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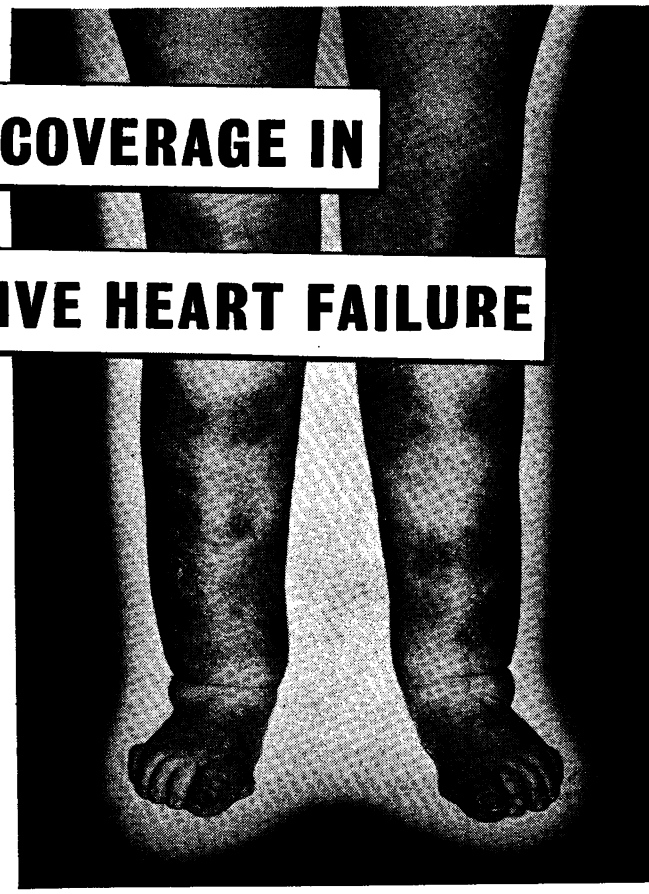

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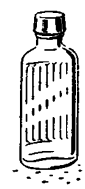

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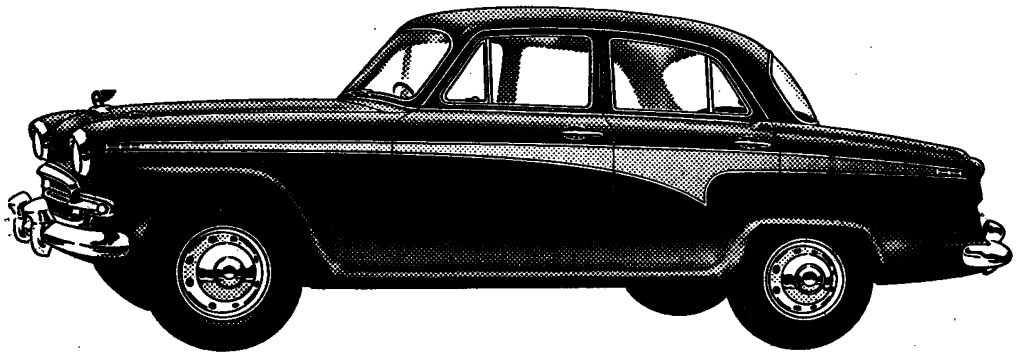

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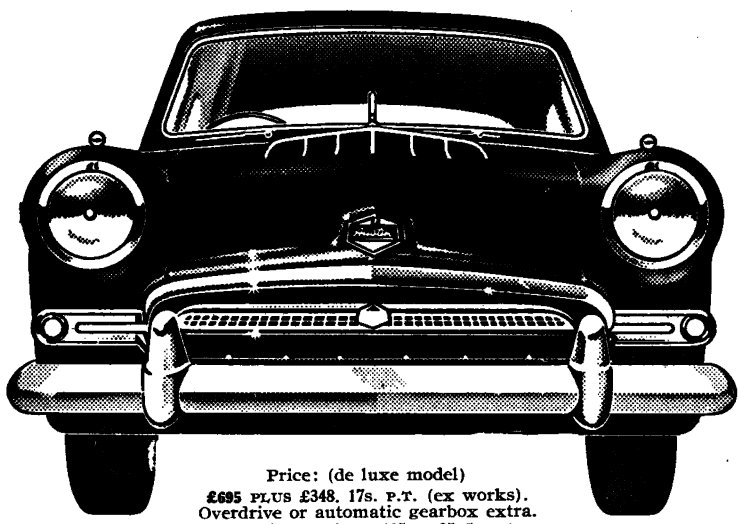

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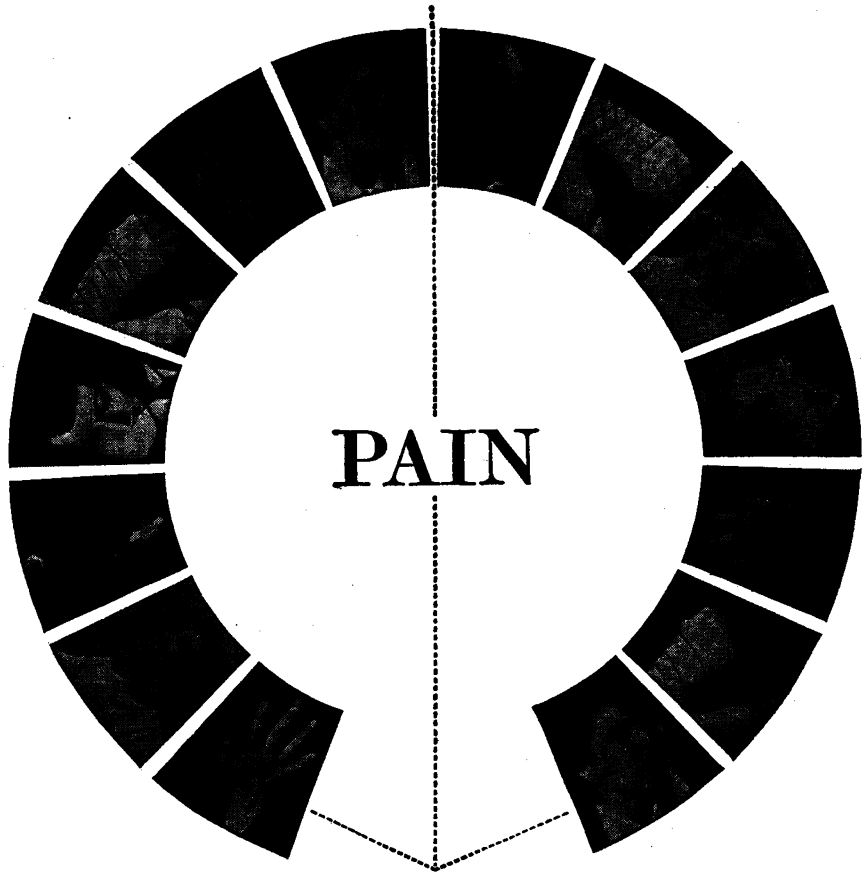

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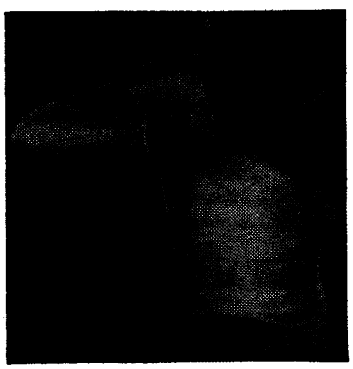

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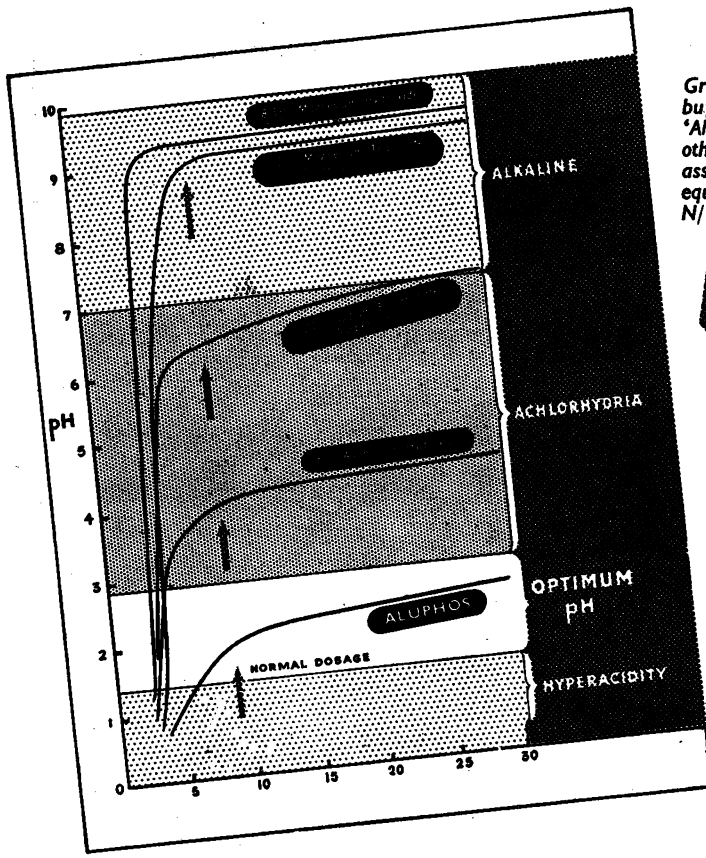

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The Ulster Medical Journal

VOL. XXV

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THE ULSTER MEDICAL JOURNAL
1956

CONTENTS

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No. 2 : November, 1956

CONTENTS

Fellows and Members of the Ulster Medical Society receive the Journal free.

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THE ULSTER MEDICAL JOURNAL

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1. Authors are reminded that concise and clearly expressed papers are those most welcomed by readers and by the Editorial Board.

2. Manuscripts should be typewritten with double spacing and with wide margins. They should be fully corrected, and contributors will be responsible for the payment of any sum charged for alteration in printer's proof in excess of ten shillings per sheet (16 pages).

3. References should be given as in the publications of the British Medical Association and in most other modern British journals. If contributors are uncertain of the correct abbreviation for the title of any journal, as given in the World List of Scientific Periodicals, they should give the full title.

4. Tables and illustrations should be reduced to a minimum, and should be sent detached from the typescript of the paper. Line drawings should be used whenever possible. All illustrations must be in a finished form ready for reproduction. Half-tone blocks require to be printed on special art paper and are costly. Authors may be charged for these at cost price.

5. Orders for reprints must be given when the author returns the printer's proof. The cost of these may be obtained from the printers in advance.

6. Editorial communications should be sent direct to the Editor, Dr. J. E. Morison, D.SC., M.D., Central Laboratory, Lisburn Road, Belfast. The Editor will be glad to advise authors on the preparation of their manuscripts.

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May we, therefore, appeal to you to join the Ulster Medical Society, and so enable us to widen its influence and sphere of usefulness still further? A proposal form is appended : your proposer and seconder must be Fellows of the Society.

If you do not wish to become a member of the Society, will you consider entering your name as a subscriber to THE ULSTER MEDICAL JOURNAL? The subscription is fifteen shillings per annum, payable in advance to the Honorary Treasurer.

We remain,

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THE
ULSTER MEDICAL JOURNAL

PUBLISHED ON BEHALF OF THE ULSTER MEDICAL SOCIETY

Vol. XXV 1st NOVEMBER, 1956 No. 2

Folklore and Medicine

By T. H. CROZIER, B.Sc., M D., F.R.C.P.

Opening Address, Winter Session, 1956-57, Royal Victoria Hospital, Belfast

IT has been customary for the past one hundred and twenty-eight years, at the opening of the session, to offer some word of welcome to the students—particularly those who are newly-joined. It gives me great pleasure, therefore, in the name of the Medical Staff of the Hospital, to congratulate you on having reached this important milestone in your career.

Your education heretofore has been focused on the horizon which opens for the first time to-day, to fit you to receive training as entered apprentices of the mystery and art of clinical medicine and surgery. From now on you will come into contact with the raw material of our craft, the sick and suffering who seek relief within the walls of this hospital. It will be your duty and inestimable privilege henceforth to comfort and succour all who suffer, and in so doing increase your professional knowledge and skill, and reap a rich reward in the joy of service.

The regimen of pedagogy and tutelage in which you have hitherto been nurtured (and which has served you well) will give way to a situation where all who labour within this hospital are perpetual students, for no-one can be an effective teacher who is not constantly seeking fresh light for himself. The position is not so much one of teachers and taught as of co-workers in a timeless and altogether enthralling enterprise, in which even the most junior student has a place. You will, in consequence, find yourselves closer to your purpose and ambition in life, and discover yourselves newly confident, reliant, and beginning to feel something of that burden of responsibility for human life and happiness which presses (albeit lightly or even invisibly) on the shoulders of every practitioner of medicine.

It is my very great privilege, on behalf of the Medical Staff, to welcome you to the clinical practice of the hospital. May your wayfaring be happy and the outcome fortunate. This day you fall heir to the noble tradition and zealously guarded

reputation of the School, and the responsibility for its future well-being is inescapably and for ever yours. As heritors of this distinguished succession may you be able to say :

> The lot has fallen unto me in a fair place.
> Yea, I have a goodly heritage.

In circumstances of poignant tragedy, the death of Mr. Cecil Armstrong Calvert has robbed this School of a great teacher. Mr. Calvert entered medicine as a vocation and not through accident or process of choice by exclusion. A mature and highly-gifted student, his undergraduate career was one of the most satisfactory possible. He joined the Visiting Staff of the Royal Victoria Hospital as a general surgeon in 1935, and soon made a name for himself as an exceedingly careful and capable operator. His devotion to the work was complete; his meticulous attention to all aspects of the specialty which later claimed his undivided interest became something of a tradition in the hospital. By his pioneer work in neurosurgery during the war years and after, he widened the scope and enriched the technique of that most exacting branch of surgery.

His modesty, charm, sincerity and delight in the fellowship of kindred spirits were quite unforgettable, and the world is much the poorer for his passing.

In a spirit of thankfulness for the life, work, and example of Cecil Calvert, we may say in John Milton's words :

> Nothing is here for tears, nothing to wail
> Or knock the breast; no weakness, no contempt
> Dispraise or blame; nothing but well and fair
> And what may quiet us in a death so noble.

Mr. Robert John McConnell retired from active duty in 1949 at the zenith of his professional reputation, with a youthfulness of body and mind which belied his chronological age. We mourn his death as one who was teacher, friend, and personal surgeon of many of the present Medical Staff. A man of strong purpose and honesty of mind, his practice of the surgeon's art was a delight to the beholder and his clinical judgement well-nigh unassailable. Mr. McConnell will long be remembered as one of the master-surgeons of his generation.

To the relatives of these beloved colleagues we tender our heartfelt sympathy.

Mr. Hardy Greer has joined the ranks of the Elder Statesmen after thirty-two years' service as gynæcologist to the hospital.

Mr. Greer is an eloquent and earnest teacher and a resolute friend of the student body. There was never a dull moment in his classes, and many of us had our eyes first opened to the saving grace of humour and the gentle art of apt Biblical quotation there.

A man of wide responsibilities and proportionately wide shoulders, Mr. Greer has given inestimable service to his profession, his specialty and the community, as well as in the wider sphere of administrative activity.

Mr. Greer has three great loves: his work, good talk, and the game of golf. Five days a week he concentrates on the first two; on Saturdays he exemplifies

Shakespeare's dictum : "Every man the mark of his profession," and no one could mistake him for anything but a pursuer of the small white ball.

We wish him all happiness in his well-earned leisure.

Another distinguished recruit to the ranks of the Elder Brethren is Dr. Stafford Geddes, who has for many years rendered service of outstanding merit to the hospital.

A pioneer of modern anæsthetic methods, credit is largely due to Dr. Geddes for the notably high standard of anæsthetic practice in our local hospitals.

Greatly loved for his modest bearing and devotion to his chosen work, he has proved a tower of strength to many a harassed and despairing novice of the art. Whatever the alarms and excursions incidental to the practice of surgery, two members of the theatre team invariably display nothing but unruffled calm and confidence—Dr. Geddes and the patient.

We would offer him our very best wishes on his retirement.

The Medical Staff has been strengthened this year by what might be termed a consangulation of surgeons. Mr. Reginald Livingstone and Mr. Willoughby Wilson are distinguished students of the hospital and alumni of the Queen's University. After a long and very willing apprenticeship to the surgical side of the hospital, they have received the imprimatur of their pastors and masters. We welcome them for their personal as well as professional attributes, and wish them God-speed as they embark upon their surgical odyssey.

Mr. C. A. Gleadhill has joined the staff in place of the late Mr. Calvert, and it is a happy omen that he bears the same initials.

Ulster spread the light of Christianity in Scotland by the exertions of St. Columba, and it appears that the Scots have at length repaid (in some measure) their debt by sending us two of their most promising neurosurgeons.

We welcome Mr. Gleadhill as a representative of the Edinburgh School of Neurosurgery, and we like him all the more for having made his academic pilgrimage by way of Dublin, with which school we have many personal, professional, and cultural ties. We wish him every happiness among us.

It is an interesting and rewarding exercise to trace the roots of a great profession, and in the case of medicine this includes the cults of the magician and charlatan through the ages. It is at times impossible to separate orthodoxy from chicanery, except perhaps on a basis of emphemeral success which frequently follows the latter. An essential ingredient of all cures is faith, and this the quack has always been able to inspire the more readily because of flamboyant or aggressive personality, whereas in orthodox medicine the more impressive the mental equipment, often the shabbier and less personable the practitioner. The quack can radiate supreme and infectious confidence the easier because he suffers none of the inhibitions and provisos with which the practice of any scientific system abounds.

For a view of the origins of medicine we must refer to the instinctive, empiric or (from its predominant theory of disease) the demonic epoch, which includes

medicine as practised in ancient Greece, India, and Egypt. Next came the great era of Hippocratic medicine, which flourished in the second century. In the Dark Ages Europe became a melting pot, in which all theories and beliefs were transmuted. The ban of the Church was another factor in retarding medical advance in Europe. Consequently Greek medicine during this period was held and transmitted in its purest form by the Arabian physicians, who added a considerable overlay of necromancy. Later, at Salerno, for example, we find Greek medicine returning to the West in Arab guise, modified, enriched, and containing a minute germ of the new science of chemistry. Attacked from without by iconoclastic spirits like Paracelsus and the anatomists, after two thousand years' currency, both varieties of Galenism yielded up the humoral pathology in face of the factual epoch, in which tradition and authority were relegated in favour of observation and deduction.

Great strides in medical knowledge followed the work of such men as Harvey, although the impact of chemistry, anatomy, and physiology was not always fortunate, as new systems were devised, based on narrow concepts, which led nowhere. However, with the rise of clinical medicine during the nineteenth century (of which the leading spirit was Laennec) the systems perished.

Many present-day methods of healing derive directly from prehistoric times. For example, venesection was an ancient method in the time of Pliny, who described the plethoric hippopotamus on the banks of the Nile searching for a sharp-pointed reed. He moves his body abruptly against the reed, which penetrates a leg vein. When the animal has bled sufficiently to feel relieved, he closes the wound by rubbing on the soft river mud. Emetics date from observation of the dog's habit of eating grasses which irritate the gastric mucosa. The fondness of goats for hellebore led to its use as a calmative, and poppy seed-cakes were found in the Swiss lake dwellings. Trephining the skull was done from neolithic times onward, being used for epilepsy (to allow exit of the evil spirits) and for depressed fracture. The bony disc removed was thought to contain all the virtue and mental power of the patient and was treasured as a potent amulet.

