Go to the bedside

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IN 1684 Hans Sloane (1660–1753), later to be President of the Royal Society, graduated M.D. from the now defunct University of Orange in France. On his return to England, Sloane called on Thomas Sydenham (1624–1689), 'the English Hippocrates', with a letter of introduction which described the young graduate as: 'a ripe scholar, a good botanist, a skilful anatomist.' Sydenham is reputed to have commented: 'This is all very fine, but it won't do. Anatomy! Botany! Nonsense! Sir, I know an old woman in Covent Garden who understands botany better. As for anatomy, my butcher can dissect a joint full and well. No, young man; all this is stuff. You must go to the bedside; it is there alone you can learn disease.' (Brooks 1954).

This expresses the basic simplicity of approach to true clinical medicine as practised by Hippocrates. Through the intervening centuries it has frequently been lost sight of in a welter of theories and counter-theories, of logical and illogical argumentation, sterile and unproductive. The introduction of science into medicine, which began in the sixteenth and seventeenth centuries, might have been expected to put an end to such disputes, but rather it gave dissension fresh impetus. The iatrophysical school believed that all problems of physiology could be explained on mathematical and hydrodynamic principles, while the iatrochemical school attributed all to chemical changes. The two theories seemed to be mutually antagonistic and no one suggested that both chemistry and physics might be involved.

There were, however, some glimmerings of light in the disputatious darkness, for even one of the greatest of the theorizers, Giorgio Baglivi (1668–1707) of Rome, an ardent iatrophysicist, was in his practice a true Hippocratic clinician who praised Sydenham as 'the embellishment and ornament of our art' (*artis nostrae ornator et ornamentum*) (Withrington 1894) and who wrote: 'To frequent societies, to visit libraries, to own valuable unread books or shine in all the journals does not in the least contribute to the comfort of the sick.' (Garrison 1929). Baglivi recorded the true spirit of clinical research when he wrote: 'Idle talk is of no use; one should only study in the light of reason and experience and indefatigably investigate the truth. . . . Let those who read my book (Baglivi 1696) think that experience alone has guided me, that vain hypotheses and grandiloquent systems serve no purpose. To study medicine, it is necessary to compare disease with disease, moment with moment, and man with man.' (Castiglioni 1947).

Hermann Boerhaave (1668–1738) of Leyden, a iatrochemist, expressed the importance of observation rather than hypothesis: 'We should restrain our Judgment, and leave Doubt to be solved by Posterity, when they shall have obtained Light enough from Experiments which have escaped us. It therefore behooves us to defer our Opinion . . . till Time shall bring the Truth to Light. By this means Physic, 'tis true, will be reduced to a small Compass, but then it will be true, certain and always the same.' (Boerhaave 1751.) That did not prevent Boerhaave from indulging in some speculations and theorizing of his own.

Bedside Teaching

As in practice, so in teaching. Baglivi summed up the essence of clinical instruc-

tion when he said: 'Let the young know that they will never find a more interesting, more instructive book than the patient himself.' (Castiglioni 1947).

In the Hippocratic era, medical teaching was an individual master pupil affair based necessarily on the sick-bed. The first organized school of medicine was established at Salerno in the ninth century AD. With the Greek origins and culture of southern Italy, this school inherited the Greek tradition in medicine and was influenced by the treatment of the sick carried out by the Benedictine order at its monastery at Monte Cassino and at its hospital in Salerno itself. In the beginning Salernitan teaching was, therefore, essentially based on personal experience at the bedside, with little stress on book learning.

With the rise of mediaeval didacticism and the establishment of medical schools associated with universities at Bologna, Padua, Montpellier and elsewhere, universities which were seats of traditional classical learning, bedside instruction in practical clinical medicine tended to disappear in favour of a purely theoretical approach taught through the medium of didactic *ex cathedra* lectures in Latin. The university of Padua, situated within the domains of the powerful Venetian republic, was less tramelled by church dominance and conservatism than the other universities in Italy. Padua welcomed Jews, Moslem Arabs and later Protestant Christians as students and teachers despite papal edicts to the contrary. This resulted in a considerable display of intellectual freedom in Padua, a willingness to cast aside tradition and to question the pronouncements of classical authors.

