmary, the oldest provincial teaching hospital in England. Among the other "medical saints", two of the most popular were the twins, Saints Cosmos and Damian, who never charged a fee and were responsible for many miracles, notably the "black leg miracle", lightheartedly hailed in recent times as the first transplant surgery. They are the supporters for the shield of the Royal Society of Medicine. The crest of its Arms is three sprigs of the plant "all heal" referring to Panacea, Asklepios' daughter.

Of course, the early teaching hospitals were ecclesiastical. For example, Barts grew from St. Bartholomew the Great which was founded in 1123. Their beautiful geometrical Arms are so old that they have never been registered at the College of Heralds in London. The early university medical schools were also ecclesiastical. In Aberdeen, Bishop William Elphinstone and King James IV petitioned Pope Alexander VI for the bull to found a university. Alexander was a Borgia Pope with Borgia Arms. He granted a bull in 1494 for a university to include a "Mediciner', the first of whom, James Cummin, was appointed in 1505. This is the first recognition of medical teaching in the English-speaking world. The third Mediciner, Gilbert Skene, wrote the first medical book to be printed in Scotland; – "Ane Breve description of the Pest" (1568). There is only one copy extant. The present Arms of the University of Aberdeen contain, on the Shield, the Arms of Bishop Elphinstone in one quarter and in another a pot of lilies, symbolic of the Virgin. Elphinstone's university was first known as the "College of St. Mary of the Nativity", a title soon changed to King's College in honour of James.

Much earlier there had been a secular medical school at Salerno but in the middle ages, Padua, being Venetian, had a free thinking university and medical school. A visitor to the old buildings there (Il Bo) is almost overwhelmed by heraldry and can see the lectern from which

Galileo taught, and remember Vesalius, Fallopius and Fabricius, whose wonderful anatomy lecture theatre is still in excellent condition.

As well as the medical schools and hospitals, there were also guilds, for example the Worshipful Company of Barbers of London. The Barbers and Surgeons were originally separate, with a Company of Barbers and a Fellowship of Surgeons, but they united in 1540 as the Worshipful Company of Barbers and Surgeons, only to split again in 1745. The Barbers kept the old Arms but the Surgeons assumed new ones that were the basis of the Arms of the present Royal College. The present Arms of the Worshipful Company include elements of the Company of Barbers of the second half of the fifteenth century and the Fellowship of surgeons from the end of that century. On the two black quarters of the shield are fleams-lancets used for venesection – while on the two green and white quarters there is a crowned spatula surmounted by a rose.

In due course William Harvey went to Padua. He is the sinister supporter in the Arms of the British Medical Association. He wears a gown which may represent his Lumleian lectureship and he holds a circular object of red and blue which denotes the circulation of the blood. His face is taken from portraits. The dexter supporter of these Arms is Hippocrates holding a pomegranate. Harvey himself was not armigerous, but at Padua, as representative of the English students there, he was given a stemma and two representations of it are painted on the ceiling of the cloisters in Il Bo, and also on his diploma. A horizontal arm (rather like that in the Arms of the London College of Physicians) grasps a lighted candle entwined (as on a caduceus) by two snakes. Later, Leyden replaced Padua as the free-thinking university and Boerhaave was the greatest teacher of medicine there. Boerhaave's men played a major part in the formation of the Royal College of Physicians of Edinburgh under a charter of Charles II. Its Arms are therefore very Caroline and royal, the shield showing the Boscobel oak and as a special honour a canton (small square) containing the Royal arms of Scotland. The crest is a "demi-Apollo".

There were two important features of medicine in the eighteenth century,the so-called "age of enlightenment". The first was the systematisation of learning, taxonomy, in fact. The most famous taxonomist of the time was Carl von Linne (Linnaeus). He was a physician in Stockholm and briefly Professor of Medicine at Uppsala, but his fame rests on the fact that he invented the binomial system of nomenclature. His Arms, after he was enobled, represented the three natural kingdoms, animal, vegetable and mineral and the crest is the plant named after him, Linnaea borealis. As well as classifying plants and animals, he also classified diseases. His "Genera morborum" of 1763 followed one produced in Montpellier and preceded Cullen's nosology. The second dominant feature of medicine in the eighteenth century was the widespread use of bleeding and purging. Bleeding is represented heraldically by the fleams in the Arms of the Barbers and the lancets in the Arms of the Glasgow College of Physicians and Surgeons, while purging is represented by the aloes in the Arms of the Pharmaceutical Society.

Morgagni in Padua had written his treatise "de sedibus et causis morborum" systematising diseases on the basis of morbid anatomy and this is alluded to in the motto of the Arms of the Royal College of Pathologists ("to seek the seat and causes of diseases"). Their Arms introduce the foundations of medicine as we know it. The crest is Lord Lister's microscope designed by his father, J. J. Lister, the scientist who designed the achromatic lens. Behind it are sprigs of the plant Haematoxylum, from which is derived the "H" in the stain "H & E". At the top of the shield is a red wavy line representing a collagen fibre, and therefore histology. Above it are two red discs, one representing a Gram negative coccus indicating bacteriology, and an erythrocyte representing haematology. Below the collagen fibre is a black benzene ring representing clinical chemistry.

Progress then came thick and fast, for example, with the discovery of x-rays. The Arms of the Royal College of Radiologists shows on the shield what at first sight looks like a caduceus, but is instead "an x-ray tube irradiated" and entwined with serpents. The hand in the crest that

holds the heraldic thunderbolt is appropriately a skeletal hand. The development of anaesthesia is celebrated in the Arms of the recently formed Royal College of Anaesthetists. There are poppy seed-heads in the crest and the top of the shield (opiates-Analgesia and anaesthesia) and leaves of the plant Erythroxylum coca are in both the crest and the shield. Cocaine is derived from this plant and it represents general and local anaesthesia. The two supporters are actual medical men in academic dress. The dexter supporter is Dr. John Snow, a London physician, wearing the robe of an MD (London). He twice gave an anaesthetic to Queen Victoria (a la reine). Interestingly, he also represents in our history, epidemiology, because he was the same John Snow who traced the cholera epidemic in Soho to the Broad Street pump and stopped it by removing the pump handle. The other supporter is J. T. Clover in the robe of a Fellow of the Royal College of Surgeons of London. He holds his portable ether inhaler and gave an anaesthetic to Florence Nightingale.

To represent modern scientific medicine I have chosen the Arms of the Royal Postgraduate Medical School of London at the Hammersmith Hospital. Its motto is "Science directs the medical hand" and it certainly does so there. Hammersmith is represented by the anvil and crossed hammers. The plants in the flanks are Artemisia, not from its use as a vermifuge for round and threadworms, nor because it is the poisonous substance in absinthe that causes delirium. It is, of course, wormwood, because the hospital is next to Wormwood Scrubs, prison and all.

The history of a single teaching hospital can be summarised in its Arms, for example the Arms of St. Thomas' Hospital, London (Pre-Tomlinson). It started as the Priory of St. Mary the Virgin, and she is represented by her lilies in the crest. After a fire in 1212 it was rebuilt, largely by the good offices of Pierre des Roches, the Bishop of Winchester. He is represented by a Roach (fish) on the shield. It was dedicated to St. Thomas of Canterbury (Thomas a Becket) whose Arms were three Cornish choughs, sometimes referred to as "Becket birds". After the Reformation, King Edward VI granted the Hospital a new Charter based on Royal Emblems and the Arms of the City of London (St. George's Cross and the Sword of St. Paul). At the same time it was rededicated to St. Thomas the Apostle, who was said to have been martyred by spears; the spears now appear in the crest. The dexter supporter is a Becket bird and the sinister supporter is a nightingale – a reminder that Florence Nightingale started her important school of nursing at St. Thomas' hospital.

This account of the history of medicine portrayed in medical heraldry started with the Arms of the Institute of Health Services Management. This subject is much in the air at present, so perhaps my story has some curious accidental relevance. As we wander round medical libraries and see specialized journals lying on the shelves, we will see Arms on the cover of many of them. It is worth looking at these Arms, as well as the contents of the journal, for the Arms too, have stories to tell.

This was followed by a talk given by Charles Burnett, Ross Herald of Arms, Librarian of the Scottish Priory of the Order of Saint John. He traced the origins of the Hospitaller Order at Jerusalem during the Crusading period and went on to discuss the detailed layout of the hospitals erected by the Order on Rhodes and Malta. The former was built during the mid Fifteenth century and apart from a large ward with individual beds, had a maternity unit and a separate ward for infectious diseases. The hospital on Malta had its foundation in 1575 and its main ward formed the longest enclosed space in Europe at the time. It could hold 300 patients who ate and drank from silver utensils which were more hygenic than ceramic plates and cups. The Malta hospital had a section for the mentally ill and a large medical library for the benefit of staff.

Mr. Burnett explained that the Order of Saint John was in the forefront of providing hospital care during the late medieval period.

THE SECOND HALDANE TAIT LECTURE

The Second Haldane Tait lecture took place in the Royal College of Physicians of Edinburgh on 28th May 1993. 44 members and guests including Mrs Tait were in attendance. The President, Mr John Blair, introduced the guest speaker, Dr. John Cule, the President of the International History of Medicine. Dr. Cule took as his subject Sir Charles Bell and the Portraiture of Beauty, illustrating his talk with many examples of Bell's own drawings.

SIR CHARLES BELL (1774-1842) AND THE PORTRAITURE OF BEAUTY

'O! why was I born with a different face?
Why was I not born like the rest of my race?'

William Blake (1757-1827) to Thomas Butts

The literati of the eighteenth century thought much on the subject of the significance of the human face. There were those who believed that its features predestined the character of their owner and others who believed that they were but a consequence of it. Neither of these were new ideas. Man was continuing his preoccupation with the relevance of perceived beauty to hidden goodness.

Its appearance was also known to be of diagnostic value. The visage was already in the training of medical men, long since taught to look for signs of ill health in the prognostic facies described by Hippocrates. In the general terms of the *Prognostics* the *facies hippocratica* showed a sharp nose, hollowed eyes and collapsed temples, and other portents of impending extinction.

Signs of disease, resembling those of normal facial expression, crudely enough in some cases, later earned epithets such as the distinctive *risus sardonicus* resulting from the facial spasm shown in Tetanus; a pathologically rigid smile.

Some other well known signs of illness, such as the exophthalmos of Grave's Disease are perhaps more difficult for the layman to distinguish from the appearance of astonishment.

It is not surprising, in the realms of finer sentiments: for example, that the subtle but nevertheless visually recognisable distinctions between feigned and real emotion have still today remained elusive of gross description, and require an element of genius for their portrayal. Sir Charles Bell (1774-1842) was a thoughtful surgeon anatomist of considerable artistic skill, with a particular interest in the meaning and portrayal of facial expression or the outward manifestation of the passions.

His philosophical reflections on the purpose of mankind and the nature of human beauty began in his youth, before he had left his native Scotland for London. They were to appear in his *Essays on the Anatomy of Expression in Painting*, although the first edition was not published until 1806 after he had taken up residence there. A second edition appeared in 1824 with the revised title of *Essays on the Anatomy and Philosophy of Expression.*

He made a continental tour in 1840, during the last years of his life, to study the great masters at first hand, and then undertook an enlarged and revised third edition, using the notes from his journal, and which the publisher John Murray produced posthumously in 1844 as *The Anatomy and Philosophy of Expression as connected with the Fine Arts.*

In the field of the fine arts, Charles Bell was concerned with his thesis that man's facial expressions were peculiar to man, and portrayed emotions that were associated with an intellect, not shared by animals. His brother, Professor George Joseph Bell (1770-1843), who held the Chair of the Law of Scotland at the University of Edinburgh, believed that it was this interest which had led him toward his great neurological discoveries.

He recounts in the preface to the posthumous volume the association of the work of his brother Charles in the analysis and portrayal of expression with the inspiration for his scientific research.

'In tracing the causes of movements in the countenance and in the frame of the body under the influence of passion or emotion, he engaged in a very careful inquiry into the origin, course and destination of nerves; and consequent investigations led him to those fundamental truths, hitherto unperceived, by which he, and those who have followed his course, have revealed to the medical world, the beautiful simplicity of this part of the animal economy.'

The study of movement involved a pursuit of reciprocal benefit to science and to art.

Anatomists had long been interested in portraying their own dissections and therefore needed to develop their technique in drawing. Artists needed a knowledge of underlying myology in order the better to portray shape. Initial interest had been in surface anatomy, revealing such superficial structure as flaying produced. Artists and anatomists were to learn from one another. Anatomy was to be but part of the essential knowledge in revealing the transient changes of human bodily and facial movements, which could catch the fleeting expressions which reveal the individuality of our personal emotion.

Charles Bell, whose empathy for his patients was evident in his approach to painting, had been considered a candidate for the chair of Anatomy at the Royal Academy of Arts, of which Dr. William Hunter (1718-1783) had been the first holder in 1768.

Hunter had emphasised the importance of the "'smaller constituent parts", enabling the artist to catch glimpses of those fleeting forms which are the result of the "quick and transient Actions of the Muscles", not always to be seen in the living body".' In his inaugural lecture he showed how the 'anatomical disposition, especially of the bones and muscles, affects the outer appearance'. The artists Johann Zoffany (1783-1810) and Joshua Reynolds (1723-1792) were amongst those who attended his lectures.

The anatomists' contribution had at first been constrained by the limitations inherent in any unimaginative examination of the motionless cadaver. Jacopo Berangario da Carpi, who died in 1550, professor of surgery at Bologna, prepared some figures of variable quality for artists in his *Commentary* (1521) on the anatomy of the late C13/early C14 Mondino de Luzzi (?1275-1326). The 1491 edition was the first to contain anatomical illustrations.

In his late Italian Tour Bell had made a study of Michaelangelo, admiring his avoidance of 'the error of artists of less genius, who, in showing their learning, deviate from living nature . . . I recognised the utmost accuracy of anatomy in the great artists's studies . . . of the knee for example every point of bone, muscle tendon and ligament was marked.' But on surveying his fine statues '. . . only the effects of muscular action as seen in life, not the muscles'.

Leonardo da Vinci (1452-1519), who died in 1519, himself pioneered a better pictorial representation of anatomical dissection. His interest, like that of Hunter after him, had been aroused by the simple mechanical analogy, and in this field it was to be the later 'muscle-men' of Andreas Vesalius (1514-1564) that set the new standard. These were to be the artistic models for future anatomists. Inspired by Vesalius, the rigidity of static anatomy progressed to the fluidity of a dynamic concept.

The simple mechanical analogy that resulted from this would in time require a physiological explanation for the activation of the mechanics. It was Charles Bell's contribution that he searched for the detailed part played by the Nervous System, as well as defining the individual facial muscles, in order to explain it in neurological terms.

As an experienced comparative anatomist he also described the comparative development of organs adapted to the functions of different animals, but his philosophy remained orthodoxly Christian, with an Old Testament belief in Creation. And as a Scot of the British Enlightenment he included a mystic content.