Hippocrates, "the Father of Medicine," who flourished in the third century, B.C., was one of the first to reject the supernatural and encourage study of disease at the bedside. He left forty-two carefully written clinical histories; no less than twenty-five of these cases ended fatally—an example of literary candour rarely equalled. Æsculapius (who became the historical god of medicine) passed his knowledge on to his two sons, one of whom became skilful in drawing out darts and healing wounds, so that Homeric medicine dealt mostly with treatment of wounds and duties of the military surgeon.

Temples (asclepidæ) were erected to the god of medicine, and over three hundred are referred to in classical literature. In these developed the treatment known as incubation. After sacrifice and purification, the sick person (clothed in the skin of the sacrificed animal) slept beneath the altar of the God. The correct mode of treatment was revealed to him, either in a dream, or by the priest dressed to represent the Deity. Thankofferings in the shape of votive tablets (with clinical details inscribed) or gold or silver models of the part healed, were usual, and have

been recovered at various archæological excavations. Sacred wells (often alongside the temples) were similarly visited, and this type of health-seeking pilgrimage has persisted through the ages.

Apart from purification at sacred wells and incubation, many other methods of treatment derive from classical antiquity : Squeezing, beating and pummelling, as in modern massage techniques; fumigation, as in the Apocryphal tale of Tobias freeing his bride of a demon by fumigating her with fish heart and liver.

The background of medicine in Ireland shows many interesting features. The Irish kings had attendant physicians, and both the chieftainship and the medical dignity were hereditary. The status of Ollav included doctors, philosophers, and scientists of all kinds, who had high rank and were entitled to sit at table next to the chief himself.

Leading Irish medical families were the O'Cassidys (physicians to the Maguires of Fermanagh), the O'Shiels (the McMahons of Oriel), the O'Lees, the O'Hickeys, and the O'Mearas. Similarly, the Beatons were physicians to the kings of Scotland, and the Teares hereditary Manx physicians. Some of these families were specialists; for example, the MacDonalds cured chest complaints by "touching" with incantation. The blood of the Keoghs was considered curative in toothache, and that of the Walshes was esteemed in Connaught for cure of erysipelas. Among the most renowned hereditary practitioners were the Donlevy family, physicians to the O'Donnells. Cormac Donlevy, a cultured writer, translated many classical treatment texts into Gaelic, such as Gordon's "Lilium Medicinæ" and Guy de Chauliac's "Chirurga." Neil O'Glacan, a native of Donegal and pupil of the Donlevys, became Professor of Physic at Toulouse in 1629 and later at Bologna, and physician to the French king.

Many physiotherapeutic techniques were practised in Ireland, but the sweat-house was held in particular regard, as in Scandinavian countries. Good examples of these structures remain at Assaroe, Maghera, and Rathlin.

Many beliefs and rites described in prehistoric and classical times have equivalents in the cults of savage peoples, and are still in use. The savage medicine-man works on animistic principles (as did our professional forebears up to the time of Sydenham). He believes disease to be due to demonic possession—either by agency of disease demons, human enemies, spirits of the dead, or spirits of animals killed by hunters. He cannot conceive of death from natural causes (except senility) and looks for a magical explanation.

Medicine was in general decline during the Middle Ages, and a low level of professional and lay culture obtained. Monasteries were the mediæval hospitals and dispensaries, and the clergy were not seldom regular members of the legal or medical professions—the latter often addicted to supernatural cures. The priest-doctor came into general disfavour, and many edicts of the Nestorian and Latin Churches forbade divinity students to follow the physicians. Finally, Pope Honorius III prohibited all persons in holy orders from practising medicine in any form, but the necessity for numerous prohibitions bespeaks their ineffectiveness.

The final separation of Church and medicine was due more to general causes—the increasing complexity of the art and the rise of the great secular universities (Salerno, Padua, Bologna, Montpellier), where the best medical works were re-translated from Arabic sources. Some of our most venerable prescriptions come from the priest-physicians, such as Rufus' pill, from Arnald's Brevarium (thirteenth century). These contain aloes 4 parts, myrrh 2 parts, and saffron 1 part. This is very similar to the Pharmacopœial pill of aloes and myrrh—the dinner pill of the Edwardian era, when such were popular and necessary.

The redeeming feature of the Middle Ages was the origin of the hospital, with its tradition of dedication to the public service. St. Bartholomew's, St. Thomas's, and St. Bride's are good examples of these early foundations. Pope Innocent III encouraged all bishops to build hospitals in their dioceses. To avoid argument or temporisation, he built a model institution in Rome, and endowed the Order of the Holy Ghost to provide medical and nursing personnel.

Until the eighteenth century medicine was still based on the galenical doctrine of humours. John Gegnes, M.D.Oxon., was in 1559 cited before the Royal College of Physicians for impugning the infallibility of Galen, but saved himself by timely recantation. In this era of obscurantism little wonder that the astrologer, the charlatan, and even the psychopath competed successfully with orthodox medicine, and the traditional folk remedy or magical rite was reckoned equally effective. We cannot therefore ignore the corpus of folk medicine or the contributions of magic and witchcraft to medicine as we know it.

Rosamund Bayne-Powell ("Housekeeping in the Eighteenth Century") points out that "when a man was taken ill there were several courses open to him. He could call in a physician or apothecary, have electrical treatment, go to a witch or wise woman, try home remedies or trust to nature for a cure. The last course might have been the best, but it was not often resorted to. Electrical treatment has a modern ring, but at one time it was much the fashion . . . in the hands of quacks . . .; witches and wise women were more often consulted by the poor than the well-to-do." Many, in addition to charms, used herbs with good effect. Religious houses, apothecaries and noblemen's establishments had herb gardens and still rooms, where infusions of herbs and simples were distilled and stored for medical use. Thus the term "still room" has come a long way from its original meaning. Most cookery books had a section on herbs, and recipes were treasured heirlooms. The herb harvest could be a complicated affair, as, in addition to seasonal variation in quality, astrological considerations, as well as the necessity for silence and working before dawn, often arose.

We must now consider the folklore of relationships in the family and community, as a strong animistic bias has been given to all religious and folk-medical thought by these, and they can be traced back to the dawn of mankind. Kings and princes are hedged about with divinity to-day—much as at the beginning of things. They were originally kept in strict seclusion, to avoid attracting the notice of evil spirits, and the safety of the realm was intimately bound up with the welfare of its monarch. Evans-Pritchard has described the monarchial cult of the Shilluk tribe of Northern Sudanese, which is representative of many to-day. In the kingship centre all

interests "which are common to all the people : success in war against foreigners and the fertility and health of man, cattle, and crops, and of those wild beasts which are of service to man." If a king becomes sick or senile he should be killed to avoid some grave national misfortune such as defeat in war, epidemic or famine.

A man's shadow is thought by some to indicate his soul, and loss of shadow implies debility or approaching death, a long shadow being *per contra* a healthy sign. Amboyna Island is, from this point of view, unfortunatey situated, being almost astride the Equator, and the inhabitants are reluctant to go out of doors at midday. The Irish greeting, "May your shadow never grow less," reflects this remnant of belief from the ancient civilisation, which persists likewise in Russian and German folklore.

Taboos existed on dead bodies, on menstrous and puerperal women, and on pubescent children during initiation preparations, when they were isolated; there were hunters' taboos also, to avoid vengeance from the spirits of slain animals. Such taboos are still enforced by most primitive peoples. Many survived from pagan sources into the Mosaic dispensation, thence to the Christian era. Iron and bronze have been the subject of taboos and also the reverse, for metals were sometimes supposed to confer safety. The temple at Jerusalem was built without nails. On the other hand, spirits dislike iron, and horseshoes (if accidently acquired) prevent their evil-effects. In the Scottish highlands nails were driven into the front of the bed to keep elves from "women in the straw," and a knife was laid near the sleeping child's bed.

The spilling of blood has been a subject of constant taboo. In Viking days a ram or cock was killed and its blood allowed to run over the foundations of a new building, or on the slipway at the launch of a ship. This ceremony has been attenuated in occidental civilisation to the placing of coins, newspapers, and lists of benefactors' names in the foundation cavity of a building, or the smashing of a bottle of wine on the stem of a ship by the director's wife.

A very large body of superstition grew up through the ages and gave rise to the theory and practice of witchcraft, which poisoned the life of Europe and Asia. Present-day superstitions are survivals of pre-Christian beliefs. Mother Church has dealt as kindly as possible with the more tolerable superstitious practices, although the Reformed Church tried hard (without notable success) to stamp them out. Many of these are wrapped in medical folklore, and the roots of modern medicine and surgery are to be found here.

The magical theory of regeneration was strongly held in some parts of the Kingdom. Holed stones were upright monoliths with a roughly circular hole in the shaft. There is a good example at Doagh, Co. Antrim. They were used primarily for fertility rites. Scrofulous, ricketty or otherwise sickly children were "regenerated" by passage thrice through a holed stone, the analogy being emergence, fair and without scathe, from the maternal womb.

The lore of stones is multitudinous and of great interest. Apart from providing the instruments and weapons of our "lithic" ancestors, this material has always been endowed with magical properties, and the fact that it could descend from heaven (in the form of meteorites) invested it with special sanctity. Flints and

arrowheads of the Stone Age were later looked upon as elfin arrows which could kill cattle by penetration of the hide with insignificant entrance wounds. The sudden stab of pain which signalled an attack of lumbago was thought to be an elf shot, which was cured by boiling a stone arrowhead and drinking the water. In Ireland the mitre stone of a high cross is still placed on the head to cure headache.

Healing stones are common all over Europe and good examples are found in Inniskeel Island, Co. Donegal, which are still used as curative agents. Those at Bruckless and Glencolumkille are dumbbell-shaped, and have travelled as far as the United States on their healing mission. After devotional preliminaries the suppliant passes the stone round his body sun-wise. It is said that passage in the reverse direction invokes a curse on one's enemies. Healing stones are reputed to have the miraculous property of returning to their normal resting-place. Some have been stolen, thrown into the ocean or carried to sufferers too ill to make the pilgrimage, but they always return. Stones for curing backache are very common, like the crickstone at Morna, Cornwall, St. Declan's stone in Co. Waterford, and at the Church of the Holy Sepulchre in Jerusalem. The water which collects in basin stones is reputed curative of warts, skin and eye diseases; at some a pin thrown into the water reinforces the cure.

Other stones credited with healing virtues are organic concretions and various precious stones. Adder stone (coralline limestone) was reputed effective against snake-bite, and the mythical toad stone against fairies and all calamities.

The savage medicine-man carries as equipment stones—renal, gall, or even small pebbles. Bezoar (gall stones or enteroliths) was popular in the sixteenth and seventeenth centuries for prevention of plague and poisoning. These were scarce, expensive and frequently faked. Lithontriptics were stones used to dissolve stones in the homeopathic mode; for example, grit from a cock's crop was powdered and drunk in water to dissolve bladder stone. In 1739 Mrs. Joanna Stevens received by Act of Parliament £5,000 for the recipe of her stone remedy, which consisted of calcined egg shell, snails, pigs' droppings, soap, burdock, hips and haws. Powder scraped from venerated images, relics and crosses is the basis of many miraculous cures. Earth from a saint's grave given in milk or water is still a very popular remedy in Ireland; so much so that fresh earth must be added regularly.

Amulets can be of any material—wood, mineral, hair, amber, crystal or precious stones; gems and jewels have a magical lore of their own. Amber beads were worn to prevent plague, and in Ireland cataract is relieved by rubbing the eyes with the tenth bead of a rosary. Blood stones and red coral were given (powdered) for hæmorrhage—a homeopathic remedy. Coral was also hung round infants' necks as protection against fits and sorcery, and many old types of children's rattle have a stem of this material. Coral changed colour in the presence of poison, which made it a prized possession and heirloom in the Middle Ages. It changed colour also according to the state of health of the wearer, a property shared by the turquoise, opal, and pearl. The amethyst (from the Greek "not drunk") rendered its wearer proof against inebriation, hence its former popularity for episcopal rings.

Amulets were safeguards from the accidents of life, from evil machinations, or to promote health, wealth; and prosperity. Personal amulets were worn next the skin, household ones (e.g., horseshoes) fixed to the door. Early in the present century all chemists stocked camphor moulded in the shape of a Maltese cross, which was worn as a preventive of infection, and iodine lockets as charms or cure for everything went into the limbo not very many years ago. People have been known to carry a potato as a charm against rheumatism. Some precious or semi-precious stones cut and mounted in gold or silver and often carved with cabalistic symbols have become famous as healers. The caterpillar charm against murrain in cattle is very similar to the badge of the caterpillar club of Great War days. These jewels were steeped in water and the water given to pigs or cattle. The Lee penny was a Scots amulet renowned against plague—a red stone of heart-shape set in the reverse of a silver groat. It was found in Spain by Lord James Douglas while journeying to the Holy Land to bury the heart of Bruce; it provided the theme for Sir Walter Scott's "The Talisman." Mary Queen of Scots, on the eve of her execution, bequeathed to her brother-in-law, Henry III of France, "two rare stones, valuable for the health in token of true love towards him."

Talismans were usually sacred writings (Gospel, Old Testament, Koran) or mere jumbles, worn or fixed near the door to avert the evil eye. The Chinese doctor, finding himself out of stock of drugs to dispense his precsription, will burn it and give the ash in water to be drunk, believing it just as effective as the mixture. Peter Fleming ("One's Company") describes the acquisition of fresh courage in battle by Manchurian troops from amulets—either by attaching them to their rifles or burning them and swallowing the ash. For ague, the words "Febra fuge" were written on paper and one letter cut off daily; as each came off the fever lessened and ended with the letter F. The Deity and the devil were invoked indifferently : "Good devil cure her; take her for your pains." This type of talisman was obviously not meant to be opened and read by the beneficiary.

The fashion for amulets is not dead. Students sometimes fortify themselves against the wiles of examiners with a silver threepenny piece with a hole, a miniature teddy bear or a piece of old bootlace.

The circle was an important magical figure, protecting those within it from the toils of the evil one. Children with fever were passed head-first through a wreath of woodbine, which was afterwards cut into nine pieces and burnt. A red silk thread round the neck prevented growth of a goitre, as did the pregnancy girdle overgrowth of the fœtus and difficult labour. Rings have been transferred from pagan to Christian rites, and most jewellery used for adornment to-day dates from pre-history. A ring of iron possesses inherent magic; the twentieth-century variant is the so-called magnetic ring worn to prevent rheumatism. Cramp rings were made from coffin handles. The sacrament ring is an interesting Cornish cure for paralysis. A woman collected thirty pennies at the church door. These were changed by the parson for a silver coin from the offertory. Three weeks later a ring made from the coin was placed on her finger and she thereupon regained the use of her limbs.

One important example of amulet healing was "touching" by the reigning monarch. Scrofula (ecruelles, King's evil) was tuberculous adenitis in which sinus formation and skin infection frequently rendered the sufferer miserable and an object of pity. The power originated in the English dynasty through Edward the Confessor. The ceremony survived until 1715; Queen Anne was the last English monarch to touch. Charles II was the most successful (he touched 100,000 subjects —about one in sixty of the population). Pepys attended one of his services ("an ugly office") and Dr. Johnson was touched as a child by Queen Anne. William III was cynical and believed the rite to be superstitious nonsense. Once, being induced to perform the ceremony, he used the phrase "God grant you better health and more sense." The healing power vanished with the advent of the Hanoverian dynasty, to the secret relief of the Jacobites, who, up to the middle of the last century, used the blood of the self-styled Henry IX (obtained from his surgeon in Rome who bled him regularly, and dried on linen threads) as a "touching" medium for healing.

The Elizabethan service consisted of the Litany and other prayers and a discourse on the last chapter of St. Mark's Gospel; during the reading of verse 18 the Queen applied her bare hands to the diseased region. At the reading of the first chapter of St. John's Gospel she made the sign of the cross over the distempered part, using a gold coin attached to a ribbon, and delivered this to be worn round the sufferer's neck. Shakespeare mentions touching by King James I (Macbeth):

> Strangely visited people
> All swoln and ulcerous, pitiful to the eye,
> The mere despair of surgery he cures, put on with holy prayers.

Seventh sons are credited with magical healing powers. Seventh sons of seventh sons (no daughters intervening) are even more potent healers. A seventh son (not left-handed) could be called in to hasten tardy childbirth by giving the patient three shakes; if no seventh son available, any lucky man would do, provided he was not married to a red-haired wife. Babies born feet-first are reputed to become skilful manipulators of bones and joints.

The medicine-man is still a force to be reckoned with in the primitive tribes of many lands, and much of the African witch-doctor's stock-in-trade resembles that of the mediæval European healer. As proof that the cult is still flourishing, I would mention a news item which appeared beside the Press reports of last year's opening address. One hundred witch-doctors held a medical convention in Pretoria. They discussed a project of providing a college of witch-doctors, with an examining faculty (headed by an African non-witch medical practitioner).

The Galenical system rested on the theory of opposites, whereas homeopathic magic was based on the concept of similars (similia similibus curantur) and the usefulness of drugs decided on the strength of superficial resemblances, e.g., burrs stick to anything, and were therefore taken by the Cherokees for weak memory; the Brahmin cures dropsy by ablutions; hot fomentations relieve inflammation and rubbing with snow cures frost-bite. Contiguity magic differed in that the opposite was regarded as curative—bear's grease was until the

beginning of the century a favourite application for baldness, the bear being a hairy animal. Mummy powder or "resin" was taken to ensure long life.

The homeopathic system was reintegrated from ancient Greek elements by Paracelsus and established in modern guise by Hahnemann early in the last century. He advocated treatment of disease by drugs causing like effects: those producing hot dry skin (atropine, aconite) for fever; laxatives for diarrhœa. Emetine is still much used in amœbic dysentery, even by allopaths, and until the introduction of sulphonamides, saline aperients were universal treatment for bacillary dysentery. He adopted the Paracelsian theory of drug signatures, which was based on astrological considerations, as well as on the form and colour of the various plants. The unscientific theory of potency by dilution and that of "proving" the repertory were added by Hahnemann to the Paracelsian structure. This system was refurbished as a protest against the poisonous dosage usual with Hahnemann's allopathic contemporaries, but a cynic remarked that "patients of the homeopaths died of the disease, and patients of the allopaths of the cure."

Witchcraft as a religion was superseded and frowned upon by Christianity in Europe, as by Islam in the East. The second commandment prohibited any sharing of altars, and the dethroned God was always referred to as anti-God, anti-Christ, fallen angel or devil. The names of the pagan pantheon varied from district to district, and, as the worship antedated writing, little evidence (beyond cave art) remains. The horned God was a universal emblem of fertility. He was called Cernunnos by the Roman occupants of Gaul—in English "Herne," or coloquially "old Hornie." In Northern Europe the ancient Neck or Nick (spirit) had such a hold on the peoples' affections that the Church regularized his position by canonisation as St. Nicholas. In Cornish depiction he still retains his horns. The Lammastide Puck Fair at Killorglin, Co. Kerry, is a remarkable remnant of paganism, where Puck, king of the wild goats, reigns over the saturnalia for a week. The old religion was based on magic and witchcraft, and it is interesting to note the many examples of magical interference mentioned in Scripture.