It is not surprising, therefore, that it was at Padua that a reversion began from the authoritarianism of the orthodox physicians of the period, back to the clinical simplicity of Hippocratic medicine. This trend was strongly influenced by Girolamo Fracastoro (1478–1553) of Verona, the physician and scientist who gave syphilis its name and, far in advance of his time, expounded the theory of contagion by minute organisms. Giambattista de Monte (Montanus in Latin, 1489–1551), another Veronese who was professor of medicine at Padua, was the first to put bedside teaching on an organized basis, using the hospital of St Francis in Padua as well as taking students directly into the homes of the sick (Riesman 1919).

At that time at Padua, the medical student was required to attend lectures for three years, to practise 'with some famous physician' for at least a year and to have 'visited the sick'. Shortage of clinical material is not a problem peculiar to our time, for so many students flocked to Padua 400 years ago that some had to go to Venice for their practical instruction. One of these was Andreas Vesalius (1514–1564), the great anatomist, who later referred to 'treating the sick in Venice under the direction of the most famous professors there' (O'Malley 1964). Vesalis graduated M.D. in 1537 and was immediately appointed professor of surgery and anatomy.

During the five years that Vesalius taught at Padua he was also writing his major work, *De Fabrica*, which changed the face of anatomy. The late Professor C. D. O'Malley, in his biography of Vesalius (1964) made this comment: 'As the *Fabrica* represented a movement in anatomical studies away from the authority of man directly towards nature, so in the field of medicine some of the Paduan faculty had recognized that the medical student could frequently gain more knowledge at the bedside of a patient than from medical treatises.'

Vesalius and da Monte were teaching at Padua at the same time and their collaboration marks a high point in the history of medical education. After the death of da Monte, the practice of bedside teaching seems to have lapsed for a time at Padua, but it was revived some 20 years later by Albertino Bottoni and Marco degli Oddi (not to be confused with the nineteenth century Ruggero Oddi of the sphincter). One of their pupils was Jan van Heurne (Heurnius, 1543–1601) from Utrecht. He graduated at

Padua in 1571 and ten years later was appointed professor of medicine at Leyden, where he introduced the Paduan method of bedside teaching.

The medical school at Leyden was established in 1578. The first two teachers were Pieter van Foreest Forestus, (1522–1597) and Gerard de Bondt (Bontius), both of whom had studied at Padua. The first medical student to matriculate at Leyden (21 September, 1581) (Smith 1932) was an Englishman, John James (d. 1601), who had previously graduated M.D. at Cambridge and went on to become the second medical graduate at Leyden (September, 1581). James was the forerunner of the many Britons who flocked to the Leyden medical school in the next two centuries. He graduated and returned to England in the year that Heurne was appointed to the chair at Leyden. We do not know how much of the Paduan philosophy of medicine James may have absorbed from his teachers, Foreest and Bondt.

After his return to England, John James became a member of Parliament and for the last five years of his life he served as physician to the household of Queen Elizabeth I (Hunt, 1878). Francis Bacon (1561–1626), later Lord Chancellor of England, was a member of Parliament at the same time as James and was a frequenter of the royal court while James was serving in the household. It is almost certain, therefore, that the two were acquainted and there is some possibility that Bacon's thoughts on medicine may have been influenced by Dr James, although they were published after the latter's death. Speaking as an intelligent layman, Bacon certainly expressed a Paduan philosophy when he urged a return by physicians to 'the ancient and serious diligence of Hippocrates, which used to set down a narrative of the special cases of his patients, and how they proceeded, and how they were judged by recovery or death.' (Bacon 1605).

On 17 March 1636, the Utrecht professor, Willem van der Straten, gave an inaugural oration expounding the value of bedside clinical teaching and this was taken up in Leyden by Jan van Heurne's son, Otto van Heurne, and his colleague, Ewald Scrivelius, who were appointed on 25 August 1637, at 200 guilders each per annum, to give bedside instruction on an organized basis (Garrison, 1929). Françoise de la Boë (Franciscus Sylvius of the aqueduct, 1614–1762), who became professor of medicine at Leyden in 1658, was an enthusiastic clinical teacher in the infirmary which had only 12 beds. Sylvius also regularly performed autopsies on his deceased patients for the further instruction of his students. He was the founder of the iatrochemical school and he established at Leyden the first chemical laboratory attached to any university in Europe (Singer and Underwood 1962).