Fig. 1

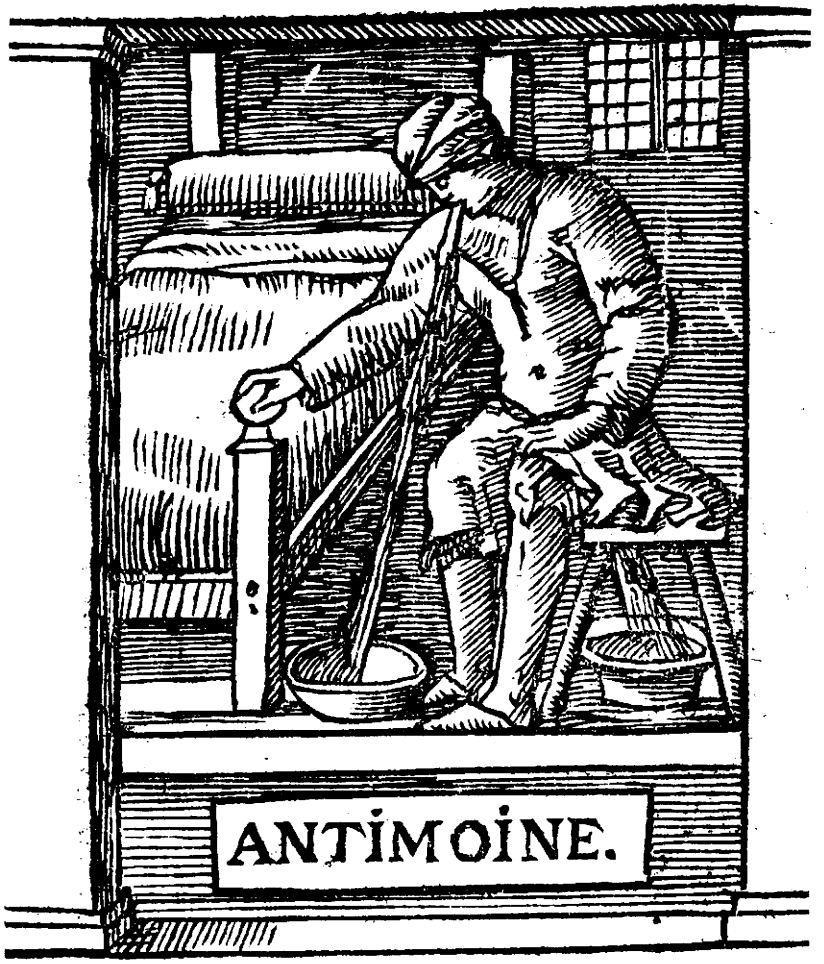


Fig. 2

BASIL VALENTINE

HIS

Triumphant Chariot

OF

ANTIMONY,

WITH

ANNOTATIONS

OF

Theodore Kirkringius. M. D.

WITH

The True Book of the Learned *Synesius* a Greek Abbot taken out of the Emperour's Library, concerning the Philosopher's Stone.

LONDON.

Printed for *Dorman Newman* at the Kings Arms in the *Poultry.* 1678.

Fig. 3

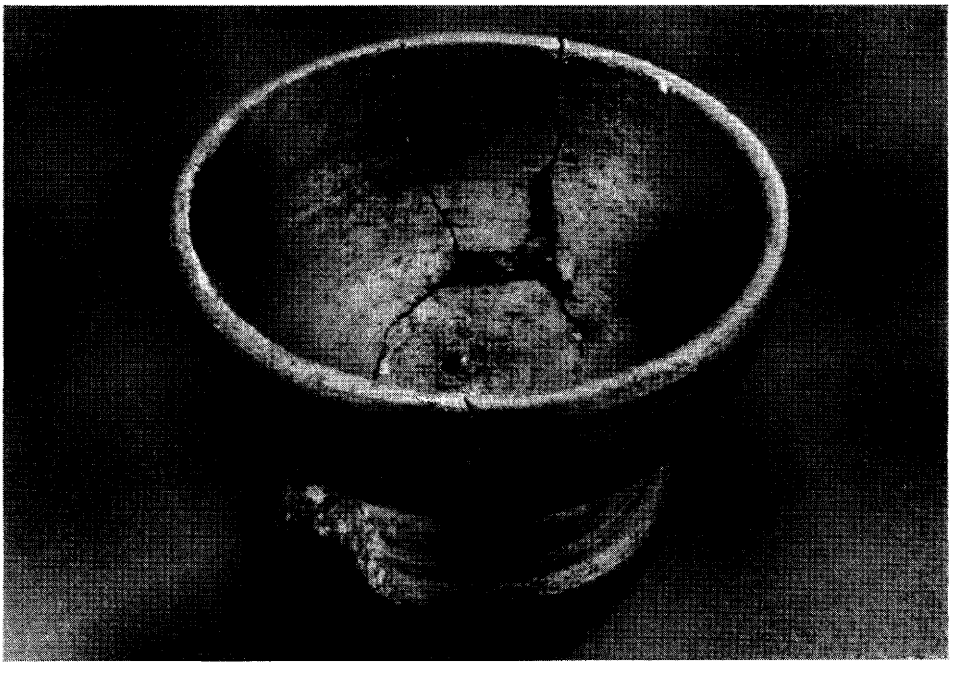


Fig. 4

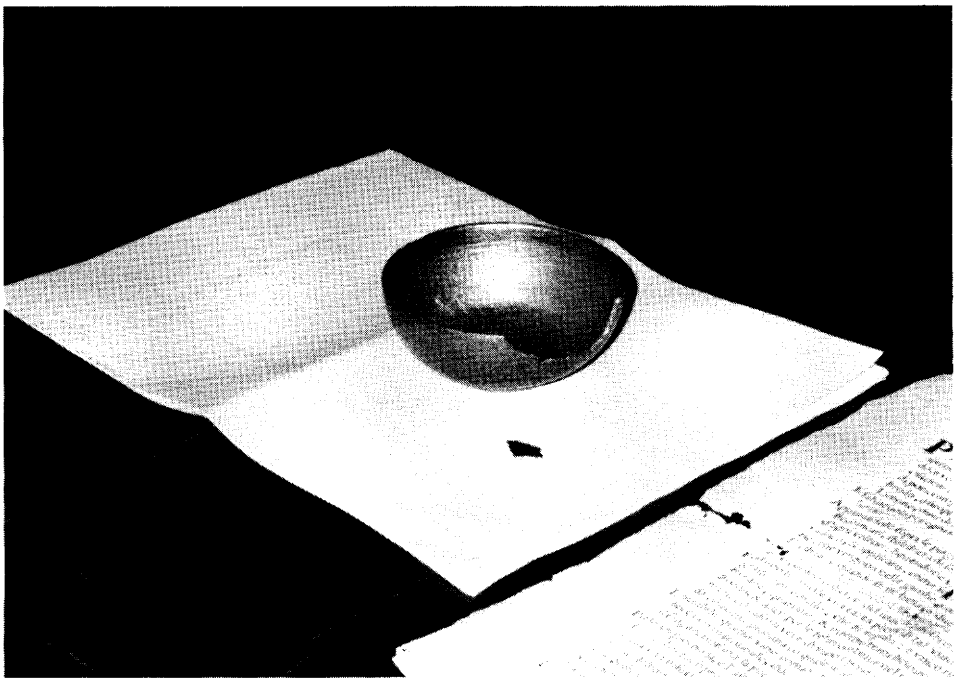
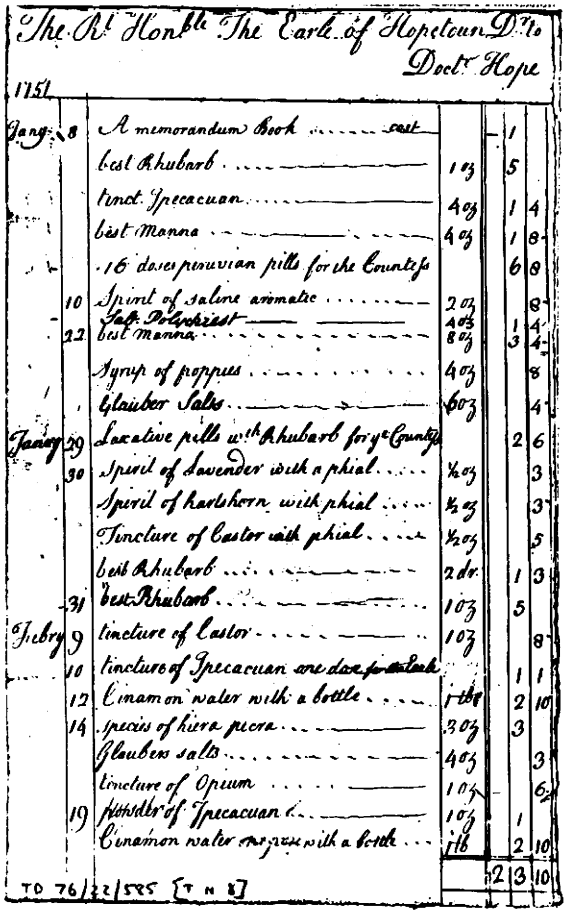


Fig. 5



The Rt Honble The Earle of Hopetoun D.r to Doct.r Hope

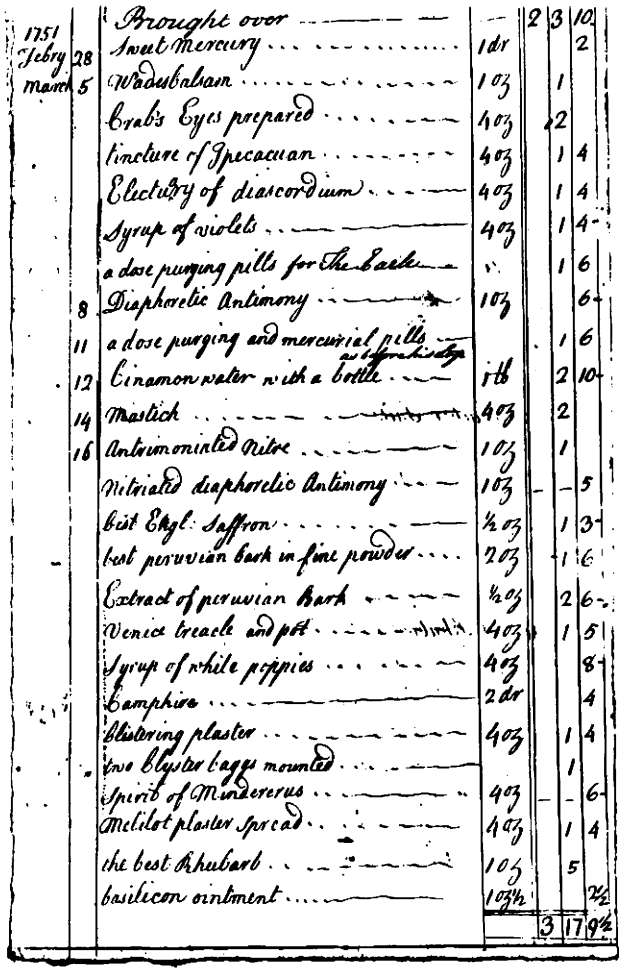
1751

Jany	8	A memorandum Book ..... cast			1	
		best Rhubarb	1 oz		5	
		tinct. Ipecacuan	4 oz		1	4
		best Manna	4 oz		1	8
		16 doses peruvian pills for the Countess			6	8
	10	Spirit of saline aromatic	2 oz			8
		Salt Polychrest	4 oz		1	4
	22	best Manna	8 oz		3	4
		Syrup of poppies	4 oz			8
		Glauber Salts	6 oz			4
Janry	29	Laxative pills with Rhubarb for y.e Countess			2	6
	30	Spirit of lavender with a phial	½ oz			3
		Spirit of harthorn with phial	½ oz			3
		Tincture of Castor with phial	½ oz			5
		best Rhubarb	2 dr		1	3
	31	best Rhubarb	1 oz		5	
Febry	9	tincture of Castor	1 oz			8
	10	tincture of Ipecacuan one dose for a Child			1	1
	12	Cinamon water with a bottle	1 lb		2	10
	14	species of hiera picra	3 oz		3	
		Glaubers salts	4 oz			3
		tincture of Opium	1 oz			6
	19	powder of Ipecacuan	1 oz		1	
		Cinamon water one pint with a bottle ...	1 lb		2	10
					2	3 10

TO 76 | 22/595 [T N 8]

2nd Earl's Medicine List & Costs

Fig. 6a



1751		Brought over		2	3	10
Febry	28	Sweet Mercury	1 dr			2
March	5	Wadsbalsam	1 oz		1	
		Crabs Eyes prepared	4 oz		2	
		tincture of Ipecacuan	4 oz		1	4
		Electury of diascordium	4 oz		1	4
		Syrup of violets	4 oz		1	4
		a dose purging pills for The Earle ...			1	6
	8	Diaphoretic Antimony	1 oz			6
	11	a dose purging and mercurial pills ...			1	6
	12	Cinamon water with a bottle	1 lb		2	10
	14	Mastich	4 oz		2	
	16	Antimoniated Nitre	1 oz		1	
		Nitriated diaphoretic Antimony ...	1 oz			5
		best Engl. Saffron	½ oz		1	3
		best peruvian bark in fine powder	2 oz		1	6
		Extract of peruvian Bark	½ oz		2	6
		Venice treacle and pot	4 oz		1	5
		Syrup of white poppies	4 oz			8
		Camphire	2 dr			4
		blistering plaster	4 oz		1	4
		two Blyster bagges mounted			1	
		Spirit of Mindererus	4 oz			6
		Melilot plaster Spread	4 oz		1	4
		the best Rhubarb	1 oz		5	
		basilicon ointment	1 oz ½			2½
				3	17	9½

Fig. 6b

In his work on *The Hand* (1832) he is aware of the dilemma posed by his faith and invites the reader to join with him 'for a moment to reflect what is the natural result of examining the human body as a piece of machinery; and see whether that makes the creation of man more or less important to the Whole Scheme of nature.'

The ideas of evolution were already being debated by doctors and the physician, Erasmus Darwin (1731-1802), believing in the mutability of species expressed in his *Zoonomia* (1794-6), had already felt his own need of rescue from the heresy of Manichaeism. His commitment to the idea of evolution was eventually emblazoned on his horse drawn carriage in the motto *E conchis omnia* ('everything from shells').

There were also technical problems of draughtsmanship. In his analysis of the drawing of the different types of human face, Bell studied the head from all angles. He pondered on Campus' measurements and particularly on his facial line. The Dutch anatomist Peter Camper (1722-89) adopted a geometric approach on the relation of the face to the skull, which Bell thought flawed. How could a true representation best be made?

Bell concluded that we are moved emotionally more by the form of the features than by the shape of the whole head. It is the face that matters more to us than does the skull; the mobile features, not the immobile skull.

Bell first draws two heads in his analysis of the anatomical impossibility of the facial line in which he uses a Greek god image to demonstrate skull shape.

The classic beauty of the Greek god's head with its vertical line is not natural, or even possible: beautiful but unreal. It is irrelevant because it is the face that reveals man.

> '. . . expressions, peculiarly human, chiefly affect the angle of the mouth and inner extremity of the eyebrow; and to these points we must principally attend in all our observations concerning the expression of passion.'

The mobility of the living face was of greater moment to the clinically interested artist, than the anatomical stillness of death.

The principal muscles involved were the *Corrugator supercilii* in surprise and wonder; the frontal portion of the *occipito frontalis* in puzzlement; and the *Triangularis oris* or *depressor anguli oris* giving the arching of the lip in contempt, hatred and jealousy. In order to recall and capture the fleeting movement, the artist had to know they were there. But a knowledge of their contractions was not enough.

There was, above all else, a need to show the element of human thought in expressing agony of mind, grief, contempt, hatred or jealousy, where animals show mainly rage and fear. Bell examined the purpose of these expressions together with the detail of other facial muscles, and using his clinical knowledge also considered the effect of repeated attacks of illness such as depression on the countenance. But he was here concerned with the artist's need to depict the passions, the emotions that distinguish man.