The making of images and effigies was an essential technique of witchcraft. They usually consisted of wax, clay or breadcrumbs, and could be used in a malevolent or benevolent way. Pins were inserted into the region to be "treated," and the figurine or "poppet" exposed to heat with suitable incantations, when the victim might be expected to wither and die. Benevolent uses included restoration of missing spouses and inspiring love in lukewarm admirers. Love potions and magical cures were the stock-in-trade of all witches.

From witchcraft to alchemy seems in retrospect an easy step, for both dealt with imponderables. Pythagoras (born 582 at Samos), mathematician and sage, believed that numbers contained the secret of the universe. He is best remembered for his theorem that the square of the hypotenuse of a right-angled triangle equals the sum of the squares of the other sides. He decided the proportions of a perfect rectangle as 1 : 1.618, and the latter magical number represents the diameter of a regular pentagon if the sides measure 1. He founded a brotherhood on the familiar basis of "high thinking and low living" in Southern Italy. They initiated the search

for the philosopher's stone for transmutation of base elements to gold. The alchemists were motivated not by mercenary ideas (as popularly supposed), but by a most precise theology which, for lofty symbolism, would vie with any modern Christian foundation.

An intricate gradation of values of grace and merit ranged from lead, dull, heavy and impure (sinful and unregenerate man) to gold, beautiful, untarnishable, purged by fire and corrosive agents (the redeemed and happy soul).

The history of this much-maligned branch of natural philosophy may be completed shortly by saying that they were the first chemists, and that some of their methods have stood the test of time.

Trees are objects of unusual significance in religion from classical antiquity down. Some varieties were planted round dwellings as domestic amulets, and even to-day the laurel is much in favour for this purpose. The rowan was good against the evil eye, and a cross of twigs of this tree is still fixed on the thatch of farm-houses and byres. The elder, thorn and honeysuckle also keep witches at bay. The oak is renowned mainly on account of its parasitic mistletoe—the sacred "golden bough" of the Druids. This plant was dedicated to Mylitta; it also decorated the temple of Venus, so that as an incentive to the osculatory art mistletoe has retained its function in a most commendable way. It was a popular cure for epilepsy and infertility, and until recently the active principle was given for reduction of blood pressure.

Trees were used for regeneration and transference cures. Gilbert White describes "a row of pollarded ash trees in a farmyard in Selborne, which, when young, were cleft vertically and the gap held open by wedges. Ruptured children were stripped and pushed through the aperture. The tree was then plastered with clay and carefully swathed up. If the tree healed, so did the child." A similar country cure was practised in Imperial Russia.

Water was regarded as a magical substance in every civilisation. Apart from its essentiality as current coin in which all biochemical activities are transacted, it in itself provides a system of medical treatment. Small wonder then that man has always regarded rivers and lakes with awe, and the source of a river as a goddess to be propitiated. The Seine rises in a valley of the Cote d'Or, where there is a statue of the river god (Sequana) in a grotto. The Roman army in Gaul raised a temple close by, to which pilgrims have resorted for the past two thousand years, and votive offerings (models of healed parts) are to be seen in the museum at Dijon. This type of pilgrimage, like those of the Greek æsclepidæ, resembles the "patterns" taking place at many holy wells to-day. The cult of the bath was one of the glories of Roman civilisation, and it spread in conquered countries, to their untold benefit. Massage and curative exercises were likewise practised, as well as urtication, or switching the painful rheumatic limbs with nettles (with which seed the Roman legions were well provided). There was considerable need for therapy of this nature as the weather then, as now, was damp and conducive to rheumatic disorder. It is amazing how little the British climate and character have changed through the centuries. Tacitus wrote to Rome: "The Britons themselves submit to the levy, the tribute and other charges of empire with cheerful

readiness, provided that there is no abuse. That they bitterly resent, for they are broken into obedience, not slavery. . . . The climate is objectionable with its frequent rains and mists, but there is no extreme cold." And so say all of us!

The lore of water is most elaborate. Jordan water became popular for baptism about the time that the Crusaders were returning to civilian pursuits. Water drawn before sunrise, downstream, silently, on Easter Sunday has valuable properties. It does not spoil; it restores youth to the aged, strengthens the cattle and cures their rashes (Grimm). South-running water had peculiar efficacy. A very sick patient could be clothed in a shirt wrung out of the water or, if preferred, the water might be carried to him in a vessel, the mouth of which is held pointing due north, and in silence. In both Scripture and folklore silence was essential to many magical cures, like carrying water in which a murrain stone had been immersed, to cattle.

A very popular Welsh transference cure for epilepsy (obviously derived from the Greek incubation rite) was practised at St. Tegla's Well, near Ruthin. The sufferer washed in the well at sunset and threw in an offering of fourpence. He then walked thrice round it, repeating a Pater Noster and carrying a cockerel. The suppliant entered the church, crept under the altar and composed himself to sleep, using a Bible for pillow. In the morning an offering of sixpence and the fowl was made to the church. If the bird died the epileptic was cured.

There are innumerable holy wells in these islands, many of them pagan sites adapted to Christian usage. In Ulster the Struel wells near Downpatrick (most potent at St. John's Eve) are particularly renowned for cure of eye affections. In doing the rounds of a well (usually three or nine times), saying the Rosary, the pilgrim is careful to move from left to right (sunwise); moving "widdershins" (anti-clockwise) calls down a curse on the pilgrim's enemies. The "desuil" (Deas soil), sunwise or holy round—always left to right—is a Greek-Roman-pagan act of worship adapted to Christianity, and a Lamaistic and Mohammedan practice also. It is used on rounds or patterns at any venerated site, as well as in multiple baptism. The crews of fishing-boats are careful that the craft leave port in a sunwise direction, and playing-cards are similarly dealt.

Immersion in various wells, rivers, and lochs was reckoned a cure for madness—the Well of Spey; Lough Monaar in Strathnaver—but others were supposed to make mad anyone who was immersed. The Borgie Well did this to those drinking thereat; the unfortunate inhabitants of Cambuslang had this well as their main water supply for centuries. There are holy caves in Scotland in which water dripping from the roof is used to relieve deafness. That credulous and unsuspecting tourist, Geraldus Cambrensis, mentioned two Irish wells, one of which turned the hair grey and the other had the exact opposite property.

Natural water cures were of three kinds—physical, magical, and religious (animistic); these were often combined as a physical method—cold water baths for feverish states, hydrophobia, "the vapours," and insanity (the shock supposedly driving the devils out). John Wesley advised setting a demented person under a great waterfall, as long as his strength will bear, or pouring water on the head from a tea kettle. Shock treatments were always popular. The recovery of a lady

bedridden from paralysis is ascribed to one Dr. Morse, whose wig had been dusted with gunpowder in mistake for wigpowder. Bending over to examine his helpless patient by the light of a candle, the wig exploded and the patient leaped out of bed, cured. Modern instances of water cure under religious auspices may be found at the famous grotto of Lourdes, and under medical auspices at the many spas of Britain and the Continent.

Colours have considerable significance for students of folklore. In China yellow was the imperial colour, reserved for the emperor and highest mandarins; it is a sacred colour in Tibet and the distinctive dress of a lama. Red is disliked by spirits nearly everywhere and red worsted thread used to be tied on cows' tails, and Chinese mothers tie red silk in their children's hair, to avert the evil eye. Mephistopheles is conventionally arrayed in red as this colour is objectionable to him.

John of Gaddesden prescribed red hangings in the sickroom of the son of Edward II, which cured his smallpox, and red blinds were in favour for acute exanthems until the end of the nineteenth century. Red flannel is an important cure for chest ills and rheumatics. Expensive proprietary pads of this material are available for application to the various joints.

A black cat is sheer magic, as the domestic familiar of witches. A hair from the tail plucked on the first night of a new moon will cure styes, if rubbed on nine times. Blood from a black cat's tail smeared on the eruption will cure shingles, and the fur worn collarwise cures goitre. It will be clear that, apart from the ravages of Davy Crockettism, the expectation of life of a black short-hair domestic feline is small. Black wool used to be stuffed in the ears for toothache; blood of a black hen is valuable against rheumatism, shingles, or indeed anything.

Planetary movements have always mystified and attracted the credulous. The astrologer's art of making inference from planetary influences on birth dates was firmly believed in, and advice (frequently contradictory) based on this rather insecure foundation is freely available in the popular Press to-day. Still, the farmer will follow his instinctive lore in preferring to sow crops with a waxing moon. A child born between moons is said to be delicate and hard to rear. It is widely believed that death is most likely during the middle watch of the night, but in seafaring communities death is most feared when the tide is at its lowest ebb. "He's a going out with the tide," said Mr. Peggotty of Barkis.

Sir Kenelm Digby ("Discourse on the Power of Sympathy") wrote: "If one would not think it a folly that one should wash his hands in a well-polished silver basin, wherein there was not a drop of water, yet this may be done by the reflection of the moonbeams only—infallible for taking any warts from the hands if often used." Sir Kenelm was a many-sided character, but his claim to fame rests mainly on the powder (copper sulphate) with which he revived the sympathetic magical weapon treatment of the Middle Ages, the theory of which was that it was more effective to treat the weapon than the wound which it inflicted. As the enemy was not always obliging enough to attend with the weapon, Digby treated the blood-stains on the victim's clothing with his powder. This system had unconscious virtue in that neglect of wounds in that particular surgical era was a boon indeed.

Metals were regarded as under the domination of their respective planets (gold—the sun; silver—the moon; lead—Saturn). The description "saturnine" is still applied to a thin, sallow, anæmic and melancholic individual—formerly typical of lead encephalopathy. Various parts of the physician's art were under planetary tutelage; a survival of this is the "recipe" sign printed at the top of every prescription form issued by the Health Services Board, which is an invocation of the planet Jupiter (℞ from ♃), although the Early Church made it respectable as the "responsum Raphælis."

With regard to the lore of numbers, which were held peculiarly significant by the alchemists, there was marked potency in odd numbers, of which Virgil wrote, "Numero Deus impare gaudet." The climacteric now refers to the cessation of reproductive activity, but in the Middle Ages it meant upheaval or renewing of the body every seven years. This concept of somatic revival persists, and children are said to "grow out of" various diseases at the age of seven or fourteen.

Human spittle was credited with miraculous properties—especially fasting spittle, and Pliny devotes a chapter to its many uses. In baptism of children in ancient Rome the forehead was moistened with saliva to avert magical arts. Mungo Park described how, in certain African tribes, the witch-doctor baptizes by spitting thrice in the infant's face; this gesture may also be a sign of respect or forgiveness. Thomas Dinley ("Tour of Ireland," *temp.* Charles II) says: "They are never to bless, praise or commend anything without spitting thereon, for fear of witch-craft." It is still a common custom to spit in the hand before commencing work, concluding a bargain or paying a debt. Healing with spittle is a venerable rite. Christ restored sight, speech, and hearing with this medium, and St. Hilarion cured blindness in Egypt similarly.

Many country cures were noteworthy for their simplicity. Iron was reputed health-giving and proof against witches' spells. Anæmia was cured by ferric hydroxide in the form of anvil dust suspended in water. Forge water—the stagnant pond in which the heated iron is quenched for tempering—is also prized medicinally as it contains arsenic (from the horses' hooves) as well as iron. These are good examples of the inspiration which on occasion elevated folk remedies to the level of scientific medicine. An equally prescient form of treatment was the application of fungus from damp walls or poultices of bluemoulded bread or potato to septic lesions. Another early application of antibiotics was the practice of South African farmers of storing a few apples in the wardrobe. These grew a heavy fungus and were ground up and applied to wounds. Plesch records that the late Professor Balogh used extracts of moulded meat as medicine for dysenteric complaints.

Transference cures were popular and completely magical—passing the disease to someone or something else. The Welsh epilepsy cure was of this nature, and one for whooping-cough which still survives is to draw the child (naked) nine times over the back and under the belly of a three-year-old she-ass on three mornings. Disease could be transferred to a corpse; rheumatism, warts, wens, goitres and toothache were all responsive to rubbing with a dead finger; a suicide's or judicially hanged finger was particularly effective. Transference of disease to trees has already been described. A Cheshire cure for warts was to rub them with a scrap

of bacon which was inserted under the bark of an ash tree; with any luck galls would appear on the trunk and the patient be cured. There is a lingering remnant of superstition that certain venereal infections can be cured by transference to young persons; this has been responsible for much crime against children and untold suffering.

Animistic methods also included hide cures, where the sufferer covered himself with the hide of an animal in hope of transferring disease to the animal's spirit, or of inheriting some desired characteristic, like sureness of foot from a goatskin. Sir Walter Scott was, as a child, arrayed in a still warm sheep fleece as a cure for poliomyelitis. The dried and powdered organs of animals are used by many savage peoples to impart desirable characteristics, such as the heart of a lion for bravery, the lungs of a roebuck for fleetness of foot. In China the gall-bladder is eaten to ensure courage; amongst African tribes the liver is sought after as the seat of the soul. Blood, especially sacrificial blood, is purifying and regenerative, endowing the recipient with concentrated characteristics of the slain. These are the motives which underlie the practice of cannibalism. Here we see the beginnings of organotherapy in an age when endocrines had not been thought of.

Fats were prominent in dispensatories of all ages, and every self-respecting witches' brew contained at least one. Human fat was available (up to 1792) from the public executioner of Paris, and it was considered effective as an external application for rheumatism.

Anointing an infant's nostrils with oil or butter was a common "Sairey Gamp" gesture. Langdon-Brown, when an obstetrical pupil, noted the midwives' habit of slipping a ball of butter with honey or sugar into the new-born infant's mouth, as a protection against the evil eye. Application of camphorated oil for cough and neat's foot oil and goose grease for sprains are magical rites still common in Ireland. Sheep's wool fat (lanoline), although originally part of a sacrificial rite, is a remedy of outstanding merit.

Snakes, serpents, toads, lizards and crocodiles were worshipped, particularly in Egypt, India, and Africa. (Touacatlcoatl, a Mexican Indian deity, was a serpent.) The snake was a symbol of fertility from its phallic form and apparent rejuvenation by sloughing the skin. These reptiles were supposed to possess an antidote to their own venom, and snake flesh, fat or venom was therefore an ingredient of most witches' brews. ("Fillet of fenny snake, in the cauldron boil and bake!" (Macbeth).) The entwined snake on the budding staff has become the heraldic device of medicine. The staff with twin snakes (caduceus), as depicted on the overhead corridor abutting on this building, is the wand of Mercury (Hermes), messenger of the gods.

African natives immunize themselves against snake-bite by squeezing venom into their mouths, and injections were at one time given for epilepsy (homeopathic methods). Theriac (or mithradacticium), the magical formula of the second century King of Pontus, Mithriadates, was designed as a universal antidote. It contained sixty-three ingredients, of which the principal was snake's flesh, and all inert. In 1746 Heberden moved the rejection of viper theriac from the Pharmacopœia, but his proposal was carried at the Royal College of Physicians by one vote only.

The name "theriac" was afterwards bestowed on molasses. The sulphur-treacle electuary, so beloved of our grandparents as a spring blood purifier, is a direct descendant of, and as free from good or ill as, theriac. The recent popularity of blackstrap molasses as a component of certain transatlantic "eat and grow thin" regimens is likewise reminiscent of the viper theriac.

Excrement bulked largely in materia medica from classical times onward. The justification was that it contained the concentrated virtues of the donor. The revulsive element was considered beneficial, and the anti-demonic factor was strong. Culpeper's London Dispensatory (1640) devoted a whole section to "Parts of living animals and excrements." A holy man's or totemistic animal's ordure was particularly effective, and a brisk trade used to take place in dried fæces of the Grand Lama of Tibet.

Dr. John Hastings (1862) wrote on "The value of excreta of reptiles in phthisis, etc." This material was highly prized and highly priced, as it had to be imported and many complaints of substitution and adulteration arose. Pliny wrote that a plant that has grown up on a dung-heap is an excellent remedy for quinsy; also, "A plant upon which a dog has watered, torn up by the roots and not touched with iron is a very speedy cure for sprains." The Hottentots dash urine in the faces of strangers as a mark of respect.

Sheep's droppings in water was an English countryside cure for whooping-cough, jaundice, and measles, and warm cow dung a universal application to wounds and "gathered" breasts. Cardinal Richelieu at his last illness was given dung in wine, and the eighteenth century Lord Fermanagh took a horse-dung posset daily for fifteen days, after which he was cured.

It is possible that some kind of local antibiotic effect occurs. As has often been the case, proof of practical efficacy of a remedy may anticipate by many years knowledge of its rationale.

Urine owes its place in folklore to its intrinsic antiseptic properties, and many primitive races regard it as a natural cleanser and dressing for wounds and sores. Sal ammoniac, so named from its first manufacture in the temple of Jupiter Ammon, was originally made from camel urine, and during the Middle Ages urine was the main source of phosphorous and saltpetre.

Amongst the more curious scatological customs is the mushroom festival, as Oliver Goldsmith ("A Citizen of the World") described it among the Tartars of Koraki. *Amanita muscaria* possesses inebriant qualities and its alkaloids are excreted in the urine. When a nobleman makes a feast all the neighbours round are invited . . . "The mushroom broth goes freely round and they laugh, talk *double entendres,* grow fuddled and become excellent company. The poorer sort, who love mushroom broth to distraction but cannot afford it at first-hand, post themselves round the huts of the rich and watch the opportunity as they come down to pass their liquor; of this they drink with the utmost satisfaction and thus they get as drunk and as jovial as their betters." Bergen Evans ("The Spoor of Spooks") states that he recently witnessed this festival amongst the Chuckchee and Koryaks settled near the Behring Strait.

That scatological tendencies survive is shown by reference to the annual report of the Medical Officer of Health of Tyrone for 1949 : "Doctors and nurses encounter indifference, ignorance and superstition at almost every turn . . ., parents who administer orally a 'cure' of an infusion consisting of turkey dung (amongst other things) believing it to be a suitable remedy for jaundice are . . . exposing their children to the risk of a whole series of diseases." Plesch (1947) revives the old theory : "The accumulated experience embodied in folk medicine indicates that both own and alien urine may be effective, not only by injection, but also by external application." He recommended injections of urine for asthma and certain viral infections. A present-day dentrifrice containing an ammonium salt as inhibitor of dental caries, harks back to the traditional materia medica. Allantoin, an oxidation product of uric acid, is much in favour as a dressing for indolent ulcers. It may be that the presently popular quaternary ammonium antiseptics are not such a far cry from Pliny's watering dog; certainly allantoin is in the direct scatological succession.

We have not been concerned so much with details of actual cures as with the traditions and beliefs which motivate them. A catalogue of cures would be tedious, and anyone who has been brought up in Ireland will have acquired a working repertoire for himself. A few characteristic remedies are, however, worthy of mention. For skin cancers, a paste of arsenious oxide is applied daily until sloughing appears. This is usually an "inherited" cure, like bone-setting. Still popular in rural areas of Ireland, it has limited success in rodent ulcers, in which growth is at first slow and with tendency to heal temporarily under any treatment. A charm for "the rose" (erysipelas) is freshly churned unsalted butter as a dressing.