A typical course of study at that time is described in the autobiography of Sir Robert Sibbald (1641–1722) (Sibbald 1833) who enrolled at Leyden in 1660 and who was later the founder of the Royal College of Physicians of Edinburgh (the spelling of this extract has been modernized):

'I stayed at Leyden a year and a half and studied anatomy and surgery under the learned Professor Van Heurne. I studied the plants under Adolphus Vorstius, who had been then Botanic professor 37 years, and I studied the institutions and practice of medicine under Sylvius, who was famous then. I saw twenty-three human bodies dissected by him in the Hospital which I frequented with him. I saw some dissected publicly by Van Heurne.

'I was fellow student with Steno [Nils Stensen, 1638–1686] who became famous afterwards for his writings. He dissected in my chamber sometimes, and showed me there the ductus salivalus superior [Stensen's duct] he had discovered. I frequented an apothecary's shop, and saw the materia medica and the ordinary compositions made. I studied Chemistry under a German called Witichius, and after he went away under Margravius, brother of him who wrote the natural history of Brazil. (Margaff 1648) Sometimes I heard the lessons of Van der Linden, who was famous for critical learning. [Joannes Antonides van der Linden (1609–1664) edited Hippocrates and wrote a bibliography of medicine. (Linden, 1637)]

'I composed there (the last summer I stayed there) Theses de variis Tabis speciebus. Sylvius was praeses when I defended them publicly in the schools.'

Archibald Pitcairne (1652–1713) of Edinburgh, a leading exponent of the iatrophysical school of thought, served as professor of medicine at Leyden for one session,

1692–1693. He was also appointed to teach clinical medicine in the infirmary and was given additional salary for this duty (Lindeboom 1963). Among Pitcairne's pupils that year were John Monro (1670–1740) from Edinburgh and Hermann Boerhaave. The latter taught medicine at Leyden for over 30 years and was the greatest physician in Europe in that period, making the little old hospital the mecca of students from many lands. 'On 12 beds half the physicians of Europe were trained' (Major 1954).

'When Boerhaave died . . . western medicine lost its undisputed master. Never before had a medical teacher exerted such a far-reaching influence. Never before had a physician been so universally admired and beloved' (Siegerist 1938). Haller, Boerhaave's pupil, called him 'the common teacher of all Europe' (*communis totius Europae Praeceptor*) (Castiglioni 1947). Boerhaave was a follower of Hippocrates and Sydenham; he put the welfare of his patients first, above the medical theorizing which was then so fashionable. He taught at the bedside and also taught the related sciences: 'Besides clinical, chemical, botanical, and anatomical instruction he followed such of his patients as died into the post-mortem room and there demonstrated to his students the relation of lesions to symptoms (Singer and Underwood 1962).'

Boerhaave had three pupils who were later responsible for establishing other medical schools on the Leyden pattern, based on bedside clinical instruction. Albrecht von Haller (1708–1777), one of the greatest savants of his age, taught medicine in the new university at Göttingen for 17 years; Gerhard van Swieten (1700–1772), physician to the Empress Maria Theresa, reorganized the dormant medical school in Vienna; while Alexander Monro (1697–1767), pupil of Boerhaave and son of his former fellow-student, John Monro, established the Edinburgh medical school.

John Monro was determined that his home city should have a medical school like Leyden. Pitcairne, on his return to Edinburgh, had made some abortive attempts to establish proper medical teaching, but it was the Monros who carried the plan through. On Alexander's return from Leyden, in 1720, he was appointed professor of anatomy at the age of 23. Within a few years the new professor, with the encouragement and assistance of his father, had gathered round himself a full medical faculty offering, for the first time in Great Britain, a complete course of medical instruction (Wright-St Clair 1964). He went on to establish a hospital, since none existed in the city. Thus came into being the Royal Infirmary of Edinburgh as the first teaching hospital in the country—a hospital originally of six beds which became in time the largest of the British voluntary hospitals (Turner 1937).