The subtlety of depicting the expression following the deed of revenge should show that the storm has subsided, but the gloom is not yet dissipated. It depicts the beginnings of remorse, in the still severe eye, but the stirrings of doubt in the lips.

The cruder features of suspicion and jealousy are not unlike envy: a fitful and unsteady passion, with a frowning and dark obliquity of the eyes, with cruelty in the lower part of the face.

In his analysis of the visible demonstration of emotion, Bell began with the premise that man's facial muscles in function and structure lay between those of carnivorous and graminivorous animals; which characters were revealed in his ability to snarl like a carnivore and protrude his lips like a herbivore. These basic movements, by their nature, were related to the seizing of food.

The associated musculature, together with that of subsequent mastication, influenced the bone structure at the points of muscle origin and insertion, and thus were responsible for generic facial structure. Exaggeration of these, when transposed to human faces portrays unpleasing characteristics and in representational drawing achieves a portrayal of ugliness; these likenesses being symbolically associated with the animal components of our nature.

'Beauty in the human form', Bell felt, was naturally related 'to the characteristic organs of man', for we are most moved emotionally by seeing those expressions of the features that show the feelings that only man can possess. His synthesis of science, art and religion provided a perspective on his belief in the unique quality of the human smile and frown.

As a comparative anatomist, using his careful dissections of animals, he appreciated that 'it is not an easy task to reconcile subjects so far apart in the minds of most readers as anatomy and the fine arts'. And alone it was not enough.

He cautioned that the painter 'must cultivate the talent of imitation merely as bestowing those facilities which are to give scope to the exertions of his genius'.

All was thus not to be a mechanical application of anatomical exactitude, for this left out artistic skill and demeaned genius.

> 'Till he has acquired a poet's eye for nature, and can seize with intuitive quickness the appearance of passion, and all the effects produced upon the body by the operations of the mind, he has not raised himself above the mechanism of his art, nor does he rank with the poet or historian.'

For Bell, literature and painting shared common ground in the sensual depiction of beauty. A man of the Enlightenment, seeking the nature of truth, he went further than linking painting and poetry, he enquired into the means of its representation in history.

As Bell expressed it;

> 'The novelist who has genius to catch and to represent the feelings of men, and their motives to action, may give a truer picture of his period than the historian, even though he describes what never existed.'

For indeed whereas history in any representation requires to be factually based – insofar as that is possible – the novelist is released from a dependence upon fact alone. He may rely for credibility, like the poet, on true interpretation. Written history seeks to be factual and interpretive. A novel must respect truth but need not be factual.

This distinction is often obscured, if not totally lacking in the more romantic historical novel, a mongrel offspring of fact and fiction. But the better ones, carefully researched, can give authentic atmosphere. The lesser ones are no worse than bad history.

History, literature and painting share a common quality in man's search for an understanding of the relationship between truth and beauty. Imagination emerges as an essential constituent for the work of the historian, no less than that of the artist and scientist. And imagination requires experience.The painter has therefore to add more than a delineation of anatomical detail to show his genius and portray human beauty. There must be a romantic element in the mixture.

Many a great artist with brush and pen has sought to define beauty. Albrecht Durer (1471-1528) simplified his opinion with 'Beauty is the reverse of deformity'. Leonardo da Vinci (1452-1519) emphasised this by juxtaposition; '*Ch'il brutto sia vicino al bello, et il vecchio al giovane, et it debole al forte.*' John Keats (1795-1821), himself a doctor, contented himself with the aphorism, 'Beauty is truth and truth beauty.' Bell appeared to sympathise with the 'prevailing opinion that beauty of countenance consists in the capacity of expression, and in the harmony of features consenting to that expression.'

Bell's drawings of age & infancy illustrate the effects of juxtaposition.

The eighteenth and nineteenth centuries had seen a burgeoning of interest in epitomising human characteristics in literature and art. William Hogarth, (1697-1763), amongst the English caricaturists, also wrote the *Analysis of Beauty* (1753). Like Descartes he believed the face to be the index of the mind, and that its appearance resulted from the effects caused by a man's character. Behaviour was visible. Constant frowning left its mark.

In France, Honoré de Balzac (1799-1850), in his monumental *La Comédie humaine*, related his own literary characterisations with the caricature drawings of Parisian types made by such contemporaries as Honoré Daumier (1808-1879). The poet Charles Baudelaire (1821-1867) spent his complex life considering representation and expression.

But there also came a different encyclopaedic approach in Johann Caspar Lavater(1741-1801), when he wrote his *Essays on Physiognomy*, which revealed a relentless didactic quality. Lavater saw diagnosis of character in animal resemblance.

Bell, himself, had not added to the plethora of books on physiognomy, of which there had been a plenitude since ancient times; mostly relating a study of the face to a revelation of character. The shape of the head was generally said to reveal the nature of its owner.

Michael Scot's thirteenth century work had defined physiognomy as 'the science of nature by whose insinuation one sufficiently skilled in it recognises the differences of animals, and the vices and virtues of persons of all sorts'. He describes, for example, how to distinguish men by the shapes of their foreheads, – but warns against the use of a single indicator, as the significance of the shape of another part of the body may contradict this.

A quarter of a century before Bell's birth, Dr. James Parsons, M.D. in his Croonian Lecture for the year 1746 lists no fewer than 41 authors of whom he 'could procure an account of, who have treated of *Physiognomy*.'

He ridicules Giovanni Battista della Porta's *De humana physiognomia* . . . (Frankfurt: 1592) with its claim that facial resemblances to animals indicate similar frames of mind and passions. He insists there is no analogy and that 'every Person, of whatsoever Temper of Mind, ought to have a Power of altering it upon a necessary Occasion, and of shewing his Approbation, or Dislike, of any Affair that may chance to offer.'

Charles Bell was also scornful of Giovanni Battista della Porta saying that 'he was equally successful in detecting the qualities of plants by their resemblance to animals'!

> 'That the features indicate the disposition by resembling those of animals, is an unjust and dangerous theory. The comparison which we have made of the human form and features with those of certain classes of animals, is very different from those speculations which would lead us to condemn a man because of some resemblance in face to a brute.'

Like Charles Bell, Parsons regarded the face as a vehicle of expression so that in '. . . making an Address in Conversation, or if there be a reciprocal Affection in the Person to whom the Address is made, it will be expressed by this system of the Face . . .'

In common with Bell he noted the function of the diaphragm which 'has no small Share in being a principal *Instrument* of receiving and communicating the Impulses of the *Will* to the several Parts which are destined for the Expression or Publication of the Intention of that *Will* or *Mind*'. So that laughter 'or quick concussion of the Lungs, is begun by the Diaphragm.' And from the progression of grief to immoderate weeping 'there are not wanting Concussions of the Diaphragm here too.'

Parsons shared Bell's view on the greater importance of the facial musculature over the head shape. In the portrayal of emotion, he added with some commonsense that 'those with the best proportioned Faces may be possessed of unhappy as well happy Temperaments', but be that as

it may, alteration of the muscles alone demonstrated the prevailing passion. Their interest in patients as people is reflected in a need to show individuality in portraiture.

Parsons also calls to task John Bulwer, a physician who flourished *circa* 1654. Dr. Bulwer produced several works including *Philocopus, or the Deafe and Dumbe Man's Friend* (1648), a book on lip reading and gestures for instructing deaf-mutes, and *Chirologia, or the Natural Language of the Hand* . . . (1644).

Bulwer's study of expression was called *Pathomyotonia, or a Dissection of the significative Muscles of the Affections of the Mind* . . . London: 1649. Parsons is all for '*Metoposcopy* (which denotes Opinions arising from a view of the Face alone . . .)', but seems to feel that John Bulwer perhaps goes too far beyond 'the Muscles, which are the true Agents of every Passion of the Mind, as the *Basis* upon which our Doctrine is founded'. Bulwer describes the muscles of the face which all 'act one against another to form Laughter; and calls in Blood and Spirits to fill the Face, in the same manner that the *Membrum virile* is fill'd.'

Parsons' Croonian lecture is illustrated by drawings of far less quality than those of Bell, but he makes a simple analysis of the muscles used and their antagonists, which he says are the sole agents of expression.

As his example, he sees no need when portraying fear 'to draw the Hair standing upright . . .'. Bell, in fact, does use this device in his drawing of a man with bodily fear and describes the hair being 'lifted up by the creeping of the skin, and the action of the occipito-frontalis.'

The two figures in each of Parsons' five tables show muscle changes only in the 'same kind of Face, whereon no Change is visible, but what proceeds from the particular Alterations of the Muscles peculiar to each Passion.'

And so the same young lady's somewhat vapid features show Composure, Veneration or Reverence, Fear and Terror, then follows drawings of Scorn and Derision, a Morose Envious Countenenace, a Cheerful Countenance and a Weeping One.

Anticipating Duchenne, he was sensitive to any 'facial fraud' by the feigning or falsity of expression. He also dissected and drew the facial and eye muscles.

It was in the expression of passion in the countenance where Bell saw the relevance of human beauty, and how much more powerfully he represents it. 'The whole frame is affected sympathetically with expression in the countenance'.

Bell felt that 'There exist in his [the human] face . . . a peculiar set of muscles to which no other office can be assigned than to serve for expression'. These were human muscles that played no part in seizing and digesting prey. At this point Bell ventured upon a more controversial explanation, when he claimed that the expression of passion arises from the 'respiratory' nerves.

'The organ of breathing, in its association with the heart, is the instrument of expression, and is the part of the frame, by the action of which the emotions are developed and made visible to us.'

'There exists in the body a distinct system of nerves, the office of which is to influence the muscles in Respiration, in Speech, and in Expresssion.'

In July, 1821, the same month in which Bell read his first paper to the Royal Society, John Shaw's *Manual for the Student of Anatomy* appeared. In it Bell's system of classification of the nerves was explained and his drawings illustrating the 'original' and 'respiratory' nerves reproduced.

In a way, this ingenious but nevertheless mistaken conception, is part of Bell's major idea of the nervous system. His brother, as I mentioned earlier, thought that Charles Bell's great work on a new anatomy of the brain (1811) had been formulated and resulted from his enquiry into

expression. As you recall, it contained a description of nerve bundles carrying sensory and motor messages separately, in the distinction of function between the anterior and posterior nerve roots of the spinal cord and in differentiation in localisation in the brain.

Charles Bell's book *Anatomy of Expression* was intended for painters and expressed his views simply in terms understandable by the non-medical readers for whom it was primarily intended. The principal text in nineteenth century France for painters giving rules for *depicting* emotion and character was that of Charles Le Brun (1619-1690) in his *Conférence sur l'expression générale et particulière,* given as a lecture in 1668, but not published until 1698. Le Brun himself was not a doctor. As a master, he was widely read and had an immense artistic influence in the eighteenth century. Interestingly, he felt that blushing, as a direct reflex over which we have no control, was a better indicator of character!

He confines his own views 'to what is necessary for painters.' His simple drawings are most effective, and show admiration, esteem, veneration, ecstasy, contempt, horror, fright, love, desire, hope, fear, jealousy, hatred, sadness, pain, joy, laughter, weeping, anger, despair and rage.

Le Brun had been influenced by Descartes' *Les Passions de l'âme* (1649) with its mechanical anology for the body and its spiritual analogy for the passions, excited by the soul, 'from a little gland in the middle of the brain . . . . the Seat where she more particularly exercises her functions.'

Le Brun adds that the pineal gland was chosen 'because this part is single and all the rest double' and thus the place where the two images from the eyes and the ears were brought together.

Johann Caspar Lavater (1741-1801) has been described as the last of the descriptive physiognomists – in the more restricted use of the term. In his *Essays on Physiognomy*, of which there are many translations and editions, Lavater claimed that 'each single feature has "the nature and character of the whole" and can serve as a key to the person's character'. Physiognomy became the great pre-occupation of the 18th and 19th centuries.

Judith Wechsler in her *Human Comedy* defines physiognomics as 'the classification of people into character types according to outward bodily signs, such as the shape of the eyes, forehead, mouth and so on; and that of pathognomics, the interpretation of changing emotions by facial or bodily expression'.

Physiognomics is somewhat immutable, inherited rather than acquired, although Lavater was grudgingly prepared to admit that 'oft repeated emotions leave their mark on permanent expression and occupations have visible effects on bearing'.

There is an underlying coldness to be seen in the work of the classifying physiognomists, which reveals a lack of that human warmth shown in the drawings of many of the medical artists or of humorous caricaturists such as Honoré Daumier, who bestowed an unmistakeable individuality to each of his sketches. The theory of physiognomy was allied with that of Gall's phrenology, whose popular medical folly was included in Moreau's updated editions of Lavater. Moreau [de la Sarte] was professor of the Faculty of Medicine at Paris. Lavater's great weakness was that his interest was that of the anatomical layman.

There is a revealing passage. In the dead 'all is reduced to its proper level; each trait in its true proportion, unless excruciating disease, or accident, have preceded death'. 'What life makes fugitive, death arrests.'

Despite his *caveat*, quoted above, admitting the need to exclude the effects of any gross physical distortion resulting from the cause of death, there remains a rigidity of interpretation which weakens our confidence in his understanding of the variability and individuality of human nature. His purpose was to show how his sketches could be used to diagnose character.

Use the drawing to find a face that fits. This can do little in the end but prejudice observation and proper assessment of the subject. It is a reversal of the medical model. Its weakness had already been appreciated in the nineteenth century and criticised by Professor Karl Heinrich Baumgartner (1798-1886) of the Freiburger Medizinischer Klinik; that Lavater used art for diagnosis in the absence of the real patient.

Charles Bell was the successor of men like the physician James Parsons and the artist Le Brun in being more concerned with 'pathognomics' or Bulwer's 'pathomyotonia' than with physiognomics; with the changes of expression rather than with any delineation of character type.

Bell admits finding Lavater's engravings attractive, adding, perhaps a little sadly, 'although the study of physiognomy is now abandoned for that of the cranium.' Lavater had given way to Gall.

Bell's mind, capable of disciplined scientific thinking and concerned with the accurate portrayal of physical and mental disease, in his many works, nevertheless remained essentially within the Romantic canon. What we look upon is the result, not the cause of our ills.

Bell gives practical examples of the value of clinical knowledge in the portrayal of truth. He makes a plea for accurate representations of convulsions in portraits of possession by the devil.

He includes his famous drawing of the spasm of opisthotonos taken 'from soldiers wounded in the head, at the Battle of Corunna' and compares the posture of this figure to one which resembles that of 'a lad possessed' in a painting by Domenichino in the convent of Grotto Ferrata near Rome.

In this painting the boy's body is similarly bent backward, but his hands and jaws are open, contrary to that expected in a fit of the tonic-clonic type; the relaxation of the flexors being allowed here as a concession for the literal representation of the miracle, which requires Saint Nilus to place his finger with the healing oil in the patient's mouth. Poetic licence has a place in Bell's philosophy.

Bell's contribution to an understanding of the nervous system was a major scientific step forward. Yet, having thoroughly analysed the relevant anatomical and physiogical components, his Celtic imagination then demanded more than these in the meaning of expression, with a concern for the enigma in the more mystic quality of its humanity.

His drawings of human expression have a more realistic and sympathetic quality than the others we have illustrated in this lecture. His delineations of the expressions have the advantage of experience of human beings. He explains the mechanism behind the depiction of 'Reverence' by the upturned eye. Bell is not content with the explanation that 'when pious thoughts prevail, man should turn his eyes from things earthly to purer thoughts above.' When the 4 straight or voluntary muscles that regulate the eyes' major movements tire from weariness or exhaustion, then the 2 oblique muscles take over and roll the eyeballs up under the eyelids. 'Accordingly, in sleep, in fainting in approaching death, when the 4 voluntary muscles resign their action, and insensibility creeps over the retina, the oblique muscles prevail, and the pupil is revolved, so as to expose only the white of the eye.' Bell reflects that 'in sleep, langour and depression, or when affected with strong emotions, the eyes naturally and insensibly roll upwards'.