There were many remedies for pulmonary tuberculosis, such as passing the sufferer head-first through a wreath of honeysuckle. Asses' milk, or better, human milk, was very popular for wasting diseases, as noted in the "Rosa Anglica." Toothache was thought to be due to a worm in the tooth. Treatment was by smoking it out with frankincense, verbena or plain tobacco, which was a heaven-sent justification of this pleasant habit. Mme. de Sevigny, a noted medical dilettante, advised application of the sufferer's urine. A toasted fig held between tooth and cheek seems a reasonable remedy, even now. Whooping-cough—the chin cough—was a great scourge of child life, and remedies are legion. Apart from the asses' belly treatment, the disease could be transferred to a spider or beetle, which was tied up in muslin and pinned to the mantelpiece; as it languished and died, so did the spasms. Transference is effected to a dog by putting some hairs from the sick child into a bread and butter sandwich, which is fed to the animal. If the dog coughs while eating this (and he usually does) cure is certain. It could be transferred to the rider of a piebald horse; he must be stopped and asked for advice. Mrs. Beeton would have said, "First catch your piebald horse." Spiders were highly regarded as medicaments. As well as being used in amulet cures, they were swallowed alive for fever (a "revulsive" remedy), made into a paste and worn on the forehead for headache; spider's web, still popular as a local hæmostatic, is mentioned by Pliny.

The ubiquitous virus infection known as warts provides great scope for remedies magical and orthodox. The lesions are self-limiting and tend to appear (and disappear) in unaccountable fashion. One of the simplest cures is fasting spittle. Water, as the post-communion water-wine mixture from the chalice, is also used. Transference to a snail is accomplished by rubbing the warts with the snail and then impaling it on the north side of a blackthorn bush. A piece of stolen beef (the criminous element is essential) is a popular application, especially if afterwards buried at a crossroads, where opportunities for transference are enhanced. Buying the warts with small copper coins is recommended (and used) by many country practitioners to-day.

Epilepsy attracted innumerable cures, as its manifestations suggested bewitchment or bedevilment. The Gadarene swine and incubation are good examples of transference cure. Powdered skull had considerable virtue, particularly if from a hanged criminal. Usnea, dried moss from hanged criminals' skulls, was only ejected from the Pharmacopœia in the nineteenth century. A country cure for mumps was to dress the child in a donkey's bridle and lead him thrice round a well.

Metals were important homeopathic medicines. Arsenic causes inflammatory dermal reaction, and is therefore indicated for skin diseases. Mercury is also an historic therapeutic for skin lesions, and understandably so, as in the past many dermatoses were of syphilitic origin. The fumigation cure—using calomel vapour—dates back to ancient Greece, and was the secret of many continental spa treatments. A patient was shown in this hospital recently suffering from severe mercurialism due to wearing a mercury belt (mercury and butter inside two layers of cotton) prescribed by a Co. Antrim healer for eczema. Potable gold was a miraculous alterative, tried when all inferior prescriptions failed. Mummy resin occupied a similar "last resort" status, and was frequently faked. Bishop Berkeley of Cloyne published his tar water cure in 1728, stating that "a mild solution of the tar water contained all the properties to universal remedy for all diseases. It was used mostly for skin complaints, and I believe our dermatologists would still lend some countenance to his idea. Unicorn's horn, the product of a mythical animal, was accordingly mightily prized and very expensive. It usually consisted of narwahl tooth.

Almost all substances have been credited with therapeutic powers at one time or another. A good example is the homely potato, which on introduction to Europe sold at high prices as an aphrodisiac. Similarly, tomatoes when first brought to France were known as "pommes d'amour."

Most of the popular and well-tried items in our Pharmacopœia started life as country or quack cures. Foxglove, squill, broom and juniper are a few of many possible examples. Indeed, Withering, who introduced digitalis as a cardiac tonic, described it in 1785 as an old countryside remedy. Rauwolfia is a traditional Indian folk remedy for hypertension and mental disturbance. Khellin and ephedrine came from Egyptian and Chinese peasant lore respectively. There are records of Chinese knowledge of rhubarb from 3000 B.C. Coca leaves, the raw material of cocaine, were chewed by the Mexican Indians to gain endurance, and Indian hemp is a very ancient inebriant. Carleton ("Tales of the Irish Peasantry") described how, when

faced with a case of prolonged labour, the midwife would send one of the men to collect six heads of 'blasted' barley. She would scrape the black powder (ergot) off these and give it in milk to the patient.

Many aromatic essences were dispensed as pleasant-tasting syrups. An hippocras was an aromatic medicated wine, used as a cordial. These recipes have survived on account of their social rather than medicinal virtues, and some are still the treasured secrets of monastic foundations. Juniper, wormwood, aniseed and peppermint are made into useful and popular carminatives like gin, vermouth, absinthe and liqueurs. Sarsaparilla, an important anti-syphilitic remedy in the eighteenth century, has found its true metier as flavouring for a carbonated beverage much liked by children.

Some plants were inert or even dangerous if handled. Mandrake (mandragora), an hypnotic of ancient lineage, had to be pulled by tying a cord from the stalk to a dog's leg. The fleshy root was believed to cry when being pulled; hearing the cry meant madness, and bystanders stopped their ears during the process ("and shrieks like mandrake torn out of the earth"—Romeo and Juliet). Opium, prominent in Greek mythology, is still the foremost soporific. Shakespeare makes Iago say:

> Not poppy, nor mandragora,
> Nor all the drowsy syrups of this world
> Shall ever medicine thee to that sweet sleep
> Which thou had'st yesterday.

Many collections of medicinal substances and receipts were published, but all bear evidence of the pioneer work of Dioscorides—surgeon in the army of Nero and medical attendant of Cleopatra. While on service abroad he collected an extensive materia medica. Galen (also a surgeon to the Roman army and physician to the Emperor) worked these remedies into a system, and preparations of vegetable origin are still termed "Galenicals."

Many classical collections of materia medica have come down to us, including John of Gaddesden's "Rosa Anglica," Culpeper's "Dispensatory," Gerard's "Herball" and "Paulus Agænita." The particular interest of the "Rosa" arises from the fact that a Gaelic translation of the Latin text exists, probably from the pen of a Northern Gael (*circa* 1460), which has been published (with English translation) by the Irish Texts Society. The apologia to the Angsburg edition (1595) reads like a modern publisher's "blurb":

> "As the rose overtops all flowers, so this book overtops all treatises on the practice of medicine, and it is written for both rich and poor surgeons and physicians, so that there is no need for them to be always running to consult other books, for here they will find plenty about all curable diseases."

Worthy ambition, often imitated.

Thus the roots of the healing art practised to-day. The story, no inconsiderable saga, begins at the very dawn of domination of the earth by man. It was born of human need, cradled in the classical religious systems of Greece and Egypt, enriched by the folklore of all countries and held in thraldom by Mother Church

through the Dark Ages. Only since the divorce of medicine from theology and abolition of the bonds of doctrinal taboo has medicine found itself in the path of scientific rectitude. Much as we dissent from many of the theories and practices of our forebears of the craft, yet their wisdom and personalities stand out, as does the oft-repeated pattern of vocation for healing and devotion to the lofty ideals of the calling.

In conclusion, I would remind you of Oliver Wendell Holmes' plea that old medical books be not regarded with contempt, and take the liberty of applying it to the folk-history of medicine generally: "The debris of broken systems and exploded dogmas forms a great mound—a Monte Testaccio of the shards and remnants of old vessels which once held human beliefs. If you take the trouble to climb to the top of it, you will widen your horizon, and in these days of specialised knowledge, your horizon is not likely to be any too wide."

I am greatly indebted to the Staff of the Medical Library of the Queen's University, Belfast, for their expert help.

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Cancer of the Lung in Northern Ireland

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INTRODUCTION.

AT the end of the last century bronchogenic carcinoma was described as a rare disease. Since then, and particularly since the last war, it has been diagnosed with increasing frequency. Much has been written about this increase, and it can be concluded that while the greater part does, in fact, represent a true increase in incidence, part represents an increased awareness of the condition due to improved diagnostic, anæsthetic and surgical techniques which, in turn, have stimulated interest in lung cancer.

Thoracic surgery is a relatively recent innovation. Although Macewen (1931) claimed to have done a pneumonectomy in 1895 and Sauerbruch (1923) a multiple staged pneumonectomy some thirty years later, it now seems likely that the former may have been nothing more than drainage of a large cavity and that the latter was incomplete. Twenty years ago, Nissen (1931) did a multiple staged pneumonectomy for pulmonary suppuration; but it was not until 1933 that Graham performed the first pneumonectomy for lung cancer (Graham and Singer, 1933).

In Northern Ireland the evidence for a real increase in incidence has been considered in terms of mortality. As elsewhere, the condition is, certainly among males, and probably among females, much more common now than formerly (Cheeseman, 1950). Table 1 shows the mortality trend over the last thirty years and Table 2 its present geographical distribution. Mortality attributed to lung cancer has increased in every age group and the increase has been much more rapid among males than among females. The present-day rates are much higher in the industrial area of Belfast than in the essentially rural areas of Counties Fermanagh and Tyrone. Nothing in these tables suggests any dramatic difference in the mortality pattern between Northern Ireland and England and Wales, although Table 3 shows that, at each age group over forty years, the Northern Ireland rates are lower. Among males the rates of the two countries become more divergent as age advances, which is compatible with the theory that rates in England and Wales in the younger age groups have reached a stable level (Registrar-General for England and Wales, 1955).

The possible causes of the recent increase in incidence have been investigated very carefully (e.g., Doll and Hill, 1950, 1952, and 1954; Wynder and Graham, 1950, and Stocks and Campbell, 1955). In these investigations the male and the urban excessive incidence and the association with tobacco smoking have been variously demonstrated. Following reports of a carcinogen, benzpyrene, in domestic soot (Goulden and Tipler, 1949), in the atmosphere (Waller, 1952), and

in cigarette smoke (Cooper and Lindsey, 1955), the observation of Stocks and Campbell (1955) of a decreasing ratio of urban to rural mortality from about nine to one in non-smokers to almost one to one in heavy cigarette-smokers enabled them to formulate the current working hypothesis that 3 :4– benzypyrene is an agent in the ætiology of the disease.

The suggestion has been made that mortality is likely to increase, for some years to come, in the older age groups (Registrar-General for England and Wales, 1955).

TABLE 1.

Average annual death rates attributed to cancer of the lung per million of population at specified age and sex groups in Northern Ireland, 1925-27, 1936-38, and 1949-53.

Age Group in years	Males			Females		
	1925-27	1936-38	1949-53	1925-27	1936-38	1949-53
0-39	5	9 (180)	18 (360)	4	5 (125)	6 (150)
40-49	25	133 (532)	264 (1,056)	9	66 (733)	41 (456)
50-59	39	227 (582)	797 (2,044)	60	69 (115)	122 (203)
60-64	141	238 (169)	1,007 (714)	45	193 (429)	226 (502)
65-74	61	291 (477)	1,012 (1,659)	26	123 (473)	258 (992)
75 and over	–	186	499	19	– (–)	198 (1,042)
All Ages	18	74 (411)	235 (1,306)	13	34 (262)	57 (438)
40 and over	47	207 (440)	641 (1,364)	31	88 (284)	139 (448)

Figures in brackets indicate the rates in 1936-38 and 1949-53 as percentages of those of the corresponding age and sex groups in 1925-27.

TABLE 2.

Geographical distribution of standardised mortality ratio (per cent.) attributed to cancer of lung by sex in Northern Ireland, 1949-53.

County or County Borough	Males	Females
Belfast C.B.	177	146
Londonderry C.B.	95	74
Co. Antrim	73	81
Co. Armagh	67	55
Co. Down	76	91
Co. Fermanagh	27	65
Co. Londonderry	52	85
Co. Tyrone	56	60
TOTAL	100	100

Standardised mortality ratio for a specified area and sex is the observed number of deaths as a percentage of the number expected if that area and sex had experienced the same age specific mortality as all areas combined for the same sex.

TABLE 3.

Age and sex specific death rates attributed to cancer of the lung in Northern Ireland as percentages of the corresponding rates in England and Wales, 1950-53.

Age Group in years	Males	Females
0-39 - - -	95 ...	100
40-49 - - -	76 ...	56
50-59 - - -	62 ...	75
60-64 - - -	51 ...	82
65-74 - - -	48 ...	72
75 and over - -	37 ...	58
All Ages - -	49 ...	62
40 and over - -	56 ...	70

This being so, the early diagnosis of lung carcinoma will continue to be of vital importance and any classification of early manifestations of the disease will be similarly important if it will help in the early segregation of operable from inoperable patients and those with good from those with bad prognosis. Therefore, in an attempt to learn something of the early symptomatology of the disease we examined the records of 404 patients seen at the Royal Victoria Hospital, Belfast.

The Data Used.

The diagnosis of carcinoma of the lung is established by the history, physical signs, radiology and bronchoscopy, when a biopsy giving histological proof may be obtained. In some patients a bronchogram is required, while in others thoracotomy is necessary before the diagnosis is confirmed. In this hospital bronchoscopic lavage is not regularly carried out. One of the chief difficulties of diagnosis is the paucity of signs as distinct from the abundance and variety of symptoms.

Included in the present review are all patients seen in the period 1950-54, in the medical wards or in the thoracic surgical outpatient department, for whom an agreed diagnosis of carcinoma of the lung was made by the physician, under whose care the patient was admitted, and a thoracic surgeon. If this agreement was lacking, the case was omitted and thus, undoubtedly, some true lung carcinomata were rejected. In this way a series of 404 patients was obtained and their records studied. The items of the data reviewed here were not available for every patient, but the omissions were relatively few.

The state of all patients in November, 1955, was known. Reported deaths were checked through the co-operation of the Registrar-General for Northern Ireland and all surviving patients were seen by a thoracic surgeon or by an almoner. All patients who had resections had them at least ten months before November, 1955, so that estimates of survival up to that time have been based on all the exposed to risk, while estimates for longer periods of survival have been calculated by the appropriate life table methods (see Hill, 1955).

First Symptoms.

Table 4 shows the distribution of the patients by the first symptom; this requires some qualification. It is probable that the symptoms of which they complained were the first of which they were conscious, although in some cases they were so vague that, say, a cough which became more severe passed without comment until pain in the chest or hæmoptysis supervened.

TABLE 4.

Distribution of patients by first symptom.

First Symptom	Number of Patients		Percentage of Patients	
	Males	Females	Males	Females
Pain in chest	85	5	23.5	11.9
Cough	75	11	20.7	26.2
"Influenza"	64	7	17.7	16.7
Shortness of breath	44	5	12.2	11.9
Hæmoptysis	34	6	9.4	14.3
Loss of energy, weight or appetite	23	2	6.4	4.8
Evidence of secondary metastases	12	4	3.3	9.5
Indigestion	5	–	1.4	–
Chronic pulmonary osteoarthropathy	2	–	0.6	–
*None or unknown	18	2	5.0	4.8
Total	362	42	100	100

*Includes 7 males and 1 female discovered at routine X-ray.

Pain in chest.

This is usually described as a dull aching pain, not severe, not pleuritic and not affected by respiratory movement. It is constant, but lessens with passage of time, and is sometimes associated with a slight rise in temperature. Often the pain is referred to that part of the thoracic cage overlying the tumour, although often thoracotomy does not reveal pleuritis, adhesions or encroachment of the tumour upon the pleura. The pain is distinguishable from that due to nerve or bone involvement; the latter is likely to be more severe and often shooting or stabbing in character.

Rienhoff (1947) notes that pain is an uncommon symptom of other cancers and that its manifestation in lung cancer should help diagnosis. The cause of the pain is unknown but, by analogy with pain in the intestinal tract where spasm and distension are the agents, it might be argued that distension of the bronchus by, or spasm of the bronchus as a result of, the tumour gives rise to the early pain in lung cancer.

Cough.

The recorded features under this head are the development of a cough or the change in character of an existing cough. Thus it is important to ascertain whether

the cough is of recent onset, whether it has changed from being productive to non-productive, or vice versa, whether it keeps the patient awake at night or whether it alters with a change in position.

Influenza.

This includes all cases where the first symptom was a pyrexial attack. It has often been diagnosed as "flu," pleurisy and pneumonitis, while in some patients the lungs have been suspected so that a diagnosis of pyrexia of unknown origin would have been more accurate. Rienhoff (1947) suggests the repetitive nature of such attacks as a diagnostic clue but the slow recovery from first attack seems more striking.

Shortness of breath.

Observation of patients who before pneumonectomy complained of shortness of breath but afterwards did not, suggests that this symptom is not associated with the amount of lung out of action. Theories have been advanced that the symptom is due to venous blood passing through the segment not being oxygenated, but in atelectasis of a segment from, say, tuberculosis it is uncommon. Moreover, angeocardiograms have shown that in an atelectic lung the blood reaching the lung in the lesser circulation is reduced, while more blood reaches the lung via the bronchial arteries. Again in arterio-venous pulmonary fistula the shunt of blood may be gross, yet in the early stages shortness of breath is uncommon.

As a symptom, shortness of breath usually occurs in patients who have a bronchial carcinoma with atelectasis, and it may arise from a reflex action, as suggested for pain in the chest, of distension of the bronchus by the tumour.

Hæmoptysis.

As a first symptom this is seldom severe and often appears as a staining of the sputum. In cases of severe hæmoptysis some cause other than carcinoma of the lung seems more likely.

Other first symptoms.

When loss of energy, weight and appetite, and indigestion are given as first symptoms then probably earlier symptoms have been missed. None of our patients with such first symptoms were operable; the opinion that such symptoms usually appear late in the disease is thus strengthened and the very fact that they were in poor health at the time of questioning might have caused them to overlook earlier symptoms.

On the other hand, metastases may well be an early symptom and the occasional experience of the neuro-surgical unit, of this hospital, of cerebral metastases being present before any chest symptom, or indeed, X-ray changes in the chest (Shepherd, 1955), supports this contention.

The syndrome of chronic pulmonary osteoarthropathy, which has been reported in association with many diseases, occurred as a first symptom in two patients who had peripheral tumours and who did not exhibit the more common symptoms attributed to a tumour in the bronchus. The condition has been described by Pierre Marie (1890) as symmetrical osteitis of the four limbs, chiefly localised to

the terminal phalanges and long bones of the forearm and legs, sometimes extending to the roots of the limbs and flat bones and accompanied by kyphosis and some affection of the joints. It is generally accompanied by a raised temperature (104° in one of our patients), pain in the long bones and joints, particularly knees and elbows, and hypertrophy of the subcutaneous tissue. One of our patients had been diagnosed as suffering from rheumatoid arthritis, he had been bed-ridden for months with flexed swollen knees, immobile elbows and gross clubbing of fingers. The morning after pneumonectomy he could move his fingers; forty-eight hours later his legs were straight, and fourteen days later he walked out of hospital unaided.

Age and frequency of first symptoms.