In 1748, when the Edinburgh Royal Infirmary had grown to 228 beds, its patients were used to illustrate the first systematic course of lectures on clinical medicine, as opposed to previous individual case studies. The lecturer was Professor John Rutherford (1695–1779), father of Professor Daniel Rutherford (discoverer of nitrogen) and maternal grandfather of Sir Walter Scott (Comrie 1933). John Rutherford opened his lectures with this statement:

'I shall examine every patient capable of appearing before you, that no circumstance may escape you, and proceed in the following manner:

'1st, Give you a history of the disease;

'2ndly, Enquire into the cause;

'3rdly, Give you my opinion how it will terminate;

'4thly, Lay down the indications of cure that arise, and if any new symptoms happen acquaint you them, that you may see how I vary my prescriptions;

'and 5thly, Point out the different method of cure.

'If at any time you find me deceived in giving my judgement, you'll be so good as to excuse me, for neither do I pretend to be, nor is the art of physic infallible; what you can in justice expect from me is some accurate observations and remarks upon diseases (Rutherford 1748).'

That expresses exactly the type of clinical teaching on which many of us were reared, for from the Scottish metropolis that method of teaching medicine at the bedside spread

throughout the world wherever its graduates went: to London and Dublin, to Philadelphia, to Montreal, to Sydney and to Dunedin, the 'New Edinburgh'. To all these medical schools Edinburgh graduates brought the tradition of clinical teaching which had been trasmitted from the early Greek schools through Salerno to Padua, thence to Leyden and thence to Edinburgh.

Physical diagnosis at the bedside

Hippocrates put his hand on his patient's skin to assess whether he was feverish, felt the pulse, inspected the urine, shook the patient to listen for a succession splash and laid his ear on the chest to hear a pleuritic rub. With various refinements and the aid of simple instruments carried in the pocket, our approach to physical diagnosis at the bedside remains essentially the same.

Thermometry

Galileo Galilei (1564–1642) introduced the thermometer about 1612. The name 'thermometer' is said to have been first used by a Jesuit priest, Father Jean Laurechon, in his *Récréation Mathematique*, 1624 (Goodman 1956). The first to apply the new methods of scientific mensuration to human physiology was Santorio Santorio (Sanctorius, 1561–1636), professor of medicine at Padua. His use of Galileo's thermometer in clinical medicine was described in 1625 in his commentary on the works of Avicenna (Santorio 1626). It was two and a half centuries before the thermometer was put to general use by physicians.

A layman was ahead to the profession as an advocate of clinical thermometry. Sir Robert Moray (1603–1673), a prominent Scot at the court of King Charles II, was a founder Fellow of the Royal Society. In 1662 Moray presented to that body a paper entitled, 'A new use to be made of thermometers, viz. to know by their help the degrees of heat in a man's body in fevers, etc.' (Hartley, 1960). Giovanni Maria Lancisi (1654–1720) of Rome, a pupil of Malpighi and one of the greatest Italian clinicians of his time, made the suggestion in a work on medical education (Lancisi 1715) that physicians should familiarize themselves with the use of the thermometer.

Boerhaave is said to have owned an elegant thermometer made for him by Daniel Gabriel Fahrenheit (1686–1736) of Amsterdam. A pupil of Boerhaave, George Martine (1702–1741) from Edinburgh, wrote in 1740 what Garrison and Morton called the 'first important work on clinical thermometry' (Garrison and Morton 1965). George Cleghorn (1716–1789), an Edinburgh student who became professor of anatomy at Dublin, recorded that in a patient with pneumonia the body heat raised 'the mercury in the thermometer to the 103rd or 104th degree' (Goodman 1956). Cleghorn had never been to Leyden and it is not certain where he learned the use of the thermometer, but as the above observation was made five years after Martine's publication it may well have been based on it. Anton de Haen (1704–1776) was a pupil of Boerhaave and later worked in Vienna with van Swieten. He was one of the earliest physicians to make regular use of the thermometer at the bedside, but his observations were buried in his fifteen-volume treatise on therapeutics (Haen 1758).