Fear near at hand differs from apprehended fear. The expression more closely resembles the actual expression of bodily pain immediately expected: the eyes start, the lips are drawn wide and the scream is heard.

Rage makes the features unsteady, the eyeballs roll, the frontalis furrows and unfurrows and the corner of the mouth is raised. And then to weeping:

I have thrown the expression of weeping from pain into the face of a Fawn; for such expression is inexpressibly mean and ludicrous in the countenance of man.

Bell's book on expression is a philosophical study on the nature of man and the use of a knowledge of anatomy in the delineation of human beauty. He applies his medical knowledge only in its relation to relevant points for depiction, where clinical detail helps accuracy, but with a caveat to allow artistic licence. It is this which confirms his belief that what we look upon is the result and not the cause of our ills. Bell gives a practical example of the keenness of his observation in his portrayal of hydrophobia to demonstrate agitated anxiety.

In his pictorial descriptions of madness Bell seems solely concerned with 'hints respecting the external character of the outrageous maniac.' Distinguishing between melancholia and madness, he proceeds upon the theory that in madness 'the expression of mental energy should be avoided, and consequently the action of all those muscles which indicate sentiment.' To this end, and somewhat paradoxically, he recommends the transfer of animal expressions 'of timidity, of watchfulness, of excitement, and of ferocity' to the human face. But it is clearly a matter of artistic technique.

In his sensitivity toward the patient's plight, he stresses that 'these discussions are only for the study of the painter', who should consider whether 'such painful or humiliating details are suited to the canvas. If madness is to be represented, it is with a moral aim, to shew the consequences of vice and the indulgence of passion.' This need not imply, as has been suggested, that Bell believed that mental illness was *necessarily* the result of sin. Although the spirit of the age undoubtedly encouraged a belief that illness might be the punishment for wrong doing, it behoved the sufferer to examine himself to repent the cause.

His extensive practice and known sympathy toward suffering was likely to have revealed to him that the wretchedness of the poor contributed to widespread mental stress, often necessitating crime in order to survive.

The differences and need to distinguish between madness and badness were ever relevant. It was an age when Providence had to be taken into account, and could prove something of a dilemma for the thoughtful. Neither could the effects of disease on behaviour be ignored by a medical scientist of Bell's quality.

In his observations on mental illness Bell describes the bivalent mood changes of the sufferer from a manic depressive psychosis, where a portrayal of the depressive phase required the artist to show 'features inactive, but not incapable of feeling . . . the imprint of long suffering isolated from human sympathy', a very sympathetic view of a depressive patient.

> 'Successive attacks of this kind impress the countenance indelibly. The painter has to represent features powerful, but consistent with the maturity and perfection of feminine beauty. He will shew his genius by portraying, not only a fine female form . . ., but a face of peculiar character; embodying a state of disease often witnessed by the physician . . . .'

There are some informative comparisons to be drawn with his younger contemporary, John Conolly (1794-1866) whose sympathy for the mentally ill cannot be doubted, and who later expressed similar moral feelings commensurate with those of Bell. But now, Conolly's views were to be supported with illustrations found in photographs. He wrote of 'a woman of the poorer ranks of life; -from which ranks our large crowded county asylums are filled.'

> 'How people in such ranks contrived to live, and the kind of life they lived before being sheltered there, is intimately known to few who attempt to write about them . . . . And the worst of them, too impatient of this lot, or tempted beyond their strength, deviate from the walks of industry into the side paths of idleness and gin, of dissipation and sensuality, become instructed in thieving . . . . God alone can judge such.'

Bell's view of the face altered by psychiatric illness differed in quality from that of John Conolly. In the middle of the nineteenth century, Conolly, encouraged with the use of the new photography, reverted to a more physiognomic emphasis in studying the features of the insane. A critical comparison of the relative values of painting and photography in this context became inevitable.

Writing of a patient with 'suicidal melancholy', but disclaiming any pretension to be 'a professed physiognomist', he found in the facial photographic portrait of 'this poor woman, a certain superiority of character . . . although subdued by disease' which 'would furnish a text for a pupil of Lavater; and a phrenologist would draw clear conclusions from the configuration of the head. There may be something of fancy, but there is much more of truth in both of these sciences of some acquaintance with which every one desirous to be an accurate observer ought to possess.'

The photographs which inspired Conolly were taken by Dr. Hugh Welch Diamond (1809-1886), Medical Superintendent of the female department of the Surrey County Lunatic Asylum (1848-58), and led to a debate on the relative values of the photographs themselves, the engravings made from them and the earlier paintings and drawings.

Gilman remarks on the danger inherent in photography (and also in some sketches) of the posing of the patient, the concentration on the face and in the absence of background. He suggests a confusion of the desire for aesthetics with clinical reality, and that the belief of the objective portrayal by a photograph was a fallacy. The engraving altered the illustration, but '. . . an engraved photograph was still a more accurate symptomatological portrayal than an interpretive sketch.'

Whilst attempting to use facial expression and shape for specific diagnoses, demands for artistic beauty were debated. Doctors and laymen alike continued to find the truth elusive, and the search for a classification of the means and meaning of facial expression continued.

Charles Bell believed that 'A just feeling in the fine arts is an elegant acquirement, and capable of cultivation.' None of his work shows this reconciliation between the starkness of surgical necessity and artistry better than his wellknown paintings of the wounded after Waterloo, where the facial expressions are not neglected.

Neither does he neglect the clinical notes:- Belly opened by a sabre wound. Peltier 3rd French Lancers. Admitted 3rd day after battle. Gangrenous gut. He apparently recovered.

Sgt. Anthony Tuittmeyer. 2nd line Bn KG. Arm carried off by cannon shot. German Legion. Rode 15 miles upright into Brussels and presented himself to Dr. Bach. When put to bed he fainted and remained insensible for half an hour. The incision through the deltoid down to the bone. The saw used so as to leave the head in the cavity. This with a little picking away of the bone will make a good operation.

His sympathetic insight, informed by his wide experience as a practising surgeon, brought a practical freshness to all his portraits, even the battlefield horrors, contrasting with the hardness of those others drawn to fit the rigid theories of the proselytising physiognomists of the nineteenth century; the orthodox against the fringe. His theory had the advantage of being tempered by experience.

[The full text of this lecture, with references and annotations, is published in *The Journal of the History of Medicine and Allied Sciences*, Volume 48, July 1993, Number 3, pp. 302 - 319 as 'The Enigma of Facial Expression'.]

The Scottish Society of the History of Medicine

REPORT OF PROCEEDINGS

SESSION 1993-94

THE FORTY FIFTH ANNUAL GENERAL MEETING

The Forty Fifth Annual General meeting of the Society was held in the Management Centre at Stirling University on November 6th 1993 and was attended by 56 members and guests. The minutes of the Forty Fourth AGM were approved and the Treasurer's report accepted. Dr. Martin Eastwood who was demitting office as Treasurer was warmly thanked for his years of hard work for the Society, particularly in view of the increasing complexity of the finances in recent years. It was noted that preparations for the forthcoming International Congress in 1994 were advancing well and that the second announcement would be sent out soon. Retiring members of council Dr. Mark Fraser, Dr. Stuart McGowan and Dr. Alastair Masson were thanked for their services and Dr. A. R. Butler, Professor R. I. McCallum and Dr. W. C. Shepherd were elected in their place. The following Office Bearers were also elected, Vice President Dr. Harold Swan, Treasurer Dr. John Simpson, Joint Honorary Secretaries Miss Fiona Watson and Mrs Brenda White and Dr. J. D. MacGregor.

Mr John Blair then formally installed Dr. Elizabeth Rose as the first Woman President of the Society. Dr. Rose thanked Mr Blair for all his work particularly in connection with the International Congress and congratulated him on his being elected President of the British Society for the History of Medicine.

THE ONE HUNDRED AND FORTIETH ORDINARY MEETING

The One Hundred and Fortieth Ordinary Meeting was held at Stirling University and directly followed the Forty Fifth Annual General Meeting. The President, Dr. Elizabeth Rose introduced Dr. David Smith from the Wellcome Unit at Glasgow University, who talked on Professor Cathcart's Military Physiology and Nutrition.

PROFESSOR CATHCART'S MILITARY PHYSIOLOGY AND NUTRITION

Edward Provan Cathcart was born in Ayr in 1877. In 1895 he entered Glasgow University, graduating MB ChB in 1900. After periods in hospital posts, studying in Munich, and working at the Lister Institute, Cathcart returned to Glasgow University in 1906 as first Grieve Lecturer in Physiological Chemistry, at the Institute of Physiology. In the same year Diarmid Noël Paton, formerly Superintendent of the Laboratory of the Royal College of Physicians of Edinburgh, was appointed Regius Professor of Physiology. (1)

At the Institute of Physiology, Cathcart developed his research interests in protein metabolism, employing the new calorimetric techniques which had been introduced by the American chemist, Otto Folin, for the analysis of the nitrogenous metabolites creatin and creatinin. The Director of the Boston-based Nutrition Laboratory of the Carnegie Institution of Washington, F.G. Benedict, was greatly impressed by Cathcart's experiments when he toured Scottish Laboratories in 1910. Benedict, whose geography was clearly not very good, reported to the Carnegie Institution:

> Dr. Cathcart impressed me as being one of the keenest men that I saw in England . . . I find that he is well thought of throughout the whole of England. (2)

The following year Cathcart went to Boston to learn the techniques of nutritional research employed in Benedict's laboratory.

Benedict and Cathcart worked together on a project using a trained cyclist and a bicycle ergonometer, measuring energy expenditure by indirect calorimetry – from measurements of gas exchange. Their report "Muscular Work. A metabolic study with special reference to the efficiency of the human body as a machine" was published in 1913. The introduction remarked that physiological studies of training would not only be of value to athletes but would also be of practical for those

> . . . who are accomplishing large amounts of work. It is of vital importance to the contractor, to the railroad constructor, and to other large employers of labor, that their human machinery as well as their mechanical appliances work to the highest degree of perfection. They spend large sums of money in designing, repairing and altering the most complicated machinery, but until recently no attempt has been made to increase the efficiency of the large number of workmen that they must necessarily employ. With the advent of scientific management we see the dawn of a new era in muscular work and its relationship to large manufacturing and construction enterprises. Scientific management, will, however, always fail in its purpose unless it is based upon a scientific foundation, and as yet there is a great paucity of physiological data on which to base such management of the human machine. (3)

Readers wishing to find out more about "the advent of scientific management" were referred to *The principles of scientific management* by F. W. Taylor which had been published in 1911. Taylor advocated the rationalisation and enhancement of the efficiency of work through detailed study of the activities of workers. In one of his own studies he had investigated the effect of shovel size upon the rate of shifting of ashes and coal in a steel mill. The movement for scientific management became known as Taylorism.

In 1915 Cathcart left Glasgow to become Professor of Physiology at the London Hospital. An officer of the Glasgow University Officers Training Corps since 1908, Cathcart now joined the Royal Army Medical Corps and became Deputy-Director of Anti-gas Services, Home Forces. However, in 1917 an opportunity arose for Cathcart to develop his pre-war interests – he was transferred to the personal staff of the Director-General of Army Medical Services for work in connection with the feeding of the army. He acted as liaison officer between the War Office and the Ministry of Food and advised on how the army rations could be effectively made up out of the foods available. (4)

At this time pressures on British food supplies were particularly acute and while cuts in the scale of rations for overseas troops had been avoided, rations for the home forces had already been reduced several times. Accusations that the army was overfed continued to be made, and in order to resist the demands for further cuts, Cathcart was detailed to draw up a plan for "direct measurements of the energy expended by the soldier in training to enable his food requirements to be stated with precision and so settle the question as to the irreducible minimum of the ration." (5)

This work was carried out by Cathcart, in collaboration with John Boyd Orr, who had studied and conducted research in collaboration with Cathcart in Glasgow in the early 1910s. Just before the war Orr had been appointed researcher at the newly-established nutrition laboratory in Aberdeen. This was to become the Rowett Research Institute and Orr, its first director. Since 1914 Orr had been serving with the R.A.M.C. and then in the Navy. He was seconded back to the army to assist Cathcart.

Cathcart and Orr's studies involved 16 soldiers at two training camps. The Douglas-Haldane method was used for measuring energy expenditure of most of the activities engaged in during training. These included sitting, standing at attention and at ease, marching, performing various kinds of drill, and participating in a range of exercises including musketry, bayonet, assault, bombing and entrenching practice. The experiments were carried out in the field while the subjects were participating in training with the other members of their squads.

The estimates of energy expenditure during the various activities, along with the estimates of energy expenditure during sleeping, eating, cleaning, free time etc. and data on the physique of recruits and their weight change during training, were used to produce estimates of total energy expenditure. It was suggested that the ration provided a slight surplus for the young and a slight deficit for the mature recruit.

Cathcart became involved with a second series of experiments using indirect calorimetry just after the war. This was the result of observations that troops wearing 1914-issue equipment needed to keep their belts uncomfortably tight, because of the way the weight of the equipment was distributed. Cathcart was asked to study the equipment and to suggest how it could be improved. He carried out this work with N. V. Lothian, an R.A.M.C. officer who had taken his medical degree in Glasgow shortly before the war. Cathcart and Lothian measured the energy requirements of troops wearing different types of equipment. They claimed that the modifications which they favoured would allow a saving of 533 food calories for each man carrying his equipment for 2 hours a day, or a dramatic saving of 8,000,000 calories per day for a division of 15,000 men. (6)

In 1919 Cathcart was appointed to the Chair of Physiological Chemistry in Glasgow, but he continued to be involved with the physiological needs of the army through membership of the newly-created Army Hygiene Advisory Committee, which first met in September 1919. Cathcart served on the committee for the following 25 years.

The remit of the Army Hygiene Advisory Committee included a wide range of business, such as the facilities at Army Hospitals, other medical and sanitary questions, the organisation and direction of research, and technical questions including food requirements, clothing and equipment. It was soon agreed that research projects to be undertaken would include a study of energy expenditure during marching "particularly as regards place in the column, the effect of pace and of wind direction and force (7) and a study of the most economic load to be carried by the soldier. These were matters which Cathcart and Orr had highlighted as areas for future research.

On the question of the optimal rate of marching, Cathcart soon produced, with Lothian and Major Greenwood, a statistician, a preliminary communication which was published in the *Journal of the Royal Army Medical Corps*. This consisted of a critical review of the pronouncements of continental and American workers and an analysis of data obtained during the course of the study of equipment. In conclusion Cathcart, Lothian and Greenwood emphasised the need for further enquiries:

> A principal object of this note is to call attention to the fact that in this branch of physiology zeal often outruns discretion. With the help of a little algebra and some drawing paper, it is quite easy to construct mathematical hypotheses, which will invest experimental data with a seductive appearance of mathematical precision, and bring them to the support of a great variety of physiological hypotheses . . . Yet the problem here touched upon is not only of great practical importance, but evidently capable of solution. (8)

However, the Army Hygiene Advisory Committee, when reviewing the progress of the work under Cathcart's supervision, decided that the primary concern was not the rate of marching but the question of the most economic load for an infantryman. (9) As the overburdening of soldiers during the Great War had been much-commented upon, optimum load was perhaps

thought to be the more urgent and more basic issue. And although army regulations did include clauses concerning the rate of marching, it was perhaps thought that load carried was more susceptible to bureaucratic control, as it was connected with regulations governing the issue of kit. It was agreed that the economic load would be investigated in Glasgow by two R.A.M.C. Officers under Cathcart's direction.