The most frequent single first symptom found among men was pain in the chest (23.5 per cent.), followed by cough (20.7 per cent.), influenza (17.7 per cent.), shortness of breath (12.2 per cent.), and hæmoptysis (9.4 per cent.). Among women, cough (26.2 per cent.), ranked first, followed by influenza (16.7 per cent.), hæmoptysis (14.3 per cent.), pain in the chest (11.9 per cent.) and shortness of breath (11.9 per cent.). These sex differences are slight and the higher ranking of cough among women is probably due to the more accurate observation, by women than by men, of new coughs or changed character of old coughs.

An examination of the ages of onset, available for 334 males and 37 females, in each symptom group was made by means of an analysis of variance. At the $P=0.05$ level of significance, which has been used throughout this report, there were no significant differences in the average ages of onset between groups of patients with different first symptoms ($F=1.11$, $n_1=324$, $n_2=9$, $P > 0.2$ for males, and $F=1.46$, $n_1=29$, $n_2=7$, $P > 0.2$ for females). For males the average age of onset was 54.6 years, with a range of twenty-nine to eighty-one years and standard deviation of 9.7 years. For females the average was 56.6 years, the range thirty-two to seventy-eight years and the standard deviation 11.7 years.

Histology.

The histology of lung carcinoma has three main categories, namely, squamous, adeno-carcinoma, and undifferentiated. Some authorities would add a fourth, the oat-cell tumours; but as these and the undifferentiated appear to behave similarly they have been combined in the present review. The natural relative frequency of these categories is not easily determined because of the selective nature of data obtained either from surgical series, which show a preponderance of operable squamous tumours, or from post-mortem series which exclude the majority of such surgical cases, and show a high proportion of undifferentiated tumours. Furthermore, some bronchial tumours show various structural combinations and it is sometimes difficult to accurately place a tumour in a particular category. In this hospital the practice is to describe each tumour, but to classify it according to the most malignant of the relevant categories (Biggart, 1955).

In this series there were 124 squamous, 10 adeno-carcinoma and 77 undifferentiated tumours on this basis of classification. For the remaining 193 no

information about histology was available because biopsy was impossible or difficult. Only four of the 193 were operable and the majority of the 189 inoperable were found to have subcarinol widening and distortion of the bronchial tree. It is unsatisfactory that so large a number should lack histological confirmation; they are, however, included in our considerations, as in many the bronchoscopic appearances suggested that the tumours were far advanced and their omission would result in an incomplete picture of the early symptomatology. However, the mean interval of time between first symptom and diagnosis in this group was not significantly different from that of other patients. (For males, $F=1.18$, $n_1=333$, $n_2=3$, $P > 0.2$, and for females, $F=1.36$, $n_1=3$, $n_2=34$, $P > 0.2$.) For the 375 patients for whom this interval was available the average was 7.4 months and over 80 per cent. of the patients were diagnosed within one year of the onset of the first symptom.

The advanced state of the tumours of unknown histology, as shown by physical examinations, bronchoscopic appearances and the low proportion of operations and the absence of any evidence that their advanced state was attributable to increased delay in diagnosis all suggest that a high proportion of the 193 patients had, in fact, undifferentiated tumours.

An examination of the average age of onset in the four groups of patients (squamous, adeno-carcinoma, undifferentiated and unknown), revealed no significant difference for females ($F=2.13$, $n_1=33$, $n_2=3$, $P > 0.2$), possibly because of the very small number of women concerned. Significant differences did occur, however, for males ($F=7.02$, $n_1=3$, $n_2=330$, $P > 0.001$). This was due largely to the slightly older age of onset in the group with no known histology (56.8 years) than in the squamous (53.2 years) and undifferentiated group (50.9 years) and was probably a result of our reluctance to submit some frail old patients to bronchoscopy. Although there were only seven men with histology of adeno-carcinoma and known age of onset, their average age of first symptom (58.7 years)

TABLE 5.

Percentage distribution by histology of patients in each first symptom group.

First Symptom	Histological Group			
	Squamous and adeno-carcinoma	Undifferentiated	Not known	Total
Pain in chest	18.9	18.9	62.2	100
Cough	36.1	18.6	45.3	100
"Influenza"	46.5	18.3	35.2	100
Shortness of breath	20.4	30.6	49.0	100
Hæmoptysis	57.5	10.0	32.5	100
Other symptoms	29.4	17.6	52.9	100
Total	33.2	19.1	47.8	100

On absolute numbers $\chi^2=33.36$, D.F. $=10$, $P < 0.001$.

was comparatively, and almost significantly, higher than those in the squamous or undifferentiated group.

It is of interest to examine the possibility of an association between first symptom and histology. The basic information is set out in Table 5. In this table we have combined the less frequent first symptoms because of the small numbers involved. For the same reason, squamous and adeno-carcinoma have been combined, however only in the group with a first symptom of hæmoptysis did the proportion of adeno-carcinomas exceed 3 per cent., and in this symptom group there were 47.5 per cent. squamous and 10 per cent. adeno-carcinoma. The large χ^2 value for Table 5 shows that there were significant differences between the histological distributions of patients with different first symptoms. The differences arise mainly from the number of patients observed exceeding that expected on the null hypothesis, in the following instances :—

(1) Squamous tumours, when hæmoptysis, influenza and, to a lesser extent, cough were the first symptoms.

(2) Undifferentiated tumours, when shortness of breath was the first symptom.

(3) "No known histology," when pain in the chest was the first symptom.

The interpretation of these findings is complicated by the large number of patients for whom the histology is unknown, but if, as suggested earlier, a high proportion of these had undifferentiated tumours, then it might be concluded that when hæmoptysis, influenza and probably cough were first symptoms, the tumour was more likely to be squamous than when other symptoms were the first to be noted and that when shortness of breath and pains in the chest were first symptoms the tumour was more likely to be undifferentiated than when other symptoms were first noted. Such a conclusion is, of course, quite independent of the relative frequency of the histological types in carcinoma of the lung and does not imply that for any specific symptom one type of tumour is more common than another.

Treatment.

Of the 404 patients, 115 were given X-ray therapy, 146 no treatment, 79 pneumonectomies, 12 lobectomies, and 52 had thoracotomies only. Thus in 143 operations 91 resections were carried out, giving a rate, usually described as a "resectability rate" of 64 per cent. In the complete series of 404 patients the 91 resections represent an "operability rate" of 23 per cent.—less than a quarter of the patients in whom cancer of the lung was diagnosed were suitable for resection.

An examination of age at first symptom in relation to treatment shows that the male patients on whom operations were performed were on the average significantly younger (pneumonectomies 52.0 years, lobectomies 53.1 years, and thoracotomies only 51.4 years) than other male patients (X-ray therapy 56.2 years and no treatment 56.1 years) ($F=3.94$, $n_1=4$, $n_2=329$, $0.01 > P > 0.001$). Among females, probably because so few were involved, no such differences were detected ($F=2.73$, $n_1=32$, $n_2=4$, $0.2 > P > 0.1$). Of all resections, 82 per cent. were performed within two months of diagnosis, the average interval between first symptom and resection being just over eight months.

TABLE 6.

Resections classified by histology.

Histology	Total in Group	Resections: Number	Resections: Per cent.
Squamous	124	63	50.8
Adeno-carcinoma	10	7	70.0
Undifferentiated	77	17	22.1
Not known	193	4	2.1
TOTAL	404	91	22.5

$\chi^2 = 114.07$, D.F. $= 2$, $P < 0.001$ and if "not known" excluded $\chi^2 = 17.78$, D.F. $= 1$, $P < 0.001$.
In each "squamous" and "adeno-carcinoma" combined.

Table 6 shows the resections for each histological group, and it can be seen that just over two-thirds (63 of the 91) of the resections were for squamous tumours. Of the 124 patients with such tumours just over half (50.8 per cent.) had resections and of the ten with adeno-carcinoma, seven had resections. These proportions were significantly much in excess of that (22.1 per cent.) for the undifferentiated group and again, if those for whom the histology was unknown were largely undifferentiated, it would appear that patients with undifferentiated tumours were generally seen too late for surgical treatment.

TABLE 7.

Resections classified by first symptom.

First Symptom	Total in Group	Resections: Number	Resections: Per cent.
Pain in chest	90	13	14.4
Cough	86	23	26.7
"Influenza"	71	19	26.8
Shortness of breath	49	6	12.2
Hæmoptysis	40	15	37.5
Other symptoms	68	15	22.1
TOTAL	404	91	22.5

$\chi^2 = 13.09$, D.F. $= 5$, $0.05 > P > 0.02$.

Table 7 shows the resections classified by first symptom and the percentages resected in each symptom group show some significant differences. However, differences in operability rates have already been demonstrated between different histological groups (Table 6) so that the differences between symptom groups might simply reflect such histological differences. For example, 62.2 per cent. of patients with pain in the chest as a first symptom were of unknown histology compared with 32.5 per cent. of those with hæmoptysis. Only 2.1 per cent. of patients with unknown histology were resected compared with an average operability rate of 22.5 per cent., thus it is not surprising that relatively fewer

patients with pains in the chest had resections (14.4 per cent.) than was the case for hæmoptysis (37.5 per cent.). In order to see whether first symptoms had any effect on the operability rate other than that due to their association with histology, Table 7 was prepared. Here the expected numbers of resections allow for the fact that different symptom groups have different histological composition and are in fact the number of patients which we should have expected to resect on the basis of the rates of Table 7 and the histological composition of each symptom group. The small χ^2 value of Table 8 shows that observation and expectation agree very well so that the apparent differences in operability rate between first symptoms is in fact almost certainly due to the association between histology and first symptom.

TABLE 8.

Resections classified by first symptoms, observed numbers in each symptom group compared with number expected on the null hypothesis that proportion of resections for patients with tumours of the same histological type is the same for all first symptom groups.

First Symptom	Resections		Not Resected	
	Observed	Expected	Observed	Expected
Pain - - -	13 ...	13.79 ...	77 ...	76.21
Cough - - -	23 ...	20.53 ...	63 ...	65.47
"Influenza" - -	19 ...	20.63 ...	52 ...	50.37
Shortness of breath -	6 ...	9.03 ...	43 ...	39.97
Hæmoptysis - -	15 ...	13.17 ...	25 ...	26.83
Others - - -	15 ...	13.84 ...	53 ...	54.16
Total -	91 ...	90.99 ...	313 ...	313.01

$\chi^2 = 2.37$, D.F. $= 5$, $0.80 > P > 0.70$.

Operative Mortality.

Published work suggests a wide divergence of opinion on the method of calculating operative mortality, that is the proportion of patients on whom resections have been made and who die as a direct result of the operation. Subjective definition leaves much to be desired, as one surgeon might include, for example, a death from heart failure three weeks after pneumonectomy, while another might not. Some surgeons include all deaths within, say, one, two, or three months while others combine this and the subjective method. In our 91 resections we had 3 deaths (3.3 per cent.) within one month of operation, and 14 (15.4 per cent.) within three months.

Although it would be desirable to detect differences in the operative mortality between different groups of patients classified, say, by age, sex, histology and first symptom, the number of deaths, even within three months, in this series is too small for such analysis. We have, however, examined our deaths carefully to see if there was any particular group which appeared to be more vulnerable than others, but, as expected, such examination was fruitless.

Survival.

Lack of a firm definition for operative mortality raises the question as to which patients should be those for whom survival rates should be calculated. In this we have followed the practice which seems to be most commonly used and have omitted all patients (three) who died within one month of operation. Thus the Table 9 shows for specified groups of patients, who survived the first month after operation, the percentage of survivors at the end of one, two, three, etc., years after operation. As all patients were not observed for the same period of time or could not have been so observed had they survived, the survival rates have been estimated by the appropriate life table technique which has been described by Hill (1955). Clearly some of the groups are small and consequently the estimates have large sampling errors; only groups with at least fifteen persons having survived the first month after operation are tabulated but, even so, this series is probably not sufficiently extensive for a critical comparison between groups of patients for other than the survival rates at the end of one year after operation.

TABLE 9.

Estimated percentage surviving at various periods after resection, excluding all who died within one month.

Group	Number of resections followed	Estimated percentage surviving at end of stated number of years after resection				
		1	2	3	4	5
1. Total	88	49	37	35	35	35
2. Histology						
(a) Squamous	60	54	41	41	41	41
(b) Undifferentiated	17	24	12	0	...	...
3. First symptom						
(a) Cough	22	50	38	38	38	38
(b) "Influenza"	18	61	51	51	51	..
(c) Hæmoptysis	15	57	57	29	29	29
4. Age at first symptom						
(a) Under 50 years	26	48	48	40	40	40
(b) 50 years and over	51	47	29	29	29	29
5. Sex						
(a) Males	82	47	35	32	32	32
6. Interval first symptom to diagnosis						
(a) Less than 3 months	28	52	32	24	..	..
(b) 3-11 months	35	50	45	45	45	45
(c) 12 months and over	17	28	21	21	21	..

.. No data.

With this limitation only one significant difference between first-year survival rates appears in Table 9. This is a higher rate for squamous tumours (54 per cent.) than for undifferentiated (24 per cent.). The later prognosis for the undifferentiated tumours was clearly poor compared with the squamous.

Although the survival rate at the end of one year was low in patients for whom there was a long delay of over a year between first symptom and diagnosis (par. 6 of Table 9), with the numbers available this is not significant, though it is suggestive. Thus it may be that although the prognosis depends mostly on the histology, there is a critical period—somewhere between three and eleven months before the tumour metastasises.

From paragraph 1 of Table 9 it is clear that most of the mortality in patients who had resections occurred in the twelve months immediately following the operation. Just over a half of them were dead within a year. Among patients who survive the first year the estimates suggest that about a quarter are likely to die during the next twelve months but that thereafter there are likely to be very few deaths. However, the lack of precision in these later estimates must be stressed—the precision will be improved after a further period of observation. It is, however, misleading to consider the prognosis for resection in terms of all resections irrespective of the various factors likely to influence the survival rates, and in the present series it is clear that the inclusion of the undifferentiated tumours significantly reduces the survival rates.

Summary.

The records of 404 patients, in whom a confirmed diagnosis of carcinoma of the lung was made in the period 1950-54 have been examined in respect of age, sex, first symptom, histology, surgical treatment, operative mortality and survival.

In men the most frequent first symptom was pains in the chest (23.5 per cent.), closely followed by cough (20.7 per cent.). In women the most common was cough (26.2 per cent.). The other important first symptoms were "influenza," shortness of breath and hæmoptysis. The average age at which these symptoms appeared was about 56 years, but ranged from 29 to 81 years; there was no significant difference (at the conventional $P=0.05$ probability level) in the average age at which different first symptoms appeared.

Histological examination showed that 124 tumours were squamous, 10 adenocarcinoma, and 77 undifferentiated. The remaining 193 were unclassified, but the majority are thought to be of the undifferentiated type. The average age of first symptoms for male patients found to have squamous or undifferentiated tumours was not very different, about 52 years, but the few male patients with adenocarcinomas had an older average age of first symptom by about seven years; a difference which is almost significant.

Evidence was produced that when hæmoptysis, "influenza," and cough appear as first symptoms the tumour is more likely to be squamous than when other first symptoms are observed. Moreover, when shortness of breath and pains in the chest appear first the tumour is more likely to be undifferentiated than when other first symptoms are observed.

Of the 404 patients, 143 had operations, and of these 91 (64 per cent.) had resections, thus only 23 per cent. of all lung carcinoma diagnosed had surgical treatment, and on the average this treatment took place about eight months after the appearance of the first symptom. The male patients on whom operations were performed were significantly younger, on the average, than others by some three to four years.

Histology appears to be the important factor determining the resection rate. Of patients with squamous and adeno-carcinoma tumours, significantly more had resections (50.8 and 70 per cent. respectively) than did those with undifferentiated tumours (22.1 per cent.). Of the 91 resections, 3 (3.3 per cent.) were followed by death within one month and 14 (15.4 per cent.) within three months.

Using life table methods and considering only the 88 patients alive at the end of one month after operation, the chances of survival were estimated at 49 per cent. at the end of the first year and 37 per cent. at the end of the second; thereafter no mortality was observed, and the estimated survival for the next three years was 35 per cent., but the number of patients contributing to the estimates at later periods was unavoidably small because of the short period during which some patients could be observed. Patients with squamous tumours had better survival rates than others, 54 per cent. survived to the end of one year compared with 24 per cent. for patients with undifferentiated tumours. The rates for the end of two years were 41 per cent. and 12 per cent. respectively.

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Traumatic Rupture of the Bronchus

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Traumatic rupture of the bronchus is an uncommon occurrence. Its importance lies in the fact that it is a condition dangerous to life, which, if recognized, is frequently remediable by operation. Rarely survival ensues without treatment. The accident is most frequently found as a sequel of a street accident in which a wheel passes over the thorax, possibly, but not necessarily, fracturing several ribs. The condition may also result from other indirect injuries. (Dark and Jewsbury, 1955; Meade and Graham, 1930.)

Kinsella and Johnsrud (1947), in their exhaustive review of the literature, credit Seuvre (1873) with the first description of the condition. Shield (1889) first described the occurrence of bronchial rupture in Great Britain. Krinitzki (1928) recorded the first case of survival without treatment. Surgical interference has greatly improved the prognosis for these patients. Some cases have been treated by early or immediate lobectomy (Dark and Jewsbury, 1955) where a primary bronchus was involved, and by pneumonectomy (Kirkpatrick, 1950) for involvement of the main bronchus. Other cases have had early repair of the bronchus (Scannell, 1951) or resection of the affected portion of the bronchus (Griffith, 1949), with repair.

If the diagnosis has been made later, in patients who have survived the immediate effects of the injury, late plastic repair, as practised by Paulson (1951), and Weisel and Jake (1953), has produced good results.

Pneumonectomy has been performed as long as ten years after the original injury, where a consequent bronchial stricture was complicated by saccular bronchiectasis. (Paulson, 1951; Dalgleish, *et al.*, 1954.) The condition has been reviewed by Krauss (1956), who added four further cases to the literature.

This case illustrates the classical features of the condition together with the usual development of complications which, in this instance, proved fatal.

Case Report.

A 14-year-old girl, while cycling, was knocked down by a motor-car. On arrival at the Royal Victoria Hospital she was disorientated, very restless, and talkative. She kept calling for her parents and resented examination. It was noted that her breathing was stertorous, the respiratory rate being 32/minute. Her injuries included a compound fracture of the right humerus, minor abrasions of the face and forehead, and a laceration of the right side of her neck. There was bleeding from the left nostril. The pupillary reflexes were equal and normal, as were the deep tendon reflexes. The plantar responses were flexor. The heart

sounds were normal. Pulse, regular at 78 per minute. B.P. 160 mm. systolic.

Shortly after admission to the ward, surgical emphysema appeared in the suprasternal notch and spread rapidly up the neck to the face and downwards over the clavicles into the subcutaneous tissues of the chest. Examination of the chest at this time showed that the trachea was deviated to the right and the breath sounds on the left, though audible, were diminished. The patient had rapidly become cyanosed, but her colour improved when oxygen was given by means of a B.L.B. mask. The signs of left pneumothorax, with the rapidly spreading surgical emphysema suggested the possibilities of a tear in the lung with fractured ribs or a tear in a bronchus. An X-ray of the chest confirmed the presence of a left tension pneumothorax. It also showed a smaller right pneumothorax and an impacted fracture of the neck of the right humerus. The presence of surgical emphysema was also apparent. A needle connected to an underwater seal was put into the seventh left intercostal space in the mid-axillary line and air bubbled out. Oxygen was given under pressure, but the patient expired within an hour of admission before further measures could be instituted.