When we consider the instruments available it is not surprising that most physicians continued to neglect the thermometer. The one that Haen used was over a foot long and had to be left in the axilla for seven and a half minutes. A few adventurous spirits, however, did use it. James Currie (1756–1805), a Scot who studied in Edinburgh, graduated in Glasgow and practised in Liverpool, wrote an important study on the treatment of fevers, (Currie, 1799) checking his results with a thermometer. Currie may have been influenced by Martine's published work and Currie in his turn may have influenced another Edinburgh student, Archibald Arnott (1771–1855), an obscure British army surgeon on St Helena who happened to attend Napoleon in his last illness. Arnott

was first called to the Emperor on 1 April 1821, (Langle 1753) five weeks before his death. Only two days later, on 3 April, he recorded, 'His pulse was 76; heat 96 degrees' (Goodman 1956).

Antoine C. Becquerel (1788–1878) and Gilbert Breschet (1784–1845) investigated normal body temperature and in 1835 published their results establishing a mean of 37° C. or 98.6° F. (Mettler 1947). Forty years after Napoleon's death, British royal physicians were still ignoring the thermometer. When the Prince Consort died in 1861 after an attack of typhoid fever lasting over a month, his temperature had never been taken: yet he had been attended by the best of the Queen's physicians, including Sir William Jenner (1815–1898) who was regarded as the foremost authority on typhoid fever, for he had himself suffered from both typhus and typhoid (Patrick 1955) and had been chiefly responsible for distinguishing the two (Jenner 1849).

About 1850 Ludwig Traube (1818–1876) of Berlin brought the clinical thermometer into regular use in his wards. Eventually Traube drew the attention of Carl Reinhold August Wunderlich (1815–1877) of Leipzig to thermometry as a diagnostic aid. Wunderlich carried out detailed and painstaking researches into body temperature in disease and related this to the pathology of fevers. It was only after his work was published in 1868 (Wunderlich 1868) that the clinical thermometer became firmly established as a regular working tool of the physician. Garrison said of Wunderlich, 'He found fever a disease and left it a symptom (Garrison 1929).

Pulse taking

A century after Hippocrates, Herophilus of Chalcedon used a water clock to count the pulse, (Garrison 1929) but what he recorded was the time occupied by 100 beats rather than the number of beats in a minute. Galen wrote extensively on the pulse and its characteristics in his *De pulsuum usu* and, according to Garrison and Morton, he 'established a system of medicine on the minutiae of pulse variations which persisted into the 18th century' (Garrison and Morton 1965). Sanctorius introduced the pulsilogium, or pulse-clock. This was a pendulum device in which the length of the suspending string could be altered until the beat of the pendulum corresponded with that of the pulse. The length of the string could then be recorded to give a comparison of different pulse rates (Singer and Underwood 1962).

It was Sir John Floyer (1649–1734), 'one of the most original physicians of the great scientific age in which he lived' (Neuburger 1948) who first initiated the practice of counting the pulse by the minute and introduced a special watch for the purpose (Floyer 1707). A French physician, Françoise Nicolas Marquet (1687–1759) of Nancy, devised a scheme of recording the characteristics of the pulse by musical notation, (Marquet 1769) which apparently met with some acceptance in its day (Underwood 1947).

The sphygmograph, for studying the characteristics of the pulse, was introduced by Etienne-Jules Marey (1830–1904) (Marey 1860). This developed into the polygraph used by Sir James Mackenzie (1853–1925) to investigate the heart (Mackenzie, 1902) long before the advent of today's sophisticated electronic equipment.

Blood pressure measurement

Measurement of the blood pressure of a living animal was first carried out by a layman, an English country clergyman, the Rev. Stephen Hales (1677–1721), whose work, published in 1733, (Hales 1733) was 'the greatest single contribution to our knowledge of the vascular system after Harvey' (Garrison and Morton 1965). Hales used a long glass tube connected to an artery of a horse and measured the height to which the blood rose in the tube. Jean Léonard Marie Poiseulle (1799–1869) replaced the tube by a mercury manometer to produce his 'haemodynamometer', first described in his graduation thesis in 1828 (Poiseulle 1828). This was a great advance, but it was still a laboratory instrument with no application at the bedside.