The Army General Staff were certainly anxious for a recommendation on the matter of the maximum weight that soldiers should be expected to carry, and they could not wait for the results of Cathcart's research. On the basis of a lengthy discussion of the Committee in February 1921, it was therefore decided to recommend that the maximum load should be no more than one-third of body weight, that the minimum weight of recruits should be 112 lb., and that they should be at least 120 lb. on completion of training. (10) This recommendation did not find favour with the Deputy Chief of the Imperial General Staff and so a large part of the next meeting was taken up with discussing the question again. The Chairman, Colonel W. W. O. Beveridge, presented a historical survey of loads carried by infantrymen which had been prepared by Lothian. Lothian argued against the view that in the past infantrymen had achieved great feats while carrying very large loads. In many of the cases, it was argued, much of the kit had been shed before the action in question, or else it had been carried by camp followers. Lothian also argued that historically the division of foot soldiers into light and heavy infantry had occurred precisely because of the problem of heavy loads. If the General Staff were unable to accept the Committee's recommendation that the maximum load should be one-third of body weight, then they should consider reintroducing light and heavy infantry, or develop cross-country tractors for carrying kit. (11)

Cathcart's work on the maximum load to be carried by a soldier was published in 1923. The introductory section argued for the strategic military importance of the research:

> . . . it is no more possible to conduct war without casualties than to make an omelette without breaking eggs, yet the wastage of war is just as great behind the lines as in the front trenches . . . (12)

It was pointed out that making soldiers carry excessive loads leads to fatigue and low morale and also increases food requirements and the problems faced by the Quartermaster General. In addition, as a result of the "overloaded man" becoming a "physical wreck before he is even near the front line" another pensioner "is added to the country's post-war burden and the A.G. [Adjutant General] has to find a new man for the line." (13) For these reasons, it was argued that it was necessary to establish "the maximum load which may be transported by a man who can yet remain an effective soldier". It was claimed that ". . . on this capacity of the man to remain effective will pivot all possible plans for effective action drawn up by the general staff." (14)

The R.A.M.C. Officers, D. T. Richardson and W. Campbell, not only carried out the analyses and calculations, but also took it in turns to do the marching. They marched around one of the laboratories – 27 circuits for each kilometre. Experiments were not only conducted on optimal load, but some data on rate of marching were also obtained. Energy expenditure was measured during marches:

1) at a constant rate as the load was increased or decreased between 25 and 65 percent of body weight in five percent increments or decrements;
2) at four different speeds from very slow to fast using loads of 35, 40 and 45 per cent body weight;
3) at constant speed but using three different lengths of stride from short to long, and loads of 35, 40 and 45 per cent;
4) with or without rest pauses.

The subjects were also asked to march up and down a corridor until they were exhausted, with or without rest, and with varying loads. Various tests to assess the effects of fatigue were

applied. For example, an attempt to assess tremor after marching was made by asking the subjects to point a rifle, to which a bristle had been attached, at a piece of smoked paper.

It was concluded that the maximum economic load was about 40 percent of body weight or 54 lb. for the average soldier of 135 lb., and maximum economic speed about eighty metres per minute. Since clothing would account for about 14 lb., this meant the maximum weight of equipment for the average soldier should be 41 lb. However, it was pointed out that these results were obtained in the laboratory while in the field there were variations in country, foot grip and weather to consider. It was considered, for example, that rainwater and mud could add up to 34 lb., and, in view of this, one tentative practical conclusion was drawn:

> We think, if we may be permitted to make the suggestion, that the heavy greatcoat, which is also a sponge, might be the first portion of the clothing to be dispensed with in a war equipment and a more effective and lighter substitute provided. (15)

The Army Hygiene Advisory Committee agreed that Cathcart's Report was a vindication of the "traditional view" that ". . . a soldier should not carry in the field a greater load than one third of his body weight . . .". Thus, despite the grand claims made in the introduction to the report as to the strategic importance of the research, Cathcart, Richardson and Campbell had expended a tremendous amount of effort in simply confirming a recommendation that the Committee had already arrived at by other means.

After the publication of this report, Cathcart's involvement in the Army Hygiene Committee led to no further R.A.M.C.-sponsored research in his laboratory. However, Richardson and Campbell worked together on a project on energy expenditure of soldiers in India (16) and later Richardson supervised a comparison of different types of stretcher sling, (17) and initiated study of a new system of physical training. (18) These studies all used the Douglas-Haldane technique. In a study reminiscent of Taylor's classic work, Captain A. G. Stevenson, who had worked with Cathcart in the early 1920s, (19) carried out experiments on shovelling and picking for the Army Hygiene Advisory Committee. Energy expenditure was measured while such factors as length of working period and rest pauses, throws per minute, and shovel load were varied. (20) Captain D. G. Cheyne conducted experiments following-up Cathcart and Lothian's work on methods of carrying kit. Cheyne's modifications were designed to allow soldiers to carry their packs higher on their backs, and produced a similar energy saving to that claimed by Cathcart and Lothian. (21)

Although no further research projects were carried out under Cathcart for the Army Hygiene Advisory Committee, Cathcart continued to provide advice on a variety of matters. For example, his opinion was often sought on the physiological suitability of new clothing. In 1924 Cathcart was issued with samples of new boots and asked to comment upon their suitability from "the physiological aspect". He reported that ". . . the 'toe cap' should be shorter in order to provide as much flexible material as possible between the toes and the instep . . .". (22)

During the 1930s Cathcart was again asked to advise on the suitability of some new boots. How he arrived at such advice aroused the curiosity of a student and colleague, Eldred Walls, now Professor Walls. Walls recalled that when he questioned Cathcart, Cathcart replied "I've been wearing them for three months – I'm going to wear them for six and then my report will go in." (23) It should be noted that army boots were not particularly out-of-keeping with Cathcart's usual attire, for it was his habit to wear an old khaki army tunic in the lab. (24)

That personal experience became an important element in Cathcart's advice is confirmed by the records of his comments at Army Hygiene Advisory Committee meetings. During a discussion on underclothing in 1932 he remarked that wool was valuable when heavy underclothing was required, but continued:

> I have not worn wool for years. I think that probably a mixture of silk and cotton is the most comfortable . . . Linen and cotton are almost

> equally good, but for hard wearing cotton is the best of all. It is a fetish that wool is essential. (25)

Remarks made during a discussion of the relative merits of baths and showers further illustrate the importance that Cathcart attached to personal factors rather than strictly scientific considerations. Showers, the evidence suggested, would be both more economical and hygienic than baths. Cathcart remarked however that he could understand why the men felt the need for a good "soak". (26)

Discussion

The story of Edward Cathcart's involvement in the provision of physiological advice to the army appears to be one in which attempts to base advice upon precise, physiological measurements were progressively replaced by pragmatic, commonsensical approaches to problems. The apparent shift in Cathcart's approach cannot be explained simply in terms of a response to financial stringency – there is no evidence that Cathcart made any attempts to obtain support for further projects which were rejected. At a meeting of the Advisory Committee in April 1930 problems for future research were discussed, but it appears from the minutes that Cathcart made no suggestions. (27)

One possible explanation is that as time went on, Cathcart became so preoccupied with his duties as a senior member of the medical faculty, and as a scientific and medical statesman in wider arenas, that he just did not have the time to supervise any further studies for the military. When Benedict revisited the Institute of Physiology in 1929 his impression of Cathcart was quite different to that of twenty years earlier:

> I have an idea that he [Cathcart] is now embarking on an administrative life and that the amount of research that can be expected from him will be very little. It is a great pity, because he is pre-eminently qualified for research work. (28)

In 1928 Cathcart had succeeded Paton as Regius Professor of Physiology and Cathcart was member of a wide range of outside bodies. But this also probably does not provide the whole of the explanation. Paton, for example, had managed to combine a range of outside commitments with the supervision of what, at one time, was a minor Glaswegian industry - research into the aetiology of rickets.

It may be relevant that decisions on the questions on which Cathcart did conduct military research, were not made on the basis of the results of the research. As has been seen, the advice on load-carrying was based more upon an analysis of the history of military campaigns dating back to ancient times. And the defence against calls for cuts in the rations of recruits in training was based upon *ad hoc* surveys of current practice and calculations based on previous research. This latter issue was decided long before the results of Cathcart and Orr's experiments were available.

However, further light is shed upon the question of why, after the early 1920s, Cathcart failed to pursue a programme of research in military physiology, if his overall philosophical and ideological commitments are considered. In an unpublished lecture to students, dated 1907, Cathcart argued vehemently against mechanistic approaches to problems. He declared:

> No calf of gold in the wilderness ever led the children of Israel further astray than the laudation and worship of mechanism and all that it implies leads the wanderers of to-day . . . what are we doing today in all our schools of light and learning? Training up our students in mechanical ways welding more perfectly the chains of convention and of servitude . . . Personally I cannot see what is to be gained from the

> tremendous development on the mechanistic side. The love which many of these minds possess for the reduction of all phenomena to mutations of physico chemical laws. It is almost appalling. (29)

Cathcart recommended to his students that for a "scathing and entertaining account of the dangers of mechanism" they should read Samuel Butler's satire *Erewhon.* During the interwar period Cathcart frequently returned to themes such as these. For example, in the opening pages of a book entitled *The Human Factor in Industry,* which was based on lectures which Cathcart had given to engineering students, he remarked:

> Despite the rapid increase in automatic machinery we are still fortunately far from the day . . . when man will be reduced to a mere "machine-tickling aphid". When all is said and done, man is and must always be the variable in every calculation involved in industrial production, and he will remain to the end the most interesting factor in industry, for, whatever may be his faults as a worker, he is a sentient being. (30)

The phrase "machine-tickling aphid" comes from Butler's book which tells a story of an explorer's adventures in a lost civilisation in which all machinery had been destroyed, after a book was published arguing that machines were taking over. Butler quotes the author of the "Book of Machines" asking whether, eventually, "May not man himself become a sort of parasite upon the machines? An affectionate machine-tickling aphid?" (31)

The supposed application of modern physiological and nutritional knowledge to the affairs of the armed forces and industry during the early twentieth century is often seen by social theorists and historians as indicative of the dawning of a new era in which debates and practices about such matters were transformed by the aggressive colonisation of innovative scientific professions and disciplines. Bryan Turner, for example, concluded an article with these remarks about the science of dietetics of the twentieth century:

> In Britain, scientific interest in measuring the effects of calories intake on human energy out-put was associated with research into the nutritional requirements of prisoners and soldiers, namely the combination of a minimum diet with maximum energy production . . . [And] the impact of war conditions . . . generated the need for industrial research and economic production. (32)

Behind such studies, Turner continued

> . . . we can detect the metaphor of the human body as a machine . . . The body is . . . informed by . . . by calories and protein so that discipline and efficiency can be measured with precision and certainty. (33)

However, if we consider the concrete case of the military physiology and nutrition of Edward Cathcart, we find that the constant emphasis is in quite the opposite direction – upon the imprecision and uncertainty of the scientific data And it should be emphasised that Cathcart cannot be considered to be a marginal figure. The Army Hygiene Advisory Committee is only one of several important bodies concerned with nutritional and physiological research upon which Cathcart served during the inter-war period. He chaired the Nutrition Committee of the Medical Research Council from 1921 to 1933, and the Physiology of Muscular Work Committee of the Industrial Health Research Board from 1926 to 1937. He was a member of the Industrial Health Research Board from 1926, and Chairman from 1933 to 1940. The emphasis upon imprecision and uncertainty is just as prominent in Cathcart's writings connected with these other activities.

In conclusion, in spite of Benedict and Cathcart's remarks about scientific management in 1913, Cathcart's military physiology should not be seen as an enthusiastic attempt to develop

a physiological variant of military Taylorism. Rather, it seems likely that his practical wartime and early post-war experience helped to lead Cathcart back to his earlier anti-mechanistic standpoint, from which he celebrated the differences between men and machines, emphasised the importance of personal experience, and warned of dangers of men becoming "machine tickling aphids".

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Dr. Smith's paper was followed by one from Dr. Francis McKee on the popularisation of milk as a beverage.

THE POPULARISATION OF MILK AS A BEVERAGE IN THE 1930s

Today we tend to take milk's status as a beverage for granted and we are surprised that milk only attained this distinction in the 1930s. Our culture associates milk with purity, health and goodness – deep associations rooted no doubt in milk's whiteness and the childhood bond of breastfeeding. These associations have a mythic status in Northern Europe and in American society, where milk is an important element in national diet. In Britain, at the turn of the century, however, milk was regarded with suspicion and distaste. Milk's popularisation as a beverage in the thirties was partly based on the rehabilitation of its mythic status in the eyes of the public and in order to understand why milk's image had become so tarnished it is useful to consider its early history.

Firstly, it must be remembered that 'milk' could as easily refer to ewe's milk or goat's milk until the mid-eighteenth century. These types of milk were eventually eclipsed by the popularity of cow's milk which was considered the most tasty and possibly, too, because cattle proved more profitable to keep. Although cow's milk superseded the others in lowland Britain it took much longer for Scotland, Northern England and Wales to follow suit.

Secondly, by the late seventeenth century a division had sprung up between the milk supplies for growing towns and the availability of milk in the countryside. Enclosure of grazing land reduced the number of milch cows kept by country labourers who increasingly turned to ale as a beverage and only tasted dairy products such as butter and cheese. In the towns and cities, which were now too large for the inhabitants to walk out to the surrounding countryside for milk, dairy shops and town dairies were set up. A dairy shop would supply milk and dairy products on the premises while also sending milkmaids through the streets with pails slung on yokes. Town dairies housed cattle close to the town centres where conditions were usually cramped and unhygienic. The cows were generally confined and fed on brewer's grains, cabbage and bean shells. Milkmen in the towns were frequently accused of watering the product and the milk carried through the streets in open pails inevitably absorbed the filth of the towns. To counter this, cows were often driven through the streets and milk could be bought directly from the udder – in London, a herd grazed on St. James' Park for this purpose. By the late nineteenth century, the railroads enabled farmers to transport their milk to the cities and closed milk churns on perambulators were used to deliver the milk to the customer's door.

The poor conditions of town dairies and the lack of hygiene control on rural farms still, however, meant a persistently dirty supply of milk which often carried disease. Clean, fresh milk remained a relative luxury in the towns at this time. The poor either went without or substituted the cheaper canned, condensed milk which was increasingly available towards the end of the century.

Pasteur's work in the 1850s had revealed the dangers of disease which could be transmitted through small amounts of dirt in milk. Pasteurization, however, was still not universally

accepted in Britain at this time and, indeed, it was still regarded with distrust in many quarters. Opponents of the process thought that it was simply a means of making dirty milk saleable and maximising the farmers' profits.

This at least was a rational argument. Other objections were deeply rooted in superstitions surrounding the life-giving force of milk. These objections are probably found in their most extreme form of expression in the work of Harlow Davis, an American health guru at the beginning of the twentieth century. Davis declared mother's milk essential to the physiological and psychological development of a child, and he claimed that this potency was rooted in the fact that milk was a living ferment. 'It is,' he declared, 'the presence of this occult influence in the mother's Milk which makes any adequate substitute for it impossible.' He went on to celebrate the value of cow's milk for consumptive patients, saying the milk should be drunk before the magnetic warmth of the cow has left it. He states that

> Every glass of Milk which is drunk by the patient while it is yet warm from the cow, is equivalent in nourishing and stimulating qualities to a glass of blood . . . One glass of the naturally warm Milk will give more vitality than a quart or more of milk which has lost its natural warmth. This is owing to Milk straight from the udder teeming with electricity, or animal magnetism, which is in reality a form of liquid life.