Autopsy.

An examination of the body was made fourteen hours after death. The body was that of a well-nourished young girl with obvious crepitance of the subcutaneous tissues over most of the body. On opening the thorax, surgical emphysema was seen in the mediastinal tissues, and it was noted that both lungs were collapsed and almost airless. A transverse fracture of the left first rib, which did not involve the pleura, was the only thoracic bony injury. There was a subpleural extension of blood laterally, from the posterior mediastinum along the line of the third, fourth, fifth, and sixth left ribs. The neck organs, œsphagus, trachea and thoracic viscera were reflected forwards, from above downwards, and remained en bloc. A moderate amount of recent hæmorrhage was seen around the region of the tracheal bifurcation, and dissection of this region revealed a ragged transverse rupture of the left main bronchus, with a smaller, less extensive transverse tear running about $\frac{1}{2}$ cm. distal to the main lesion (illustration central art insert). There was a considerable amount of blood-stained mucus in the air passages. None of the main blood vessels of the hilum of the lung were damaged. Other findings related to the accident were a compound and an impacted fracture of the right humerus, a fracture of the orbital plate of the left frontal bone, and a small area of contre-coup bruising of the right occipital pole.

Discussion.

This case exhibits the clinical and pathological features usually found in this condition. The points that warrant investigation are the mechanism of bronchial rupture, the effects of bronchial rupture and their complications, the problem of early diagnosis, and finally the treatment of the condition.

Various theories have been advanced on the mechanism of bronchial rupture. Dalgleish, *et al.* (1954), suggest that the accident occurs with the lungs expanded with air and the glottis closed, and that it is comparable to rupture of the bowel or of other closed segments. The trachea and bronchi are rendered rigid by the

increased pressure and burst or fractured against the vertebral column. The direct effect of a crushing injury is not, however, always present. Dark and Jewsbury (1955) record the case of a 6-year-old boy who fell ten feet, the point of impact being the outer aspect of the shoulder.

Direct pressure, regardless of the pressure within the respiratory system, must be considered. A high proportion of these accidents occur in children or young adults. Of the cases mentioned by Kinsella and Johnsrud (1947) in which the age was known, twenty of thirty-four cases were 21 years or less in age. As is well known, the thorax in the young person is capable of great deformation with little or no bony injury, and it is reasonable to suppose that the manubrium may be pressed back, almost into momentary contact with the vertebral column by crushing forces applied to the upper chest. In this case the trachea, due to its rigidity, would be pushed to one or other side of the vertebral bodies, leaving a main bronchus crossing the vertebral column. It is perhaps significant that fracture most frequently occurs near the tracheo-bronchial junction.

It is, however, also probable that when the upper thorax is compressed, the thoracic viscera are forced downwards into the lower thorax to some extent. The heart and lungs connect with the neck by means of the great vessels, which are essentially elastic in nature, and by the trachea, which is relatively inelastic. It follows that the trachea and bronchi may thus be exposed to longitudinal stretching. Shearing or tearing would be expected at, or close to, the insertion of the major bronchi into the trachea. It is, of course, illogical to argue that a certain effect must always be the result of the action of one of a number of possible causes. We are of the opinion that, in the case of rupture of the bronchus, all these mechanisms occur, acting alone or in conjunction.

The effects of bronchial rupture may be initially severe if there is separation of the fractured ends with resultant obstruction of the lumen by soft tissues or blood, thus removing the affected lung as a functioning organ of respiration.

At this stage and later, hæmoptysis is usually present, the presence of bright red blood indicating probable damage to the lung parenchyma or pulmonary veins. Pain is variable and is usually obscured by accompanying injuries to the thorax or other parts of the body. It is of little or no value as a diagnostic feature. Dyspnœa is usually seen, it has several causes. The sudden avulsion of one lung or part of a lung from the tracheo-bronchial tree will prevent adequate ventilation of pulmonary tissue distal to the bronchial tear. Since the pulmonary vessels are usually intact, the lesion initially permits an unoxygenated arterio-venous shunt in the pulmonary circulation, at least, until the gases in the affected lung have been absorbed and full pulmonary collapse has occurred. Dyspnœa produced by the resulting anoxia may be aggravated by the presence of vagal afferent impulses from the collapsed lung tending to stimulate further the respiratory centre.

Surgical emphysema commonly, but not invariably develops, usually appearing first at the root of the neck and extending thence to involve most of the upper and later the lower part of the body. The development of surgical emphysema is due to the presence of a pressure gradient between the air in the respiratory tract and the exposed tissue planes of the mediastinum. Crying, coughing, and partial

bronchial obstruction will all contribute to the occurrence of this complication. The presence of air in the mediastinal tissues could conceivably result in constriction of the large venous channels in the mediastinum and root of the neck (Barford, 1906). The escaping air frequently enters one or both pleural cavities with the formation of a pneumothorax which may develop considerable positive pressure and require aspiration. Tachycardia and shock are commonly associated with bronchial rupture. In this case the blood pressure was raised to 160 mms. Hg.—probably by a reflex response to the anoxia.

In our opinion, one of the most important factors in the early diagnosis of bronchial rupture is awareness of the existence of the condition, because, once suspected, confirmation of the diagnosis may be obtained by several methods.

The diagnosis may be suggested by the history and clinical examination, but a bronchoscopic examination provides conclusive evidence of the nature of the condition. Occasionally chest X-rays are helpful, and when combined with a radio-opaque medium in a bronchogram (Kinsella and Johnsrud, 1947) have been used to demonstrate the site of rupture in long-standing cases.

The treatment of bronchial rupture falls into three main categories. Firstly, the patient who shows little or no distress, and where pulmonary function is not disturbed may be, initially at least, treated by "watchful inactivity." It should be remembered that these cases may develop tension pneumothorax, requiring immediate relief. Secondly, other cases, those in distress or showing signs of surgical emphysema, tension pneumothorax or pulmonary collapse should be subjected to exploratory thoracotomy. Ideally an endobronchial tube should be inserted into the uninjured bronchus for the maintenance of anæsthesia. (Kinsella and Johnsrud, 1947.) However, since this injury, when it occurs, frequently does so in young persons, it will often not be possible to insert an endobronchial tube. In practice Sanger (1945) used endotracheal ether satisfactorily. Thirdly, less severe cases may be treated after an interval by elective thoracotomy and bronchial repair or excision as indicated.

The surgeon operating on these cases has the choice of three courses; immediate repair of the defect, possibly with resection of the affected portion of bronchus and anastomosis of the separated bronchial stumps. (Scannell, 1951.) He may anastomose the distal stump to the tracheal wall (Sauvage, 1954) with closure of the proximal (tracheal) stump or, thirdly, carry out pneumonectomy or lobectomy operations according to the order of bronchus affected (Kirkpatrick, 1950; Dark and Jewsbury, 1955). Preservation of pulmonary tissue is, of course, preferable to excision, and repair should, where possible, be attempted.

Sometimes when a patient has survived the accident for a period without serious disability, and then develops bronchiectasis or some other infected lung condition secondary to bronchial stenosis, surgical treatment will be required to remove the infected lung. If the lung is not seriously affected, or is merely collapsed, bronchial repair, even at a considerable lapse of time after the original injury, may yet produce good results, with expansion of the collapsed pulmonary tissue. (Paulson, 1951.)

Summary.

A case of traumatic rupture of the left bronchus is described. The literature is briefly reviewed and the mechanism of rupture, its effects, diagnosis and treatment are discussed. The condition is usually caused by crushing injuries of the upper thorax. It may cause hæmoptysis, dyspnœa, cyanosis, surgical emphysema, pneumothorax, pain, shock, tachycardia and pulmonary collapse. The diagnosis may be confirmed by bronchoscopy, bronchography or exploratory thoracotomy. Except in rare mild cases, surgical repair of the bronchus with restoration of the airway to the affected lung is advised. Surgery may be undertaken even after a lapse of years for delayed complications, and with the prospect of good results.

We should like to express our gratitude to Mr. Loughridge for permission to publish details of this case, to Professor J. H. Biggart and Mr. T. B. Smiley for their interest and advice in the preparation of this paper, and to Miss J. Ellson for secretarial assistance. The photography is the work of Mr. David Mehaffy, A.R.P.S.

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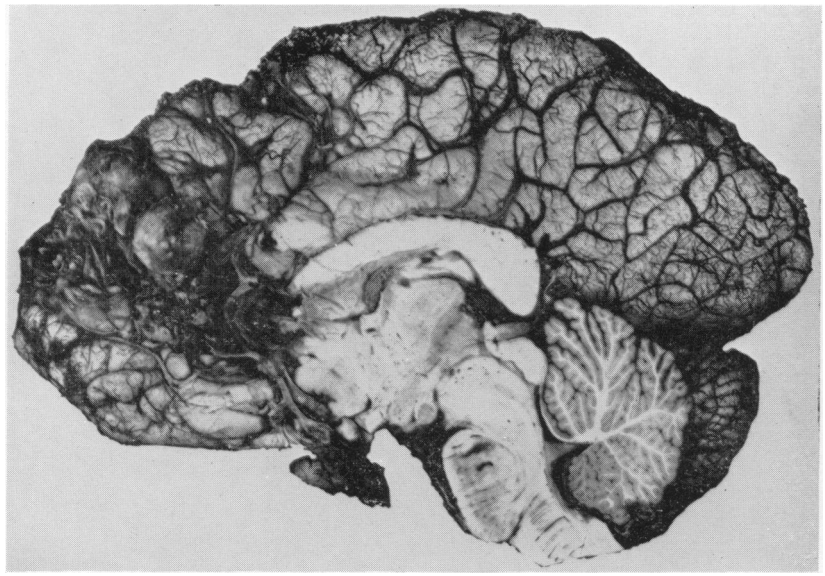
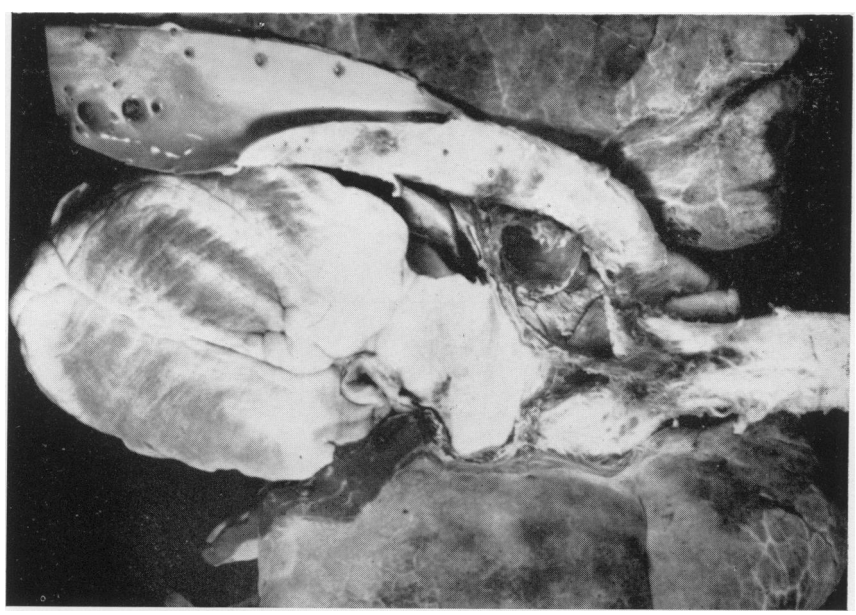
Ruptured Intracranial Aneurysms



A "berry" aneurysm of the anterior cerebral artery associated with an angioma in the frontal lobe.

Traumatic Rupture of the Bronchus



The ruptured bronchus seen from behind.

Medical Aspects of Hospital Planning

By Cecil W. Kidd, o.b.e., m.d., d.p.h.
Northern Ireland Hospitals Authority

"I am living in an ideal world of lifts, gas, baths, and double and single wards," wrote Miss Florence Nightingale (Woodham-Smith, 1949) just over one hundred years ago. She was then 33 years of age and was to live to 90 years, and she had already made her impact on hospital design and had done battle with architects and engineers. Her influence is still to be seen in our hospital buildings to-day, and it is only since World War II that any successful effort to break with tradition has been accomplished. The point emphasised is that buildings new to-day will require to be adapted and altered within the next fifty years to meet altered therapies and developments in medical science. Flexibility of design is imperative. It is essential that the architect should have freedom and encouragement to develop the artistic interpretation of his instructions if we are to keep our place in the new era of modern design. An escape from barrack block institutionalism is now on its way and we must keep in the forefront of our minds that these buildings are for patients—anxious, apprehensive people—and that design can contribute much to their sense of security and provide a sympathetic, as opposed to a disinfectant, atmosphere.

Since 1948 some £5,500,000 has been spent on hospital buildings in Northern Ireland—new buildings, adaptations, land purchases—and our Government is committed to capital expenditure of a further £15,000,000 on this work during the next ten years.

Never in the history of Ulster has so much new work been contemplated and never have so many people been involved. Apart from architects and engineers, doctors and lay members of hospital management committees are vitally interested, and they have much to contribute. A simple discussion of modern ideas from a medical point of view seems opportune and may stimulate interests and intelligent appreciation and enquiry. Many points may touch the controversial and there is no field where the fixed personal ideas of the user and the architectural fight against utilitarianism and functionalism are more likely to conflict.

It is proposed to describe some of the work planned or in process of building at the present time in terms of general hospitals. Much is being done for the other half of our patient responsibility—mental illness and deficiency—and as here the interest is more limited, it is not germane to this paper. Something will be said about the architect and his multiple employers, and this will lead naturally to a brief note on planning to meet demand. Then some specific units will be discussed and described, and finally some consideration will be taken of the future.

Modern Trends in Ulster.

In casting back to the immediate post-war period, the most significant incident was a report (Delegation Report, 1950) produced by the governing body of the Royal Victoria Hospital, following hospital visitations by two working parties to France, Switzerland and the Scandinavian countries. Their conclusions and recommendations on seeing the best buildings on the Continent included the following indication of new trends:—

"1. Multi-storied buildings rather than a series of pavilions or something intermediate in construction between these opposite types.

2. Recommendation that a general hospital should have 1,000 beds.

3. A ward unit should be 25-32 beds. The largest ward should contain four beds and there should be a liberal provision of single bedded rooms."

These recommendations set an entirely new horizon for hospital planners.

From this multi-storied concept has arisen, after years of planning, the North-west Hospital, Londonderry. This large building, which is illustrated in Fig. 1 (centre inset) is already a landmark on the countryside, rising, in part, to twelve storeys. In two years' time it will be completed and equipped and opened for patients, and this will be an event of international importance in the hospital world.

This complete hospital will provide just under five hundred beds and all modern ancillaries, out-patients, casualty department, theatres, central sterile supply unit, laboratory, etc., at an approximate cost of over £2,000,000. This massive and impressive building has not sacrificed simplicity, and already there is a rugged attraction difficult to define.

Fig. 2 (centre inset) is a photograph of a model of the Ulster Hospital, Dundonald, demonstrating a rather different architectural treatment of the problem of general hospital design. The contrast of several buildings, some single and some of two or three storeys, is very attractive. This hospital, which will provide accommodation for pædiatrics, general adult facilities, and midwifery and gynæcology, will ultimately have five hundred beds and the approximate cost will be not less than £2,000,000.

Another hospital building in process of construction is the Nuffield experimental surgical unit at Musgrave Park Hospital, Belfast. The design of this unit is the product of teamwork under the directorship of Mr. Llewelyn Davies—part of a study into the functions and design of hospitals sponsored by the Nuffield Provincial Hospitals Trust. Eighty surgical beds on two floors will be provided with theatres, a central sterile supply unit and a diagnostic radiology department. Investigations in job analysis, functional nursing and many others are involved, and will continue for a minimal period of five years. The building should be ready for patients in 1957 and will cost approximately £150,000.

Further details of this interesting hospital will arise in discussion of ward units.

Vine (1952) has written that "so experimental and so empirical is the art of building hospitals that fortunately no one has yet been tempted into developing a 'standard hospital.' " One would readily agree with this opinion as the develop-

ment of a design of hospital buildings requires to take into account local and special necessities and characteristics. Indeed, much money and not a little ingenuity has been expended on altering and adapting the standard workhouse buildings of the 1840 period. However, expediency and funds allocated on Civil Defence grants impelled the Hospitals Authority to build twenty-four standard units of hospital buildings in the past five years. The buildings are all exactly similar in skeleton construction and engineering services. They can be adapted internally to provide for a variety of uses—ward accommodation on the open ward principle—or departments for out-patients, radiology, physiotherapy or laboratory. A recent internal adaptation has created an excellent layout of an obstetric unit of twenty-eight beds with labour suite and all ancillaries. The buildings were planned by the technical staff of the Hospitals Authority with duality of purpose in mind, and internal construction is such that, despite the peace-time use to which they may be put, they can be rapidly adapted for in-patients in event of war or other disaster.

For some time the Belfast Hospital Management Committee and the Authority have been involved with architects in detailed planning of a new building on the Grosvenor Road site. This will provide a new Out-patients Department, Diagnostic Radiology Department and a series of eight major operating theatre suites, incorporating a Central Sterile Supply Unit for the whole hospital. This planning is well advanced and has presented many difficulties due to the limitations of the site.

Finally, there are three new buildings being designed which will be attached to or superimposed on old buildings. Each is an example of a difficult problem being solved in a different way. Fundamental to the exercise in each case is that the work of the hospital must continue. Difficulties in phasing the construction are considerable. South Tyrone Hospital, Dungannon, is designed as a single-storied building, accommodating theatres, labour suite, consultative out-patient, radiology, physiotherapy, casualty and reception, administration with central circulation to a multi-storied ward block. Coleraine Hospital and Erne Hospital, Enniskillen, are being developed on rather different lines, and in all three site limitations and problems of circulation have been a challenge to all concerned.

This statement represents only a small part of the work at present in building or planning or contemplation and is designed to indicate the scope and variety of original work in the Province.

Liaison with Architects.

Before dealing with specific units of special medical interest which make up a functioning hospital, it is perhaps timely to refer to the architects to whom we turn for expression of our requirements. It is a fact that in the United Kingdom there are no architects who are primarily concerned with the design of hospital buildings. Building work of this type has been so irregular and intermittent that such specialization is neither attractive nor feasible. However, there are now an increasing number of skilled architects interested and experienced and ready to develop the experimental and modern approach so essential in these days.

Tasks of these architects are not easy. It is notorious that an architect's most difficult client is a hospital board or authority. The basis of traditionalism common in the lay mind and the conflicting interests of doctors, nurses and administrators all contribute to the problem.

The structure and function of hospital buildings have become so complex that it is essential that the architects should have complete instructions from all concerned at the initial stage. This has long been a matter of concern, for it is clear that they cannot be instructed by a multiplicity of people. Therefore, before any drawings are prepared, a complete and well-considered schedule of accommodation must be prepared and agreed together with a general indication of design—multi-storied building—single-storied pavilions or a mixture of both. With this collected and agreed information the architect can think out his artistic solution to the particular problem and present his employing body in due course with sketch schemes and explanations of how he contemplates the finished building. Co-operative thinking is essential, and the architect, doctors and other staff require to discuss and agree all sides of their personal aspects of the building at a stage which precedes design.