The first instrument which could determine blood pressure without puncturing an artery was that devised in 1881 by Samuel Siegfried von Basch (1837–1905) (Basch 1881). This could certainly be used at the bedside but it was inaccurate. In 1896 Scipione Riva-Rocci (1863–1936) introduced a sphygmomanometer essentially similar to the instrument used today (Riva-Rocci 1896).

Percussion

The technique of percussion was known in the Hippocratic era but it was not pursued systematically in diagnosis and was related more to the gas-filled abdomen than to the chest. Galen and Aretaeus of Cappadocia, in the second and third centuries AD., used percussion in the same way in specific cases (Mettler 1947). So long as the whole system of medicine was based on a humoral theory this situation would necessarily remain the same. While the importance of structural pathology was not recognized and while autopsy findings were rarely related to clinical signs during life, the value of percussion of the chest, as a means of revealing underlying pathological change, could not be appreciated.

Lancisi used percussion of the sternum in diagnosing aortic aneurysms (Lancisi 1728) but percussion for pulmonary disease began with Leopold Auenbrugger (1722–1809) of Vienna. Auenbrugger was both the son of an inn-keeper who observed his father tapping wine barrels to see if they were full, and also a good musician with a trained ear for sounds (he wrote the libretto for an opera by Antonio Salieri). His work on percussion, published in 1761, (Auenbrugger 1761) was a definitive exercise in diagnostic method, but it was only in that same year that Morgagni's great work on pathology was published (Morgagni 1761) and the world was not yet sufficiently conscious of the significance of morbid anatomy. Consequently Auenbrugger's work was ignored by most of his contemporaries and ridiculed by others.

A rare exception was Oliver Goldsmith (1728–1774). Goldsmith has been educated in medicine at Edinburgh and Leyden although his claim to the M.B. degrees of Dublin and Oxford is dubious (Wardle 1957) and he certainly failed in his attempts to earn his living as a doctor. In his capacity as a literary critic, Goldsmith wrote a review of Auenbrugger's publication, ending:

'Whether it may be of use to society or not, there is no necessity for me to pretend to determine, only this may be observed, that the lungs are often even in the most healthy state, found to adhere to the pleura, and in such a case, I fancy the sound would, in that part, deceive the practitioner; however, I shall not pretend to set my conjecture against his experience. Upon the whole, it is a trial that may be easily made, and to borrow an expression from Doctor Rock, *If it cannot cure, it can do you no harm*' (Viets 1929).

Percussion received very little attention from the profession until 1808 when Jean-Nicolas Corvisart (1755–1821), physician to Napoleon, translated Auenbrugger's treatise into French with an extensive commentary based on 20 years' experience of percussion. Since that time this technique has been accepted as a routine part of physical diagnosis.

Auscultation

Auscultation as we know it was created entirely by one man. Réné-Théophile-Hyacinthe Laënnec (1781–1826) was a pupil of Corvisart and wrote his doctoral thesis on Hippocrates (1804). He was a leading authority on pulmonary tuberculosis from which he himself suffered and died. Because he was familiar with what Hippocrates had written on direct auscultation, Laënnec called his new technique 'mediate auscultation. The actual date on which Laënnec ushered in a whole new medical dimension by using a roll of paper to listen to a chest was 13 September 1816 and his work was published in 1819. Laënnec used his new technique to extraordinary effect to elicit signs of disease and to relate them to autopsy findings.

Thomas Addison said, 'Laënnec contributed more toward the advancement of the medical art than any other single individual', while Garrison and Morton referred to him as 'perhaps the greatest clinician of all time.' Laënnec left auscultation a virtually complete art and since his time the only major changes have been improvements in the mechanical design of stethoscopes culminating in electronic devices.

Charles James Blasius Williams (1805–1889), who graduated M.D. at Edinburgh at the age of 19 and then studied under Laënnec, designed a binaural stethoscope in 1829 (Williams 1907). Its tubes were of lead which could be bent to fit the ears. Not surprisingly, it was unsuccessful and its inventor, to the end of his life a leading authority on chest diseases, preferred a monaural instrument (Williams 1884). The first workable binaural stethoscope had tubes of gutta percha. It was exhibited by Arthur Leared (1822–1879) at the Great Exhibition of 1851 (Aitken 1866).