Davis' rhetoric is the more extreme form of a generally held suspicion at the time. The public believed in the natural goodness of milk – a recent survey of children's books at the turn of the century finds bread and milk constantly used as a reward for the good and the pure – and pasteurisation was still perceived by many as unwelcome tampering with nature. This perception was exacerbated by the consumers' suspicion of the farmers and milkmen who had for so long presented the customer with watered and contaminated versions of milk. In these conditions the ideal of milk as a good, pure, natural, and lifegiving beverage was barely kept alive.

In the early decades of this century, however, a combination of social and scientific forces was to restore the reputation of milk and elevate it to the status of a staple of the nation. Central to this change was the work of nutritionists and, in particular, nutritionists in Scotland. The first blow in this campaign was the publication in July 1928 of a report by Boyd Orr of the Rowett Research Institute in Aberdeen on experiments involving the supply of milk to schoolchildren. Orr was continuing the work of Dr. Cory Mann of the MRC who had shown that extra milk had been of benefit to schoolboys who received it in addition to a good diet. Mann's research had raised further questions such as which constituent of milk had produced the increase in weight and height of the boys he used in the experiments and how did the milk relate to the rest of the diet the boys were on.

Funded by the Empire Marketing Board, Orr carried out a series of experiments to test the nutritive value of whole milk, separated milk and a control food of equal calorific value. Using seven centres around Scotland and approximately 1400 children whose ages ranged from five to fourteen, Orr discovered that there was a clear correlation between an added milk diet and extra growth in the height of the children. The experiments allowed him to formulate three important conclusions:

1) An added milk diet provided an increase in the height and weight of those children who received it which was calculated at 20% more than those children who received no milk.
2) This increase was accompanied by a general improvement in the children's condition.
3) Separated milk proved to be as capable of producing these results as whole milk.

Although this report made a significant contribution to milk's reputation as a necessary part of the human diet, it could only have a sustained impact if the issue of dairy hygiene was resolved. Orr suggested that this could be done by improving the condition of the dairy herds

and the conditions in which the milk was collected. This improvement was to be allied to an effective policy of pasteurisation. A new ideal was thus articulated – 'clean milk from healthy, tested herds'.

Later the same year, steps were taken to tackle this problem when the Hannah Dairy Research Institute was founded. The Institute was to be sited on the Auchincruive estate of J. M. Hannah of Girvan in Ayr. This estate was also to be the home for the dairy school and experiment farm of the West of Scotland Agricultural College. The Hannah Institute was funded by a combination of public and private grants, determined by the Development Commission's policy which stated that one-third of the Institute's maintenance was to be provided by a non-government source. The Highland and Agricultural Society in Edinburgh voted a sum of £250 per annum to cover this cost and announced that the new "Hannah Dairy Research Institute" would first inquire into the occurrence of tuberculosis in dairy herds. This investigation was to assess the scale of the problem and the value of tuberculin tests on the herds.

Although the Institute didn't actually open on site in Ayr until 1931, research began immediately. The Institute's first bulletin, 'Surplus Milk and Milk Residues', was published in 1928. Written by one of the Institute's researchers, Archibald MacNeilage, the bulletin again addressed the subject of milk and the dairy industry in Scotland, pointing out that almost 25% of the country's supply of separated milk and 75% of whey were currently running to waste as by-products of the manufacture of cheese and butter. E. P. Cathcart, the interim director of the Institute at this time summed up the situation in his preface to the report, saying

> If these residues were devoid of food value there would be little object in effecting their recovery. But each of these residues has a considerable value as a food.

Cathcart went on to stress the commercial potential of separated milk, pointing out that £3,000,000 worth of condensed, separated milk was being imported annually into Britain at that time. Scotland's wasted milk, he argued, would be sufficient to provide the whole of Scotland's imported condensed milk.

In 1929, Dr. Norman Wright became Director of the Hannah Institute and published an article in The British Medical Journal which complemented the findings of Orr and MacNeilage. Wright reported that Glasgow Corporation's hospitals had been using milk supplied only from tuberculin-tested herds of cattle for a period of two years. Within that time not one sample out of 550 examined was found to be infected. In the previous years, 1921-26, the hospitals had used herds which were not tuberculin-tested and out of 923 samples 28 were found to be infected. The implications for the public were worrying. Wright acknowledged that pasteurisation would reduce the risk of tubercle-infected milk but he pointed out that at that time in Glasgow, for instance, only 30% of the public's milk supply was pasteurized.

Taken together, the findings of Orr, MacNeilage and Wright gave a clear indication of the future of milk as a national beverage. Orr's experiments demonstrated the physical benefits of milk as a central element of the human diet. MacNeilage's work underlined the commercial possibilities of the milk supply and Wright's investigations proved that a reliable clean supply of milk could be created. The combination of these arguments made milk a vital issue in national food production.

The battle to establish milk as a national beverage, however, had only begun. While it was one thing to point out the nutritional advantages of the increased consumption of clean milk, it was another to actually achieve this increase and ensure the cleanliness of the milk.

One of the greatest obstacles was economic. MacNeilage had struck a nerve with his evidence of large-scale wastage and lost profits from separated milk. His results were seen as 'a serious charge against the traditional thriftiness of the average Scots farmer' and accounts of his report were often prefaced by headlines such as 'Curd and Whey are Wasted in Thrifty Scotia'.

Attempts to rectify the situation and to capitalize on the potential of separated milk were slower to materialize. The cost for farmers at this time may have been prohibitive and the technology might also have been too experimental – a research factory for transforming whey into powder was still at an early stage in Bladen, Dorsetshire in 1930.

More importantly, perhaps, was the question of the pricing of milk and the cost to farmers of pasteurisation. On the latter issue, farmers were unwilling to invest quickly in new technology until pasteurization was proved to be beneficial beyond any shadow of a doubt. The smaller, casual produce retailers of milk, in particular, were worried that they would be squeezed out of business. Norman Wright of the Hannah Institute argued that in America and Canada the compulsory pasteurization of milk had greatly lessened public fears of infection and provided the farmer with a stable market for his product. In addition, he noted the survival of many small dealers who adapted by either installing smallscale plants, co-operating with larger plants or buying from larger businesses.

Farmers, however, argued that compulsory pasteurisation was unnecessarily expensive as there was not sufficient consumer demand for it. This point constantly came up when farmers replied to accusations of contributing to tuberculosis in children. In 1932, for instance, Scottish Farmers issued a statement on this subject saying

> The public are to blame to the extent of refusing to buy specially purified and tested grades of milk, which are, of course, dearer than raw milk.

The farmers went on to claim that the real problem was not the adulteration of milk but the adulteration of language used in the pasteurisation controversy. This was not a completely facetious argument. The Scottish Milk Marketing Scheme at that time had graded milk as 'Certified', 'Tuberculin-Tested or TT' and 'Grade A'. 'Grade A' was untested milk and thus the highest risk product of the three but its name, suggesting excellence, caused much confusion at the time.

The question of price, however, was the more sensitive issue. Attempts in Scotland to control the price of milk by the Scottish Milk Agency were foundering. In order to bring more stability to the price of liquid milk the government introduced the Agricultural Acts in 1931 and 1933. These Acts led to the formation of a Milk Marketing Board for England and Wales and a separate board for Scotland.

In order to provide cheaper milk for children various schemes were introduced to supply milk in schools. The National Milk Publicity Council began to develop the sale of milk in schools as early as 1929 when they offered one third of a pint bottles of milk to schools in the London Metropolitan area at a cost of a penny per bottle and free to 'necessitous children'. By 1931 this scheme had grown to provide milk for over 500,000 children and the Council were beginning to think of extending the scheme to factories. This scheme had the advantage of addressing the issues raised by Boyd Orr's 1928 report on the nutritional potential of milk for children while also distributing surplus milk supplies. The publicity value of the scheme was also significant in such a time of recession. In the long term, however, the advantages to the dairy industry were immense. By providing milk for school children, the Council were nurturing a generation who would grow up to think of milk-drinking as a nutritious and commonplace habit. In 1934 these schemes were superseded when the Milk Act was introduced, making milk available to children at a price subsidised by the government and the Milk Marketing Boards.

Despite the progress of the Milk Marketing Boards and the school milk schemes, the controversy over pasteurisation continued throughout the thirties. The arguments that milk lost some of its natural qualities when pasteurized remained a strong weapon. Reference was frequently made to an incident in Montreal in 1927 when 450-500 people died in an epidemic of typhoid fever which was traced to milk supplied from a dairy which practised pasteurization. Farmers referred to medical authorities who claimed that the population was immunised from

tuberculosis through limited exposure to it in the milk supply. It was claimed that by supplying tubercle-free milk to children, the government was rearing a new generation that would be highly vulnerable to tuberculosis from other sources. Many of the arguments against pasteurisation functioned more at the level of fear and superstition than of reason and were therefore all the harder to dislodge.

Proving scientifically that tuberculin-tested herds and pasteurisation ensured clean, reliable milk was not enough by itself to persuade the public to enshrine milk in the rank of national beverages. And while the school milk schemes and the Milk Act was sowing seeds for future generations more needed to be done to convince the adult population.

One of the most successful steps in the promotion of milk was the alliance of its traditional, mythic associations of purity and goodness with the futuristic, clinical domain of the scientific laboratory. This alliance both assuaged public fears over contamination and rehabilitated the image of milk.

Take, for example, an article in the *Aberdeen Press and Journal* in 1932 by the Head of the Dairy Department of the Duthie Experimental Stock Farm of the Rowett Institute. He describes the dairy byre as follows:

> The floors, walls, and roofs of dairy byres are kept thoroughly clean. The cows are fed at least half an hour before milking. To ensure efficient grooming the long hairs on tails and udders are clipped. Before milking the udders and teats of every cow are thoroughly cleansed with a clean damp cloth . . .
>
> All persons employed in or about a dairy keep their clothing at all times in a thoroughly clean condition and wear clean overalls and caps during the milking of the cows . . . the hands and forearms of the milkers are thoroughly cleansed and dried before milking is begun, and are kept clean throughout milking.

The key word here is 'thoroughly', repeated constantly to emphasize the purging of dirt from this environment. The strenuous efforts to banish dust recall the laboratory and the operating theatre. Milk is elevated from the muck of the Victorian byre to the world of twentieth-century science.

In another newspaper report milk is linked in the reader's mind with the periodic table and through association is lifted from the stink of the farm to the realm of science and technology:

> Seven surprising elements have been found in cow's milk. They are substances never before identified in the lacteal fluid.
>
> One of them is strontium, which is the base of the red fire of [fireworks]. Another is titanium, an element that supplied the smoke screens of the World War. Vanadium, well known in building and commerce; lithium,which has lent its name to some kinds of springs, and silicon, one of the main constituents of the earth's crust, are among the finds.
>
> . . . The milk was dried, burned to ashes and sufficient electric current applied to the ash to convert it into luminescent vapor. By this light, photographic plates registered the spectra, the lines of which revealed the presence of the elements.

This final passage of the article, while describing an actual scientific process, presents a striking image of milk's demise and its phoenix-like revival from the ashes as a pure, scientific subject. Such articles severed milk's long-standing association with impurities and helped to reactivate its primitive image of vitality. These kinds of comparisons were not limited to the

dairy industry alone and must be seen within a wider context of the transformation of the kitchen and the public's concept of diet. An extreme example of this sea-change can be found in the Cookbook written by the Italian Futurist artist, Filippo Tommaso Marinetti in 1930. Intoxicated by the technological achievements of the early twentieth century, Marinetti and other Futurists attempted to extend the machine age to diet and cookery. Their greatest enemy was the stodgy, calorie-laden receipts of nineteenth-century cooking. Marinetti suggested that 'In all social classes meals will be less frequent but perfect in their daily provision of equivalent nutrients'. He went on to argue that to revolutionize the kitchen and create the perfect meal the following devices should be installed

> A battery of scientific instruments in the kitchen: ozonizers to give liquids and foods the perfume of ozone, ultra-violet ray lamps (since many foods when irradiated with ultra-violet rays acquire active properties, become more assimilable, preventing rickets in young children, etc.), electrolyzers to decompose juices and extracts, etc. in such a way as to obtain from a known product a new product with new properties, colloidal mills to pulverize flours, dried fruits, drugs, etc.; atmospheric and vacuum stills, centrifugal autoclaves, dialyzers. The use of these appliances will have to be scientific, avoiding the typical error of cooking foods under steam pressure, which provokes the destruction of active substances (vitamins etc.) because of the high temperatures. [Marinetti, 1930]

Obviously the *Futurist Cookbook* was not entirely serious and its readership would have been limited to a small avant-garde clique. It is clear from the passage, however, that Marinetti is combining food and technology in the light of nutrition science. He is, in fact, absorbing the nutritionist into his pantheon of new gods for the machine-age.

While it would be foolish to make any claims for Marinetti's *Cookbook* as a direct influence on the popularisation of milk as a beverage in Britain, he does provide a background for other design elements which did play a significant role in the story. In particular, the development of the ice-cream parlour, the café and the milk bar.

In 1929, at the annual meeting of the Scottish National Milk and Health Association, a resolution was passed calling for the introduction of a statutory standard for ice-cream. They argued that

> One of the most important things they had to do if they were to get people to eat ice-cream, was for the Government to fix a standard for ice-cream the same as they had for milk. Then the public would have faith in their ice-cream and know that it contained a valuable food and nothing else.

This was a significant step forward for ice-cream in Scotland. The resolution of the Milk and Health Association was not simply a call for a standard ice-cream, it was also – finally – a recognition of ice-cream as a respectable commodity. Throughout the 1900s ice-cream had been closely linked to the story of Italian immigration into Britain and, in particular into Scotland. One of the ways in which Italians made a living here in the late nineteenth century was through the street-vending of ice-cream. By the 1900s the vendors had graduated to small ice-cream and aerated water shops, sweet shops as they would be known today. The rapid spread of these shops met with severe opposition from the authorities and they gained a reputation for notoriety in the press which was fuelled by a whisky trade already fearful that the temperance movement could damage their business.

Riding on a wave of Temperance reform at this time, the enterprising Kate Cranston had opened a series of tea rooms in Glasgow, providing an elegant alternative to pubs for the middle-classes. Rennie Mackintosh's Japanese-influenced designs provided the city with a

series of cafe interiors that transformed the notion of public eating in Glasgow – the best remaining example of this being the Willow Tea-Rooms in Sauchiehall Street. Tea and other refreshments were no longer to be taken only on a functional level in dull, unimaginative surroundings. In Miss Cranston's rooms, public eating had become an adventure. Glasgow, a city which had for so long accepted the strictures of presbyterianism, was beginning to enjoy itself. Both its prosperous middle-classes and its large workforce were seeking new entertainments – cinemas were opening, music-halls and dance-halls flourished.

It was in this context that the Italians brought ice-cream shops to the attention of the Glasgow public. The immigrant owners of the shops must have been surprised by the hostility they faced in the early years of ice-cream in the city. The conservative forces that controlled the city were already made anxious by the growing entertainment industry in Glasgow. For them, the Italian ice-cream shops epitomised the evil of luxury being smuggled into the souls of Glaswegians. The Italians were very obviously Roman Catholics, 'aliens' or foreigners, Sunday traders, and finally, they were purveyors of ice-cream. When all of these attributes were linked to the sale of something so obviously luxurious, unnecessary, unsanitary and ephemeral as ice-cream the forces of conservatism had found the embodiment of all they feared.