Llewelyn Davies (1954) said at a conference on the Design of Health Buildings : "It is at this stage that the success or failure of most hospital projects is determined. . . . A slipshod programme is likely to result in enormous waste of effort and money, disappointment for the hospital authority and frustration for the architect, who is driven to prepare schemes which later must be drastically remodelled or even abandoned when the inadequacy of the programme is discovered."

These points which I have laboured are fundamental to any project, and it has been found by the Hospitals Authority that there is much merit in a co-ordinating team, competent to make decisions, acting as the direct link with the architect. Some form of modified dictatorship at some stage becomes essential to the successful furtherance of the project.

Planning for Demand.

This brings us by natural process to a vital matter with which hospital administrators are faced in consideration of new projects—the size of the accommodation required, the needs of the community in terms of beds, theatres and out-patient facilities. The local picture requires to be looked at critically and an endeavour made to assess actual necessity. We have accepted as a general principle in Northern Ireland, after much consideration of surveys and reports, that the need for acute beds can be met by a figure of 4 beds per 1,000 population. For long-term sick of all ages and geriatric cases a further 2 beds per 1,000 are required. For obstetric needs the birth rate, local or general, is taken and applied to the fact that the liberal use of a single maternity hospital bed in a year is twenty cases. Present Government policy indicates that hospital provision for 50 per cent. of all confinements should be made. It is perhaps wise to say here that the general tendency is for the demand for hospital confinement to increase, despite well-developed Health Authority domiciliary midwifery services.

The most recent work on the problem of planning to meet demand has been done by the Investigating Team of the Nuffield Foundation. The surveys and their results are fully detailed in the Report on the Function and Design of Hospitals (Nuffield Provincial Hospitals Trust, 1955). Methodology for precise assessment of bed needs by specialities and out-patient sessional requirements is given in simple statistical form. This is a most valuable contribution to our ideas on this subject, and it is of inestimable value to be able to make a quantitative estimate, based on sound criteria, and so clarify and consolidate instructions for the architect.

A final word on waiting lists for admission to hospital will not be out of place. These lists have long been suspect and it is indeed doubtful if they truly represent unsatisfied public demand. We have inherited the idea of the waiting-list which was so well publicized in the days of the voluntary hospitals. These lists emphasize the need for greater attention to bed occupancy rates. The fact that occupancy rates vary from one hospital to another, even as between hospitals of similar size and character, is well known. It has been demonstrated by Dr. Avery Jones (1953) that a general community hospital should have at least 90 per cent. bed occupancy. The national average for general hospitals is 85 per cent., which means that every staffed bed is on average vacant for one day or more in every week. It is clear that any complacency about bed occupancies of 80 per cent. or less is unjustified and all this is highly relevant to planning to meet demand.

General Planning Considerations.

The size of the hospital will be determined by a study of the many aspects of demand and the sub-division into speciality requirements will be detailed. These figures having been determined and the schedule of accommodation clearly defined and agreed, then the interpretation must in general rest with the architect. He must realise that the patients' reaction to their hospital environment is fundamentally one of fear and apprehension, and he must design with regard to sympathetic attraction and the creation of a sense of security. This is well within his artistic scope and affects not only the outside impression of the building but also the reception area and entrance, and finally the wards. He must create a building or group of buildings in such a way that the old prison-like mass does not exist. The problem of number of storeys—a high building of many storeys or a broad building of few or a mixture of both—will often be determined by the limitations of the site, the contours or the money available for the project.

Planning with room for expansion in future years by adding an additional floor or wing is often discussed. This is perhaps harmless as a theoretical exercise, but should not involve capital expenditure. It is in these days questionable whether hospitals should be planned for much expansion at all. There is perhaps justification for creating new buildings slightly larger than appears at present necessary or indicated. It may well be necessary to build another hospital in fifty years which can more cheaply involve new ideas to meet inevitable new therapies and techniques and siting can have relation to possible shift of population. Functionally, the multi-storied building has many advocates. It is clear that stacking ward units one above the other is an economy in structure both in building and engineering

Fig. 1—North West Hospital, Londonderry.

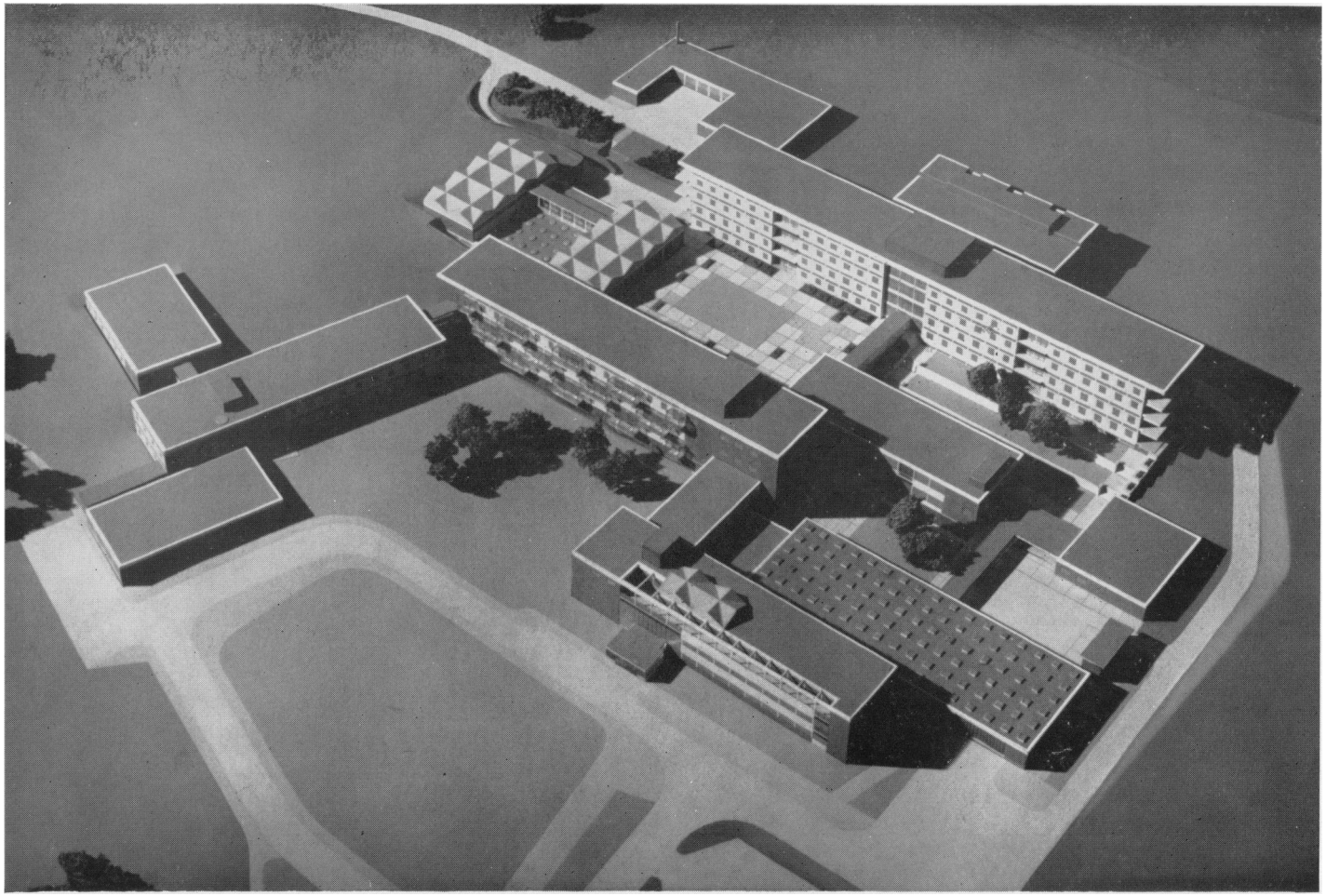


Fig. 2—Ulster Hospital, Dundonald, Belfast.

services. The majority of wards can be identical in layout and vertical plumbing stacks, pipe runs and service lifts can deal with several floors. Vertical planning has been said to be "good for things" as opposed to horizontal "better for persons." There is much to be said for good scenic perspective if, in fact, patients look out of the windows to the world around, and unobstructed sunlight and good ventilation provided by the vertical planning for ward units. Other parts of the hospital with less uniformity of size and shape can with advantage be horizontally planned, and it is quite clear that there is no economy in building departments of differing shape and floor area requirements one above the other.

The optimum size of a general hospital does not greatly concern us in this paper in that outside our cities our populations and catchment areas do not justify large hospitals. However, it should be said that present consensus of opinion is that no general hospital should have more than eight hundred beds and the ideal number for administration is around six hundred.

Ward Units.

The size of a ward unit has been much debated in recent years with a wide variance of opinion of between twenty and fifty beds. A ward unit is the nursing responsibility of a sister and her deputy with staff and student nurses. Recent work on team nursing routines which will be put into practice by the Nuffield Provincial Hospital Trust investigators at the new surgical unit at Musgrave Park is of considerable interest. Trained nurses and students in teams will have patients assigned to their care. This will relieve the sister of some direct responsibility for the patient's care and she should be able to assume overall supervisory responsibility for a greater number. Patients will benefit from the team assignment routine, as they will have more trained staff supervision and actual nursing care. It was found in a recent survey that over 75 per cent. of nursing duties in general hospitals were, in fact, carried out by student nurses.

The present indications are that a forty-bed ward unit is the ideal size, and certainly this number has appeal and realism in provincial hospital planning in Northern Ireland. The ward unit should be sub-divided into open wards of four beds, arranged two deep parallel to the window wall, six-bed wards similarly arranged, and single rooms of at least 20 per cent. of the total. Single rooms require their own W.C. and wash-hand basin, as they will serve for isolation cases as well as gravely ill or dying patients, disturbed or noisy patients, and for the diminishing number of patients prepared to pay for their privacy. Two bed wards are now realised to be a psychological risk. In point of cost, Mollander (1953) has shown that in Sweden ward units of six-bed wards are appreciably cheaper to build and run. It is indeed obvious that two-bed depth of building is more costly than a shorter, broader construction of three-bed depth. Modern planning is to incorporate a mixture of both four- and six-bed wards, and this makes for maximum flexibility of use. Two illustrations of the most modern ward unit planning in the United Kingdom at present with contrasting architectural treatment are shown.

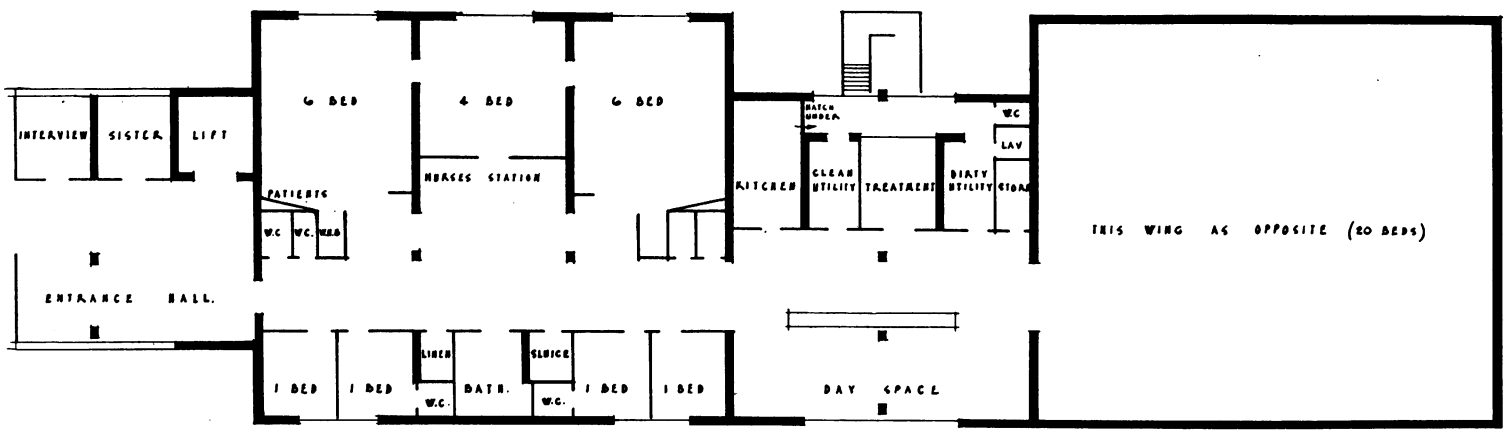


Fig. 3—Ward Block, Nuffield Unit, Musgrave Park Hospital, Belfast.

Fig. 3 illustrates the layout in the Nuffield Unit being built at Musgrave Park—four-bed wards, six-bed wards and single rooms are provided. Attention is particularly drawn to three significant features in this layout :—

(i) **Treatment Room**—There can be no doubt that this provision is a great advantage. All nursing and medical procedures (dressings, lumbar punctures, enemata and special examinations) can be carried out by transfer of the patient in his bed. This room has a dirty utility (old terminology sluice room) on one side and a clean utility (sterilizing room) on the other, both communicating by hatches.

(ii) **Day Space**—All new planning includes an area for patients to sit and read or write, receive visitors or have meals. With early ambulation around 60 per cent. of patients can sit in day space and this innovation is greatly appreciated.

(iii) **W.C. and Bath Accommodation**—Here again, the early ambulation régime reduces the hardship of the bedpan and takes from nursing one of its least enjoyable ploys. Patients are wheeled on lavatory chairs to W.C.s with wide doors, as illustrated. Note should be taken of these and other ancillary rooms which are more in line with modern requirements. Ancillary accommodation has been notoriously meagre and inadequate in the past and the natural swing is to a generous allocation of this space.

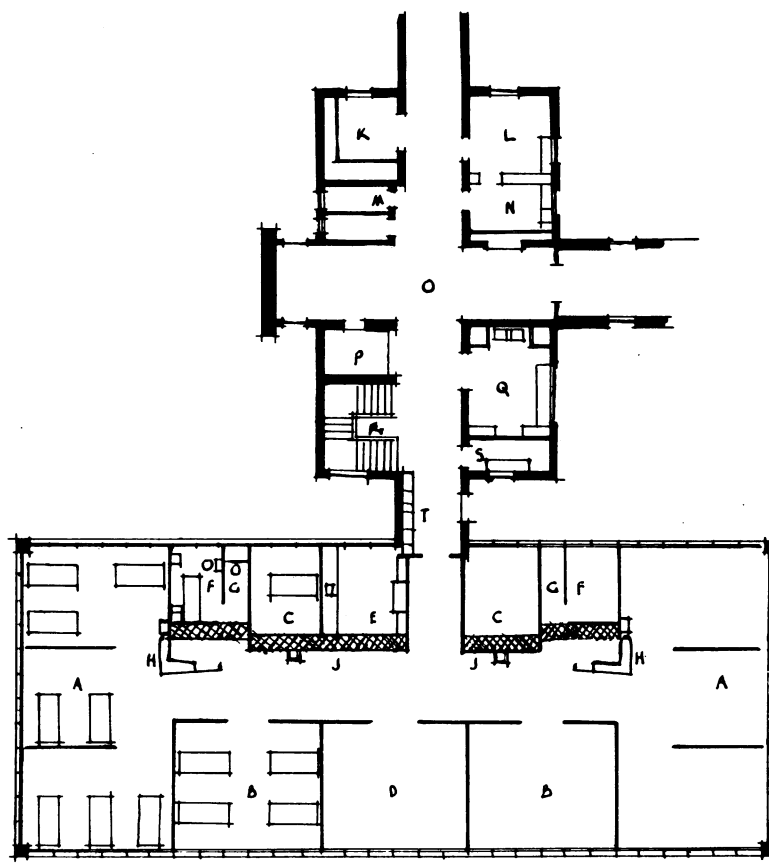


Fig. 4—Ward Unit, Vale of Leven Hospital, Alexandria, Dumbartonshire.

Fig. 4 shows a ward unit at the Alexandria Hospital, Dumbartonshire, which was built for civil defence and opened in late 1955. A 52-bed ward unit, sub-divided into two units of twenty-six beds with small sick-rooms, is illustrated. This is a very pleasant bed disposition, with good observation from the nurses' station. It will be noted that at this hospital no treatment room or designated day space has been included.

In both these units curtain cubicilisation of beds has been carried out to afford maximal privacy when required or desired. The open-type ward—that is a ward open to the corridor and without doors—is now accepted, and the corridor can be included in bed-space calculations. Sex segregation must be borne in mind in consideration of ward unit design and the necessity for central access. Individual bed-lighting and radio now appear to be standard and night-lighting should be at floor-level.

It has been a long journey from the traditional Nightingale ward of twenty-thirty beds in rows to the modern flexible unit.

At a meeting of the International Hospital Federation in London in 1953 representatives of most countries of the world affirmed that scarcely anywhere is the old type of ward being built, and where they exist they are being partitioned.

Children's Wards.

The general pattern should be observed of small flexible easily isolatable wards of a maximum of six beds or cots. Accommodation for the mother of an acutely ill child was regarded by the late Sir James Spence as an indispensable part of nursing in a children's unit. The needs of adolescent age groups should be provided for, as they have in the past fallen into a rather unfortunate no man's land. Treatment rooms are again very necessary, as are day rooms. Many pædiatricians hold that the age groups should be mixed as in the normal family group. This is probably sound, as the elder children take pleasure in helping to entertain the younger ones. A properly designed milk-room, preferably divided into two compartments, should be provided for sick infants. In planning, it is sometimes feasible to relate the milk-room to both sick babies' section and the obstetric unit, and thus save duplication of staff and expensive equipment.

A children's ward requires an admission unit for the screening of children admitted without a definite diagnosis and possibly incubating one of the infectious fevers. This unit can be small and consist of single rooms or two-bed wards. This accommodation can possibly be combined with a small isolation unit where the hospital is situated at some distance from the central fever hospital. There is little future under present conditions for multiple small fever departments throughout the country and in the main they have disappeared. Centralizing of the special skills and equipment required in this field is an economy of personnel and equipment.

This description is of a children's department of a general hospital as opposed to a pædiatric hospital which has its own special departmental problems not proper to this paper.