Urine examination

The simple inspection of the urine described by Hippocrates developed in the Byzantine and Arabic periods into an elaborate ritual which soon degenerated into a form of quackery. In the Middle Ages charlatans claimed to make a diagnosis by uroscopy alone without even seeing the patient (Bush 1969). The sweet taste of diabetic urine was known to the ancient Hindus of the period of Susruta while the Arabic physician, Avicenna (980–1037), knew that when diabetic urine evaporated it left a residue with 'a sweet savour like honey' (Mettler 1947). The first European physician to refer to the sweetness of diabetic urine was Thomas Willis (1621–1675). Willis was the leading English exponent of the iatrochemical theory of physiology and pathology. To him the urine was the external evidence of the internal body chemistry (Willis 1659), as indeed to a large extent it is, and he made the most complete qualitative analysis of urine that was possible in his day.

That the sweetness of diabetic urine was due to sugar was shown in 1776 by Matthew Dobson (1745?–1784) of Liverpool. A century earlier Frederik Dekkers (1644–1720) of Leyden had noted the precipitation of albumin by boiling (Dekkers 1673). These chemical facts seemed of little practical significance to the clinician until the work of Richard Bright (1789–1858) related albuminuria to kidney disease (Bright 1827). Bright's work was published in 1827 and 20 years later Henry Bence Jones (1814–1873) of Harrow wrote:

'The discovery of Dr Bright's disease has made qualitative chemistry more or less necessary to the medical man. Not much knowledge and not much practical skill being requisite for recognizing the presence of albumen, the tests may be applied by all, and the re-actions furnish so quick and clear a reply to the question asked, that this application of chemistry, is never likely again to be lost to the medical practitioner' (Jones 1847).

Although the tests may have been easy, this was the first step in taking physical diagnosis away from the bedside into the laboratory or back room. The trend was promoted in 1848 when Hermann Christian von Fehling (1812–1885) introduced his quantitative test for sugar (1848). This has been replaced in the present century by the method introduced by Stanley Rossiter Benedict (1884–1936). In even more recent years paper tests have brought at least qualitative screening of urine back to the bedside as the general practitioner dips a multi-test paper strip into the chamberpot under the bed.

Thus we move full cycle. Modern electronics brings the most sophisticated monitoring and recording equipment to the patient's bedside until the hospital ward begins to look like a science-fiction movie. Indispensable though this gadgetry may be to the best treatment that contemporary medicine has to offer, it cannot replace the astute clinician at the bedside. Last century the *British Medical Journal* greeted the introduction of the von Basch sphygmomanometer with the remark, 'by such methods we pauperize

our senses and weaken clinical acuity' (Major 1930). So long as we keep medical teaching at the bedside we will breed physicians who retain clinical acuity despite the worst of modern science.

Non scientia sed arte.

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Abstract of an Article by Crawford and McCormack in the Journal of Medical Education (1971) 46.263

The authors give results of a questionnaire addressed to former primary care doctors in Virginia about the reasons for leaving this field for another. Of 73 usable replies (82 per cent response rate) 57 had been in primary care practice over three years. Conditions in the community were almost always "adequate" or better. A typical working week was 60 hours; half conducted two or more evening sessions; the majority made more than ten house calls per day. They had poor practice organization; the majority took two weeks or less vacation each year. Over half had no systematic cover; most did not use an appointments system; two thirds worked alone.

The main reason for leaving was overwork and being constantly on call. Some patients use specialists and merely use the respondant doctors for 'out of hours' work. No one mentioned boredom or lack of challenge as a reason for leaving general practice. Asked about possible remedies for the situation 96 per cent suggested group practice was an answer, 81 per cent favoured residency programmes, 74 per cent association with hospital doctors and medical students. Also suggested were tax incentives and 'nurse practitioners' to be employed by the doctors. They conclude by recommending the inclusion of organizational administrative and interpersonal aspects of practice in medical training and continuing education.