Throughout the 1900s the press constantly reported on the evils of these 'Ice-Cream Hells' and the police after several nationwide conferences on the subject, led a series of prosecutions against the Italian shopkeepers for late-opening, Sunday trading, shebeening and gambling. A *Glasgow Herald* account of one of these prosecutions reveals the image of ice-cream which was being created at this time as it records the evidence given by the policemen involved in the case:

> Sergeant Spence, of the Northern District, speaking of the behaviour of the boys and girls who frequented the ice-cream shops, stated that they were in the habit of smoking cigarettes and dancing to music supplied by a mouth organ, while the language was more forcible than polite . . . witness added that he had seen the boys and girls kissing and smoking and cuddling away at each other . . . Detective Young, Northern Division, stated that he had known many little girls . . . about twelve or thirteen years of age who had since been before the Magistrates, and were now prostitutes. The boys who had accompanied them as girls were now living off them, and were going out acting as their bullies at night. [The judges asks]. Do you ask us to believe that the downfall of these women was due to ice-cream shops? [Answer]. I believe it is.

The luxurious attributions of ice-cream were here being linked to a grim image of shops that acted as universities of crime. The shopkeepers attempted to fight this smear by founding their own society which developed close ties to the Temperance Movement. They brought their complaints to the House of Lords, though without success. Throughout Scotland the reputation and image of ice-cream remained tainted and the prosecutions continued.

The resolution of the Milk and Health Association, then, was also aimed at rehabilitating ice-cream in the eyes of the public. Their efforts were accompanied by a gradual change in the design of the buildings in which ice-cream was sold. The cafes and ice-cream parlours became futurist temples of cleanliness, with bright stainless steel, polished marble, glass, and myriad reflecting surfaces (Nardini's in Largs remains as testimony to this even today). Ice-cream itself was served in more elaborate forms such as Sundaes or in a variety of cones and wafers.

The other related phenomenon is that of the rise of the milk bar in the 1930s. At a meeting of the League of Nations Mixed Committee on Nutrition in 1937, Lord Astor claimed that while milk bars were unknown in England only a few years before, now over 600 had sprung up during the previous twelve months. These establishments were also gleaming, reflective temples of health. Their popularity seemed to demonstrate the success of the campaigns to

encourage the recognition of milk as an enjoyable beverage in its own right. Part of their appeal was their American style and, indeed, running through all the milk campaigners rhetoric is the image of America as the model for British milk consumption. The fresh, hearty image of the New World could be used to offer a precedent for a healthier lifestyle which would encourage adults embarrassed to be seen consuming a drink previously thought to be for children. A *Sunday Post* article, for instance, uses this ploy to promote milk as a temperance beverage:

> I went into a cafeteria in Washington one day, and saw a man drinking a rather attractive-looking cocktail. I had never seen one quite like it, and, being curious, I called over the waitress and told her to bring me one.
>
> When she brought it there was a ghost of a smile on her face.
>
> I lifted the glass and took a good pull at it. It was milk. The Americans are great milk drinkers. They average a quart a day. The men will go into a bar and order a glass of milk without a blush, drink it, and walk out again with their heads held high.

The milk bar is sanctioned by the example of America and all of the New World's vigour, drive and wealth. If American men can drink it without shame then it must be a manly enough drink for the British, or so the argument ran. The problem for advocates of milk was its age-old associations with mothers milk, children and the sick. In a leader column devoted to milk bars in 1936, The Times confronts this problem pointing out first that the new establishments were termed 'bars' to make them sound as manly as pubs. The editor writes,

> "Parlour" springs to the mind, a suggestive word. But a new venture could hardly prosper under a device with fusty and effeminate associations. The first men who stood at milk bars to consume one of the fifty varieties of non-alcoholic shakes were already victims of taunts from the public house, where "milksop" has naturally revived as a term of abuse.

The milk bars employed two other techniques to simulate the public house experience. Drinks were ordered from a barmaid behind a counter as they were in a pub and the customer paid for the drink as soon as it arrived – a feature which caused much comment at the time.

Secondly, the drinks were given exotic names just like the fashionable alcoholic cocktails of the inter-war period. Customers could buy a 'Bootleggers Punch', a 'Goddess Dream', or a 'Blackberry Cocktail' – all made with milk and costing 4d each.

The bars were almost all built by one syndicate working from London with the intention of opening 500 such establishments across Britain. Known as 'Black and White Milk Bars' because of their decor, the first was opened in July, 1935 at 68 Fleet Street by a clergyman, Canon Sheppard, and The Times noted that

> The new bar is attractively decorated and equipped. A painted landscape covers one wall while the others have a black and white colour scheme. Chromium fittings of various kinds surround the inside of a bar which occupies three sides of a large room. it is intended to serve about 50 different non-alcoholic drinks with milk as a basis . . . the best to be tried ranged from plain Guernsey milk to caramel milk shakes. There were malted milk drinks, yeast milk drinks, lemon and strawberry phosphates, various milk shakes, a milk cocktail, and ice-cream drinks. Milk could be had iced or hot. A special notice informed the company that the glass and silver utensils served had been automatically and thoroughly washed and sterilised.

By April, 1936 there were 10 milk bars in London and the first had just been opened in Glasgow by the chairman of the Scottish Milk Marketing Board, who declared that

> After the issue of peace and war there was no more important issue before the nation at the moment than that of better nutrition, and research had brought the absolute necessity of greater consumption of liquid milk into the forefront of British public affairs.

He went on to promise that a further 10 milk bars would be opened in Glasgow and that the Scottish Milk Marketing Board would prepare a milk shake recipe book for household use, that shakers would be available at the cost of I shilling and that he would like to see a milk bar opened in every school in the city.

The milk bar, however, had little time to take root in the public's imagination before the second world war brought new priorities. The milk shake, however, survived the war to reappear in the flourishing cafe scene of the fifties and sixties. Furthermore, publicity for milk and ice-cream after the war was able to build on the efforts of the thirties which had established milk as a respectable and enjoyable alternative to alcohol.

In conclusion, then, I would argue that the popularisation of milk in the 1930s depended heavily on the rehabilitation of milk's image in the public domain. People wanted to drink more milk at the beginning of the century but were unwilling to do so due to factors such as cost, contamination, and milk dilution. The work of Boyd Orr, MacNeilage and the Hannah Dairy Research Institute allayed public fears of contamination. Nutritional research also succeeded in renewing milk's mythic powers by grafting them onto evolving myths of the high-tech laboratory and the scientist as visionary. It was not just that these scientists and organisations were actively engaged in improving the quality of milk but it was the way in which this work was presented to the public which helped to establish milk as a popular drink. By restoring confidence in the product and attempting to regulate its price, nutritional research and government milk schemes persuaded customers that milk was again safe and worthwhile. It may, however, have been the cafés, milk bars and ice-cream shops that made milk enjoyable again. The Times editorial on milk summed up the milk bar phenomenon saying

> Now the more subtle-minded servants of the public . . . have taken the dullness out of milk. The commonplaces of centuries are given a new radiance. Milk makes you sleep o' nights, gives you a milky complexion, makes muscle, gives you a healthy old age, and makes the toddler king of the castle. What more can men and women want?

THE ONE HUNDRED AND FORTY FIRST ORDINARY MEETING

The One Hundred and Forty First Ordinary Meeting of the Society took place in Glasgow on 18th March 1994. 52 Members and guests attended. In the first paper of the afternoon, Dr. J. F. McHarg posed the interesting question "Was Harvey's historic study of Hugh Montgomery's living heart carried out in Edinburgh ?"

WAS HARVEY'S HISTORIC STUDY OF HUGH MONTGOMERY'S LIVING HEART CARRIED OUT IN EDINBURGH?

William Harvey's study of the living heart of the eighteen-year-old nobleman's son, Hugh Montgomery (on the occasion on which the latter paid a visit to the Court of Charles I), has become famous in the history of medicine.

The young Hugh was son and heir of Hugh, 2nd Viscount Montgomery of the Great Ards in County Down, and grandson of Hugh, the 1st Viscount. The 1st Viscount had been, originally, Sir Hugh Montgomery of Braidstane Castle in the parish of Beith in Ayrshire, and had become renowned for the very large emigration to County Down of men from Ayrshire and Galloway

which he had organised and carried through in 1606. He had rebuilt the old Dominican cloisters at Newtownards as a home for himself, as 'Newtown House', and had had built another house, Mount Alexander House, for his son and heir, at nearby Comber. It had been at Mount Alexander House, at Comber, that the young Hugh, the future 3rd Viscount, had been born in 1623. Eventually, under Charles II, he was to be created 1st Earl Mount Alexander.

The young Hugh Montgomery:-

> 'when he was still a child had a great mishap from an unexpected fall, causing a fracture in the ribs on his left side. The abscess having been brought to a suppuration, a great quantity of putrid matter flowed out and sanies oozed for a long time from the very wide cavity . . . (1)

Through the remarkable hole in the chest wall with which he had been left, one could both see and touch his beating heart. On the occasion on which he had visited the Court the King, on hearing of this astounding phenomenon (thought by some to be miraculous), had instructed Harvey to investigate it and to report his findings. Harvey had obeyed the royal command to investigate the phenomenon but had decided, instead of submitting a written or verbal report, to demonstrate it personally to the King. The King had then himself verified Harvey's finding that one could insert three fingers and a thumb into the hole and touch the living heart without the young man feeling anything untoward.

What has never been clear about this famous clinical study of the living heart has been where the Court had been located at the time. Our knowledge of the study is based upon two accounts. It would seem that it has been widely assumed, tacitly, from these, that the Court had been either in London (Whitehall), or at Oxford, at the time. In 1981, however, Gwenneth Whitteridge (2), (ignoring altogether the claim of Oxford) suggested that Hampton Court was more probable than London while McHarg (3), in the same year, at the tercentenary of the Royal College or Physicians of Edinburgh, tentatively raised, for the first time, the possibility of Edinburgh. Since then, some significant historical and genealogical evidence has been gathered together which would seem to point to the firm exclusion of Oxford and to establish Edinburgh as being at least as possible as, and more probable than, London (Whitehall), or even Hampton Court.

The earlier of the two accounts on which our knowledge of the famous study is based is that by Harvey himself in his 'De Generatione Animalium'. He calls the study 'experimentum hoc admirabile' – which Whitteridge translates as 'this wonderful experiment'. In the setting of that chapter in the book which deals with the insensitivity of the blood (an idea more surprising to Harvey than to us) Harvey writes:

> 'In the meantime, I must not conceal this wonderful experiment from which it will appear that the heart . . . . . is itself insensitive' (4).

Then, after a brief statement of the identity of the young man, and before his actual description of the 'experiment', occur the words which, in Whitteridge's English translation, read as follows:

> "When this young man was about eighteen or nineteen, he travelled through France and Italy and then came to London" (5).

Thus, while Harvey does certainly seem to imply London as the location of the Court at the time, he does not explicitly say so. Moreover, while Harvey is known to have been in the habit of making copious and precise notes of all his scientific observations, it is not certain that his 1641 notes about this unique study were not amongst the notes which, to his intense chagrin, were destroyed when his lodgings in Whitehall were vandalised by the parliamentarians at the start of the Civil War in the following year, 1642. Consequently, it is possible (although admittedly not certain) that his contemporaneous record of the 'wonderful experiment' had to be reconstituted from memory. Certainly, the record was not published until March, 1651, almost ten years after the event itself. Whether or not his original notes were vandalised (and

Keynes expresses confidence that the material for the De Generatione Animalium escaped vandalism) what would have been, for Harvey, the unimportant detail of the location of the Court at the time, may well have been hazily remembered, and as ambiguously recorded as seems, for whatever reason, to be the case.

The later of the two accounts (which is to be found in the Montgomery Manuscripts) (6) purports to be that having the authority of the young Hugh Montgomery himself. This 'Oxford' account represents, however, only what William Montgomery of Rosemount, Hugh Montgomery's much younger cousin, understood himself to have been told, ten years after the event, in 1651, by Hugh Montgomery, no longer so young, and in exile in Leyden. William Montgomery, a student at Leyden at the time, had felt honoured and delighted to have been visited there by his older cousin, Hugh, by then the 3rd Viscount, whom he idolised (7). Moreover, these mere recollections of his cousin's reminiscences on that occasion had not been set down by William Montgomery until between 1696 and 1706 – some sixty years after the event itself – thus allowing ample scope, here also, for imprecision and even error. This account flatly asserts Oxford to have been the venue. Strangely, Sir Geoffrey Keynes, in his definitive 'Life of Harvey' (8), does not even mention this 'Oxford' account. Neither does Whitteridge, although, in the introduction to her translation of the 'De Generatione Animalium', she quotes a reported credible remark of the King to the young Hugh on the occasion which in fact is only to be found in the 'Oxford' account:

> 'Sir I wish I could perceive the thoughts of some of my nobilities' hearts as I have seen your heart' (9).

Both accounts, although contradictory as to the location of the Court at the time, are in agreement that the medically historic visit of Hugh Montgomery to the Court had been in the course of the latter's journey, from a curtailed Grand Tour of France and Italy, to his father's home. This, since the latter had succeeded to the viscountcy, had been no longer at Mount Alexander House, Comber, but at Newtown House, Newtownards. It is from the 'Oxford' account that we learn, also, that it had been because of the 'horrid' Irish Rebellion, which broke out on 23rd October, 1641, that he had been urgently summoned home by his father (10). Now, for the medically historic encounter with Harvey to have taken place when the Court was at Oxford (as the second account avers) it would have had to have taken place later than 29th October, 1642, the date on which Charles and the Court first arrived at Oxford (11). This would have been more than a year after the Irish Rebellion, which had been the occasion for him being recalled with such urgency. Thus, firstly, it is simply not credible that the recall to the young Hugh, and his hasty return, would have taken more than a year and, secondly, the young Hugh is clearly recorded, in the very same 'Oxford' account, as having been already in Ireland, fighting with distinction against the rebels, for months before his father's death on 15th November, 1642.

Nevertheless, the very mention, in black and white, of Oxford as the location of the Court when it was visited by the young Hugh Montgomery, strongly suggests that he indeed visited the Court while it was there. If so, such a visit would have been on an occasion more than a year later than the medically famous visit. It suggests that William Montgomery condensed, into one, accounts by his cousin (which he had listened to in Leyden) of two visits to the Court – the medically famous one in November, 1641, and a second visit, a year later, in November, 1642, after the Court had arrived in Oxford.

The young Hugh Montgomery's urgent recall home from that second visit to the Court (presumably the visit with which the medically famous account became erroneously identified) is recorded as having been because of the immediately anticipated death of his father – which took place on 15th November, 1642. A subsequent legal 'inquisition on 7th October, 1644, (held on his coming of age), and finding him the lawful heir of his father, records that he had been aged nineteen at the time of his father's death in 1642 (12). It is recorded elsewhere that,

despite being under-age, he had assumed immediate command, on his father's death, of the latter's forces (13) – with which, as has been mentioned above, he had already been fighting for many months against the Irish rebels. Such a second visit to the Court, at the time of his father's mortal illness, would have a plausible explanation in a request he could have been bringing to the King for permission to take over that command, despite being under-age, even before his father, already totally incapacitated, died.

Now, the chronology of the young Hugh Montgomery's recall and hasty journey home on the earlier occasion of October/November 1641 is not known with precision. However, the Glasgow University records show that he had graduated Master of Arts there in 1641 (14), and that Glasgow graduations, in those days, had been between March and July (15). The record of his graduation is not 'in absentia' and presumably, therefore, it would have been after being personally present at his graduation that he would have set out on the Grand Tour, in the Spring or Summer of 1641. Also, the summons home would surely have been sent out immediately upon the sudden out-break of the Irish Rebellion on 23rd October, 1641. It is unknown whether he was still in Italy at the time or, perhaps, in France, already on his way home, or, therefore, how long it would have taken the summons to reach him. At least it may be presumed that his response would have been immediate and his return in haste.

The continuation of the young Hugh's journey home to Newtownards, after coming, indeed, to London, as Harvey's account specifies, would surely not have been westward, to the long crossing of the Irish Sea and to a subsequent rather lengthy journey through an Ireland, already in rebellion, to County Down. It would, surely, as would have been usual, have been northward, through England, to Scotland, making for Portpatrick. Portpatrick was in fact known, at that time, as 'Port Montgomery', after his grandfather, the 1st Viscount, who had built a great church there for travellers to and from Ireland (16). The Portpatrick to Donaghadee crossing was not only the shortest seacrossing to Ireland but, for the young Hugh, would have been both the safest, at that time of rebellion, and the most convenient, route by bringing him to within only eight miles of his father's home at Newtownards.

The question, where the Court would most probably have been (from the outbreak of the Irish Rebellion on 23rd October, 1641, onwards), that the journey home of the young Hugh Montgomery would have come near enough to it to make his visit to it possible, has hitherto not been systematically examined. Nevertheless, the chronology of the movements of the Court, unlike that of the young Hugh's movements, is precisely documented. Thus, it is known in particular that at the time of the Irish Rebellion on 23rd October, 1641, the Court (which had been in Scotland since August) was in Edinburgh (17). It is known also, that it was to continue there until its departure for London on the 18th November (18). The date, thus, is not, as erroneously (and, in the present context, misleadingly) stated, by Keynes (19), as early as the 8th November. After a leisurely journey through England it had arrived at Oatlands on 24th November (19) for the King's reception at the Guildhall on 25th November, after which the King had stayed over night at Whitehall. On the following day, 26th November, he had moved immediately to Hampton Court (21). The King had remained at Hampton Court, except for two day-visits to London, until responding to an invitation by London, on 9th December, to return to the city for Christmas. Back in London, there had followed the hectic weeks of confrontation with Parliament, after which the King had fled from the City, on 10th January, 1642, to Hampton Court – but for only a single night (22), before going to Windsor Castle.

Now, because the visit to the Court by the young Hugh Montgomery was subsequent to the outbreak of the Irish Rebellion in October, 1641, Harvey's biographer, Sir Geoffrey Keynes, is certainly mistaken in saying that it took place 'probably about 1640' (23). Whitteridge, on the other hand, is, with equal certainty, correct in concluding that the visit would most likely have been during November, 1641 (24). Also, the several successive possible locations of the Court, at the time when the journey home of the young Hugh Montgomery would have brought him

nearest to it, can be listed. If during November, these possible locations are, in chronological order, (1) in Edinburgh, prior to 19th November, 1641, (2) somewhere in England, between 19th November and 25th November, during the Court's journey south perhaps, for example, at York, during the rest-day there on Sunday, 21st November, (3) in London on the single day of 25th November (the day of the King's reception there) and for part, only, of the next day, (4) at Hampton Court, for a few weeks – indeed until beyond the end of November and into mid-December.

Thus, in consideration of the fact that during November, 1641, there was only one night that the King spent in London (viz., that of the 25th November), Whitteridge's conclusion that Hampton Court is more probable than the London implied by Harvey, is scarcely to be doubted. However, the possible venue during November which must be given chronological priority, at least of consideration, over both London and Hampton Court, is Edinburgh, at some date prior to 19th November, 1641. And, as there would have been 26 days between the out-break of the Irish Rebellion on 23rd October and the departure of the Court from Edinburgh on 10th November, this would clearly have been long enough for the young Hugh to have received his summons home – especially if he was already in France, on his way home – and to have arrived at the Court, in Edinburgh, before 19th November. Thus, Edinburgh would appear to be at least as possible as Hampton Court.

Whether Edinburgh would be, also, more probable than Hampton Court is a separate question. Here, it is curious that neither of the two accounts gives, or suggests, a reason for the young Hugh Montgomery having paid the visit to the Court on the occasion which turned out to be medically so historic viz., a reason why he would (presumably) have taken the detour via Edinburgh (on his way home via Portpatrick) to do so. Here, it is not improbable, on the one hand, that his father, at the time of recalling him, told him that the Court was currently in Edinburgh, and instructed him to visit it, there, in the course of his journey home. Alternatively, the young Hugh, when passing through London in early November, and confirming that the Court was still in Edinburgh, may have made his own decision not to turn west at Scotch Corner, as he would normally have done (for the shorter, Solway, route) but to take the rather more circuitous route via Edinburgh, in order to visit the Court. The disadvantages of such a rather longer detour may have been counter-balanced by the advantage of the possibility (already established by that time) of travel by coach all the way from London to Edinburgh.

The young Hugh's intention in thus making for the Court, at that time of rebellion in his native Ireland, would surely have been to deliver those assurances of loyalty which the 'Oxford' account records that he did deliver on the medically famous visit, and to seek any possible instructions from the King, both for his father and for himself. And if he should prove to be too late to catch the Court before it left Edinburgh for London, he would have had reason to hope, still, to meet it as it made its way south.

The two accounts, although incompatible as to the venue, usefully supplement and complement each other in respect of some other details. Indeed, it is possible to interpret some of these details as clues to the venue. Thus Whitteridge claims, of the detail of the King's comment about the hearts of his nobilities (recorded only in the 'Oxford' account), that it 'accords well enough' (25) with the venue which she suggests of Hampton Court.

However, another such detail is the reference (recorded only in the account by Harvey) to 'other creditable persons who were present' – i.e. persons other than the young Hugh himself who had been able to give Harvey information about the early medical history of the case. Harvey's words are:

'uti ipse mihi, aliique (qui aderant) fide digni narrarunt.' (26)

Whitteridge, following two earlier, and similarly free, translations, by an anonymous author in 1653 (27), and by Willis in 1847 (28), gives:

'as he himself told me and other creditable persons who were eye-witnesses.' (29)

But, in translating 'qui aderant' as 'who were eye-witnesses', all three translators would seem to have imported into the original text a particular meaning, viz., 'eye-witnesses of the original injury', although there would seem to be no reason to depart from the literal meaning of the words 'qui aderant' as 'who were present' – meaning 'present (with Harvey) at the time of his medical history-taking, and his examination of the young Hugh, at the Court'. Such a meaning would not, of course, imply that they were not, also, eye-witnesses of the original injury or of its early treatment.

A persuasive answer, to the question who these 'other creditable persons who were present' ('qui aderant') could have been and, in particular, where such persons lived, might also suggest a clue to where, also, the Court would have been at the time. One such 'creditable' person, who would have known about the childhood history of the young Hugh's heart condition, and who would normally have been present at Court, would have been the young Hugh's maternal grand-father, Sir William Alexander, 1st Earl of Stirling, and Secretary for Scotland. He, however, had died the year before – in 1640 (30). Another 'creditable' person, also knowledgeable about the case, who was normally at Court, was the young Hugh's uncle, Sir James Montgomery, but it is known that, from the out-break of the Irish Rebellion on 23rd October, 1641, he had been, not at Court, but in Ulster helping his older brother, the 2nd Viscount (31), against the Irish rebels. A third 'creditable' person, who had 'pierced' the young Hugh's abscess in childhood, and who is recorded as having been at the Court in Oxford, just prior to the death of the 2nd Viscount, in mid-November, 1642, had been Dr. Patrick Maxwell, previously family physician to the Montgomery family (32). Dr. Maxwell's presence at the Court on the occasion of the 'Oxford' visit is shown by his reported confirmation to the King of the probably mortal nature of the 'drowsy sickness' affecting the young Hugh's father, the 2nd Viscount justifying a royal permission for the young man's immediate withdrawal from the Court. There is, however, no evidence that Dr. Maxwell had been with the Court a year earlier, in Edinburgh, in November, 1641.

Two 'other creditable persons' (i.e. other than the young Hugh himself) who it has been possible to identify as having been present ('qui aderant') in Edinburgh at the time of the medically historic encounter of Harvey with the young Hugh Montgomery (if this encounter was indeed in Edinburgh) have been the Edinburgh physician, Dr. John MakLuire (the 1630 petitioner to Charles I to establish the Royal College of Physicians of Edinburgh) and his wife, Mareon Greir. The virtual certainty of their presence in Edinburgh in November, 1641, is established by the facts that their fifth child, James, had been baptised in Edinburgh on 9th September, that very year (33), and that their sixth child, Thomas, was to be baptised, there, on 15th March, only two years later (34).

I have elsewhere recorded (35) how Dr. John MakLuire had been a life-long friend of Sir James Montgomery, uncle of the young Hugh. Their friendship had dated, probably, from a shared childhood in Ulster and, certainly, from their time together as students at St Andrews University from 1618 to 1622. Also, in 1630 Dr. MakLuire had dedicated his book, 'The Buckler of Bodilie Health', to Sir James. Finally, Dr. MakLuire may well have been the unnamed 'firm friend' in Edinburgh of Sir James who, in 1651, helped the latter to escape from Edinburgh in disguise.

I have also argued that the father of Mareon Greir, Dr. MakLuire's wife, had probably been a John Greir, the younger brother of, and heir and successor to, Gilbert Greirson of Castelmaddie in Kirkcudbrightshire, of whom Dr. MakLuire's father, also a 'John MakLuire', had been tenant in the associated farm of Nether Carmonoch (36). This John Greir who, unlike his older brother, Gilbert, but following the example of his family Chief, Sir Robert Greir of Lag, had modified his surname from Greirson to Greir (Sir Robert Greir of Lag's father is

described in his testament, and elsewhere, as 'Sir William Greirson of Lag' (37)). I had discovered, also, the crucial fact that that John Greir had been an emigrant to Ulster (presumably taking his daughter, Mareon, who was still a child, with him) from 1627 for a period of fifteen years (38). Moreover, it had appeared that he was probably the John Greir, recorded in the Muster Roll for Ulster of c1630 as having mustered with the 1st Viscount Montgomery at Newtownards presumably as one of his tenants (39).

Consequently, Dr. MakLuire's marriage to Mareon Greir in 1634 (not recorded in Edinburgh) was probably celebrated (as would indeed have been usual practice) at the bride's home – at or near to Newtownards. Thus, in 1634, Dr. MakLuire and Mareon Greir would have been present for their marriage at or near Newtownards at a time when Hugh, the young grandson of the 1st Viscount, well known to both of them, would have been aged 11 or 12 and probably still under medical supervision, at his father's nearby home at Mount Alexander House, Comber.

A further known connection of both Dr. MakLuire and his wife, Mareon Greir, with the young Hugh Montgomery during the latter's childhood had been through their friendship (on record in the 1640s but probably of longer standing) with Maister Hugh Kennedy, minister, by that time, at Mid Calder. The latter had baptised the couple's seventh child, at Mid Calder, at a time of plague in Edinburgh – naming him 'Hugh' after himself (40) and had been witness to the baptism, in Edinburgh, of their eighth child (41). Maister Hugh Kennedy is known to have been a co-eval of the young Hugh Montgomery; to have come, like him, from Comber; to have been the son of a Thomas Kennedy there (42) who was servitor to the 1st Viscount Montgomery; to have attended the University of Glasgow together with the young Hugh Montgomery; and to have graduated there with the latter in 1641 (43).

It had therefore seemed, in short, that both Dr. MakLuire and his wife, with their known close connections with the Montgomerys, would independently have known the young Hugh from the latter's childhood in County Down and from the time of the early treatment of his chest injury, and that they would have been welcoming friends to him on his appearance in Edinburgh.

In conclusion, therefore, it would appear that while Oxford can be confidently excluded as the venue for the medically historic encounter of William Harvey with the young Hugh Montgomery; and Hampton Court assessed as admittedly more probable than London; Edinburgh is no less possible than Hampton Court. Also, the King's comment about the hearts of his 'nobilities', which Whitteridge says 'accords well enough' with Hampton Court, could as appropriately have been uttered at Edinburgh – perhaps even more appropriately, as one of the King's chief reasons for having visited Scotland at that time had been to find out about the hearts of his Scottish 'nobilities'. Furthermore, the known residence in Edinburgh, in November, 1641, of the physician, Dr. John MakLuire, and his wife Mareon Greir, who both would appear to have been familiar with the young Hugh from the time of his childhood at Mount Alexander House, Comber, County Down, strongly suggests that they were, or were amongst, the 'other creditable persons who were present (qui aderant)' and who had been able to supply Harvey with the early history of the case. If so, this would make Edinburgh not only no less possible than Hampton Court, but more probable.

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Following Dr. McHarg's paper, Mrs Brenda White then gave an entertaining talk on "Murder in the University" in which she traced the development of Forensic Science in Scottish Universities. Using examples from notable murder cases such as the Oscar Slater trial and the Aberdeen sack case, Mrs White described the changing image of the main practitioners, from the idea of the complete medical detective to the figures of later years with their specialist skills and interests.

THE THIRD HALDANE TAIT MEMORIAL LECTURE

The Third Haldane Tait Lecture and Dinner was held on 20 May 1994 in the Royal Pharmaceutical Society, York Place, Edinburgh. 31 members and guests attended. The dinner was held in the nearby Atholl Hotel.

The speaker was Mrs Beryl Hazeldine who spoke on "Queen Victoria and the Doctors." The Pharmaceutical Society opened its Victorian Dispensary, with its fascinating treasure trove, for members to peruse the preparations of yester year. Mrs Hazeldine's lecture was lavishly illustrated by interesting slides as she followed the course of Queen Victoria's attendance by the medical profession. She discussed details of the Queen's medical problems, such as those of childbirth, including her experiences with chloroform. She also described those of her daughter, Princess Victoria, whose mismanaged labour resulted in the Kaiser's crippled arm. Queen Victoria's interest in military medicine was covered with her visits to Netley.

Mrs Hazeldine then answered with authority the many questions which her talk had elicited and following this an excellent meal was enjoyed in the Atholl Hotel.

This meeting brought the 1993-1994 session of the Society to a close.

The Scottish Society of the History of Medicine

CONSTITUTION.

1. The Society shall be called "THE SCOTTISH SOCIETY OF THE HISTORY OF MEDICINE," and shall consist of those who desire to promote the study of the History of Medicine.

2. A General Meeting of Members shall be held once a year to receive a report and to elect Office-Bearers.

3. The management of the affairs of the Society shall be vested in the Office-Bearers, who shall include a President, one or more Vice-Presidents, a Secretary, a Treasurer, and not more than ten other Members to form a Council. The Council shall have power to co-opt other Members who, in their opinion, are fitted to render special service to the Society.

4. All Office-Bearers shall be elected annually. The President shall not hold office for more than three successive years, but shall be eligible to serve again after one year. Not more than eight Members of Council, or two-thirds of the total number, shall be eligible for immediate re-election.

5. The Annual Subscription shall be fixed from time to time by the Council and reported to members of the Society.

6. The Secretary shall keep brief Minutes of the proceedings, shall prepare Agenda, and shall conduct the correspondence of the Society.

7. Meetings shall be held at least twice yearly, and the place of meeting shall be in any of the four University centres, or elsewhere, as the Council may decide.

8. This Constitution may be amended at any General Meeting of the Society on twenty-one-days' notice of the proposed amendment being given by the Secretary, such amendment to be included in the Agenda circulated for the Meeting.

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