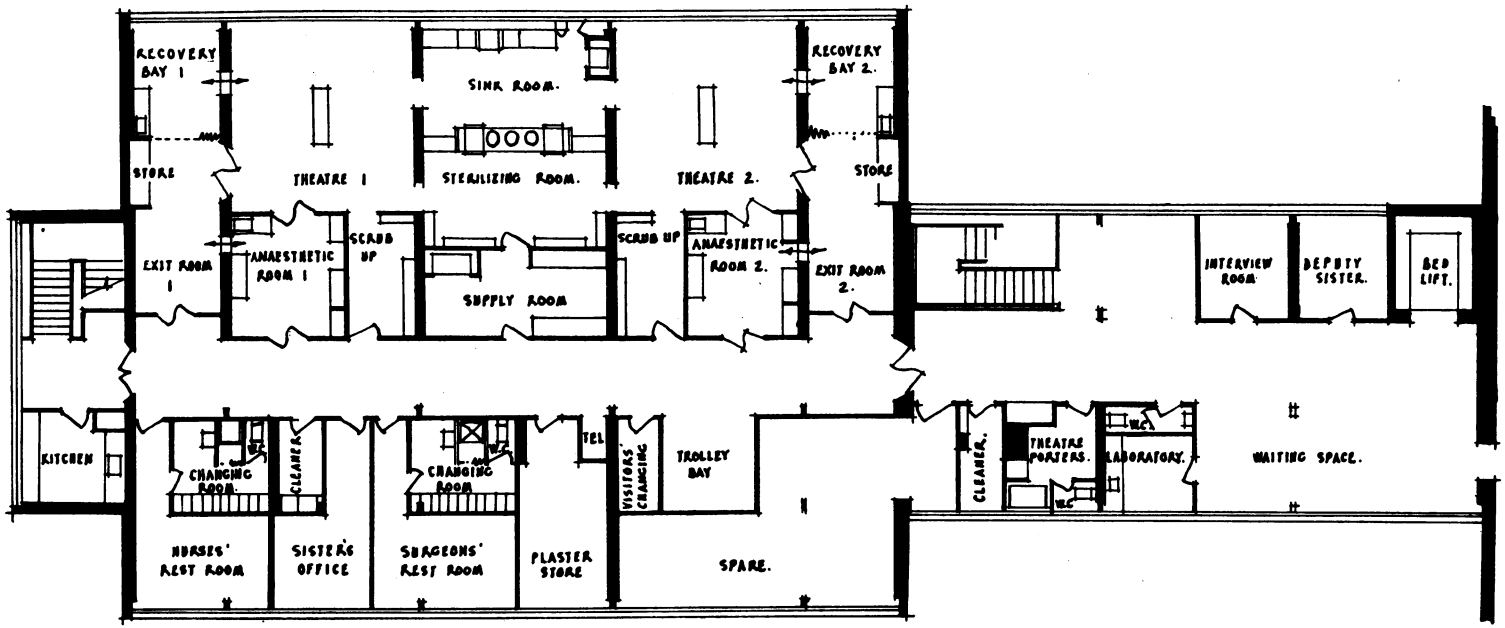


Fig. 5—Theatre Suite, Nuffield Unit, Musgrave Park Hospital, Belfast.

There is much to be said for building the children's department of a general hospital as a separate or dispersed unit. This is a matter of personal opinion.

Operating Theatres.

It is now generally accepted that a theatre suite of twin operating rooms is the minimal requirement for a modern surgical unit. The building of a single theatre is much more costly than a twin unit with shared expensive ancillary accommodation and equipment. Dispersed theatres, situated in close proximity to the surgical wards, have been the common picture for many years. Proximity to the wards with good access and circulation is important, but there is much to be said for grouped theatres either in single-storied building or vertically stacked as in a large hospital. The accepted layout in the latter is of vertical stacking in twin suites, serving a multiplicity of surgeons and specialities. Theatres should be common to the operating needs of the hospital and should no longer be labelled with the name of the surgeon. The basic requirements of each new hospital should be considered as a special study in the determination of the number of theatres required.

Each theatre is traditionally not less than four hundred square feet, and in a twin suite common design is to place one on either side of an area accommodating sink-room and sub-sterilizing room.

Fig. 5 illustrates a theatre suite of this design, showing an anæsthetic bay for each theatre and a recovery-room. There is a growing feeling that four hundred square feet is in excess of necessity for each theatre and that this size is tied up with the outmoded fashion of having the surgeons' scrub-up and banks of sterilizers actually in the theatre together with a variety of space-occupying equipment. If a reasonable working area outside the theatre is provided then a much smaller actual operating area will be required. Such additional apparatus as is required

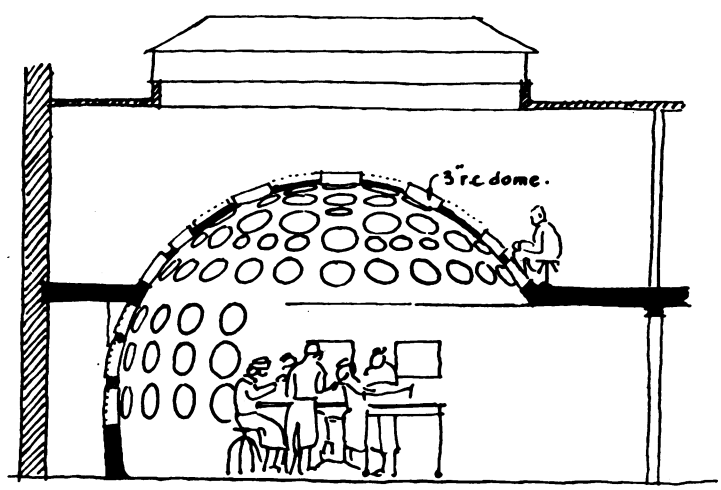


Fig. 6—Dome-shaped Theatre.

can be brought into the theatre if and when required. There is much to be said for this idea, and, indeed, recent experimental work by Goldfinch (1954a), Chief Architect to Birmingham Regional Hospital Board, on theatre air purification and lighting involved such a concept. Fig. 6 illustrates the modified egg- or dome-shaped theatre which he produced in an actual "mock-up" working model. Theatre lighting is still only a partially solved problem and the sufficiently powerful, easily focused, shadowless lamp without heat emission has not yet been manufactured. Good general lighting should be available in the theatre and windows are unnecessary; good special lighting for major operations with adequate secondary lighting for any simultaneous minor operation or manœuvre. The illustration of Goldfinch's theatre, developed following visits to continental hospitals, shows lighting by means of multiple projectors set flush in the walls and domed ceiling. This was an impressive experiment and the impression gained was that it is rather in advance of our times and the scialytic lamp is still the choice of our surgeons. Piped gases for the anæsthetist and suction and diathermy and cautery for the surgeon must be readily accessible. A boom carriage is the present solution.

The theatre suite flooring requires to have anti-static qualities and the conventional tiled-wall finish has been superseded by hard washable paint. Experimental work is being done in Northern Ireland with plastic paint finishes, and the results are promising. An anæsthetic room or bay, fully equipped for induction, is planned in suite with each theatre. A recovery-room of about one hundred and fifty square feet, equipped for resuscitation, blood transfusion, oxygen and suction, is related to each theatre. This is for immediate recovery where the patient is still under the supervision of the anæsthetist and theatre nursing staff and where the patient may be retained for a maximum of a few hours before being transferred to his ward of origin. In large hospitals, teaching hospitals and the like a special recovery ward of 10-12 cubicle-ised male and female beds will, in my view, be a development of the future. This idea has been described in America. A doctor and a highly trained staff of nurses will here have the skill and equipment to deal with the immediate post-operative period, and patients may be held here for periods up to forty-eight hours or more. Matrons will have no enthusiasm for this idea, as it will localize and centralize acute surgical nursing. In smaller hospitals immediate recovery-wards should suffice. Surgeons' scrub-up, conventionally overlooking each theatre, with changing- and rest-rooms for doctors and nursing staff and the usual offices and ancillaries complete the suite. The entire area requires to be air-conditioned, a suitable temperature range being 65°F. to 80°F., with a relative humidity of 60 and 65 per cent. Adequate air changes will be developed and air purity achieved by air filtration to eliminate particles greater than 5-10 microns. Filtered air inlets may be positioned in the theatre ceiling with low-level extraction, and the maintenance of a positive pressure is essential.

Central Sterile Supply Unit.

A centrally situated substerilizing area between twin theatres has been mentioned, and this brings us to the important consideration of a Central Sterile

Supply Unit. All general hospitals should have a centrally situated autoclave room for sterilizing drums or packs of ward dressings, gowns, masks, etc. It is regrettable that in many provincial hospitals this responsible work is entrusted to a possibly haphazard routine carried out by a boilerman or porter without supervision. This state of affairs is, however, being gradually corrected. The first stage in the concept of a Central Sterile Supply Unit was the incorporation in the central autoclave room of a syringe service department to serve the whole hospital. This service has been evolved in several hospitals in England with complete success. The next stage is to add to this department the setting up and sterilization of certain set trays for procedures such as catheterizations, lumbar punctures, etc. The final stage in a complete Central Sterile Supply Unit is the preparation and sterilization of surgeons' instrument trays for specific operative procedures. This final step—common practice in U.S.A. and Canada—has not yet been taken in the United Kingdom. However, we should plan for the full gamut of this range, and, meantime, theatre substerilizing will cope with the surgeons' trays.

Nuffield investigators (Nuffield Provincial Hospital Trust, 1955) report on this subject as follows :—

> "The advantages of a Central Sterilizing and Supply Department are believed to be partly in economy in the provision of expensive servicing equipment, saving of nurses' time, better care, and, therefore, longer life of instruments and utensils and few losses of all materials because of better control at all stages. But the advantage lies principally in the provision of facilities which make possible the routine use of the most reliable aseptic techniques."

On the Central Sterile Supply Unit generally we will continue to develop and expand our ideas and learn from the experience of installations in our new hospitals. Much has still to be learned. The necessary size of such a central unit is somewhat vague. In the Nuffield Unit at Musgrave Park Hospital a square footage of 2,457 is planned to serve 80 surgical beds and a total of about 720 general beds. Goldfinch (1954b) has said the space needs are approximately 2,300 square feet to serve a general hospital of 275 beds. In large hospitals with stacked theatres the Central Sterile and Supply Unit can occupy part of the stack—basement preferably —communicating with the theatres by hoist and chute. Circulation for general issues of syringes, dressings, etc., must also be taken into account. In small hospitals the complete unit can be conveniently sited adjacent to the theatre suite.

Obstetric Units.

These ward units have their own particular requirements, and here I deal with maternity accommodation in a general hospital and not a complete maternity hospital. Small open wards of four beds—and not more than six—providing an area of 120 square feet for each bed and cot, with one-sixth of the total bed allocation for antenatal admissions, is common basic planning. The whole unit should be highly flexible and a number of single rooms (with W.C.) should be included for isolation and other purposes. With modern therapy the spectre of puerperal sepsis does not create such a problem and the old idea of a septic ward appears to have passed. First stage rooms adjacent to a W.C. are necessary.

A minimum of two should be provided, the maximum number being determined by the number of lying-in beds. The Labour Suite should consist of two Delivery Rooms with a substerilizing and sink-room between them. One Delivery Room should have the special finish of a theatre, and here Cæsarean sections can be carried out.

No anæsthetic room or recovery ward is considered necessary. Provision of nursery accommodation for all or some of the babies has been a matter of much change of opinion and obstetric fashions in past years. The present fashion, supported by demand feeding, is for the baby's cot to be in the ward with the mother. In many hospitals there is still nursery accommodation for one cot per lying-in bed. Perhaps it would be realistic to provide nursery space for half the potential occupants and so try to anticipate possible change of fashion. Such a nursery can serve for noisy and anti-social infants. Provision for sick infants and premature babies is a special problem, and in the latter case the need should be determined by distance from a central premature baby unit. The special needs and staffing skills of such a department and the ease with which these infants can be transferred to them in ambulance incubators all influence us to centralize this problem. A well-designed milk-room will be essential, and as in the general ward units a treatment-room and liberal day-space should be provided.

Out-patient Departments.

One of the most striking developments in hospital services since 1948 has been in the provision of consultative out-patient facilities. Diagnoses and treatment of out-patients is perhaps the major function of a hospital to the community which it serves. It is commonly by its out-patient facilities and often by the design, organization and functioning of this department that a hospital is judged by the general public. The foyer and reception are, therefore, of first importance, and a separate out-patient entrance and not one shared with in-patients is highly desirable. A compromise between the hotel entrance type and the austere utilitarian should be achieved. The vitally important Records Department should be in close association with reception. A pleasing and liberal general waiting area is required which can be furnished on contemporary lines as a reaction to the rows of benches of olden days. A mobile or permanent canteen should be designed in this area and this entire location should be under the sympathetic supervision and control of reception staff. Sub-waiting will be essential in relation to the consultative suites. On the actual design of the rooms comprising a consultative suite there is considerable divergence of opinion. It is clear that doctors are influenced by and would seek to have reproduced particular units where they have had previous experience of working. It is, therefore, often impossible to reconcile completely such a diversity of opinion. Only in a large teaching hospital is there justification for "tailor-made" planning to meet speciality requirements, and here you have a separate and distinct problem.

In provincial hospitals it is essential to provide a series of rooms for consultation and examination, with or without separate changing cubicles, adequate to meet

the estimated sessional requirements of the area. A variety of interpretations of such needs have in the past been produced, and, in general, one is influenced by the strong desires of the doctors and staff who will use these departments. However, there is much to be said for dogmatism at times, and with experience of many efforts at such planning the following views are expressed.

Consultative suites should consist of a series of inter-communicating rooms of perhaps 150 square feet, each fitted with a wash-hand basin and examination couch, and having in one corner a curtained area for undressing. This series of general purpose rooms can be broken up in groups of three or four rooms and adequate subwaiting space must be designed. This type of planning will ensure maximal flexibility of use, and it will be possible to allocate suites to different specialities, according to demand. Some specialities may perhaps require one room, while another can usefully involve six rooms. There is much to be said for uniformity of pattern of these suites and an inflexible purpose-planned suite which can be used for no other purpose is an extravagance which we can ill-afford in these days.

Special facilities and arrangements within this broad plan can be made for special departments, notably ophthalmology and E.N.T. Here a plea is made for cessation of demand for rooms of 22 feet in length for ocular refractions when almost similar results can be achieved by indirect methods. Treatment-rooms, laboratory side-room, specimen-room communicating with clinette-type W.C.s are necessary. Some small rooms—perhaps two or three—can with advantage be included without precise designations. This will improve flexibility and meet some diagnostic need which cannot at the moment be foreseen. It is essential that access and communication with diagnostic radiology, laboratory and possibly physiotherapy departments should be reasonable.

Finally, on the block planning of out-patient departments, there is much to be said in favour of a single-storey building capable of expansion.

Casualty Department.

This is an important unit in a hospital of any size and in a provincial hospital it should be sited adjacent to the Consultative Out-patient Department. Casualty diagnosis and treatment is probably the most responsible work placed in the hands of junior medical staff. The proximity of the Out-patient Department, where consultants may be available for consultation and advice, is an advantage. A minor theatre and three or four treatment-rooms with examination couches, sterilizing facilities, are required with separate subwaiting. A doctor's room for interview with police, patients' relations, etc., is an advantage. Recovery-rooms (two or three) for short-period detention are essential for observation purposes. Casualty subwaiting and reception should be carefully planned, and it is often possible in an average-sized hospital to have a common reception and entrance for this department and consultative out-patients.

Finally, it must be borne in mind that about half of all casualties are not, in fact, surgical but medical, and a good casualty department should have designated rooms for the examination and treatment of such medical cases. The size of this

department will be related to the local demand for these facilities which again depend on local industrial undertakings. Diagnostic radiology, physiotherapy and laboratory departments are highly specialized units designed to meet the needs of the community. The modern design of each of these departments has been worked out in considerable detail in recent years in consultation with the consultants concerned, and a measure of uniformity of layout has been achieved. Detailed discussion of these units is not of general interest and does not justify inclusion in this paper.

The Cost and the Future.

It is common knowledge that the cost of our health services has exceeded all predictions and the cost of new hospital buildings has followed this general trend. It has been computed that since 1948 building costs have risen by some 50 per cent., and in Northern Ireland we have an additional burden in that building costs appear to be higher than for the erection of similar structures in Great Britain. This difference has been estimated at possibly 15 per cent. and arises mainly through our need to import a large amount of the materials required. This difference in building costs is particularly marked where there is any departure from traditional methods of building. There is no completely satisfactory method of reckoning building costs which can be used on a comparative basis. For many years cost was reckoned with the hospital bed as the unit. This unitage can only be valid for comparison when all hospitals are providing similar services which is obviously completely impracticable. In separate entities in a hospital plan, such as a nurses' home, this is comparatively simple, as one can then compare like with like. In Northern Ireland, in a well-designed nurses' home to provide at least twenty-four nurses' bedrooms, but without recreation or training school accommodation, the cost per bed is between £700-£800.

The cost of a complete hospital providing out-patients, casualty, maternity general ward units with theatres, X-ray and physiotherapy may well exceed £2,000 per bed. This does not allow for external engineering services, such as boilers, steam pipes, and main drainage. More realistic is an estimate made on the external measurements of the proposed buildings, and this may be taken as not less than £5 per square foot. In cubic measurement the cost is 6/- to 7/- per cubic foot. This clearly indicates the desirability of realistic and effective use of floor-space and of limiting ceiling heights. Long, wide, and high corridors and over-generous size of ancillary rooms create extravagance. "Factory area finish" has been resorted to in America and all areas in a hospital building not encroached on by patients are left with a rough finish. This is a sound idea. The present tendency is for the cost of heating, ventilating, and electrical services to increase more rapidly than the cost of actual building. An approximate percentage allocation would be for building 60 per cent., engineering services 30 per cent., and fees for architects, engineers, and quantity surveyors 10 per cent. To the building costs must be added the equipment which may be reckoned as not less than 10 per cent. of the total cost.

It will be clearly seen that we have here a problem in parallel with the economic chaos of the present-day world.

Those of us who have weathered the first half of this 20th century may well feel that it will stand out in history as a period of revolution. The arts of healing have advanced with rapidity and the complexion of medicine has undergone radical change. It is a safe prediction that this phase will proceed apace. What then are we doing to keep our buildings, and especially new buildings, in line with this progress? It is true to say that no general enlightenment has emerged and the traditional buildings good for one hundred years and longer are still being planned and built.

It is clear that future emphasis will be centred on out-patient facilities and away from the ward unit. Preventive medicine is due for renewed attention and the whole focus of medical care will inevitably centre away from the hospital bed. Flexibility of planning is, therefore, medically vital, and building for a short term, and at most not more than fifty years, should be our enlightened policy. The fantastic costs of traditional building drive us to this conclusion even if such determination was not crystal-clear on purely medical grounds.

From recently built admission hospitals for mental illness in England the ability to produce very attractive buildings at a modest cost which will last for at least fifty years has been clearly demonstrated. A new approach and experiment in materials and design, and, indeed, a new conception, must be seized by all concerned in the creation of hospital buildings. It is hoped that the excellent experimental work being carried out in this country by the Nuffield Provincial Hospital Trust will continue and develop on these lines. It will require courage to break away from the conventional traditions of architecture of past years and give our communities some adventurous designs in keeping with our times. My personal hope is that architects may be encouraged to design on contemporary lines and that the children of the atomic age may be spared the unrelieved mass of utilitarian buildings. We must have regard to recent buildings in America and fresh ideas from the Continent. Much leeway still requires to be made up.

The paper commenced with mention of Florence Nightingale, and I can do no better than conclude by quoting again from Professor Vines (1952): "Hospitals are an experiment on an international scale and they are of international interest; it is time that we in England took active steps to regain the international pre-eminence that Florence Nightingale once bequeathed to us."

In thanking the Chief Medical Officer, Ministry of Health and Local Government, for permission to publish this paper, I make it clear that opinions expressed are personal and not necessarily those held by the Ministry or the Hospitals Authority.

I am most grateful to my colleagues in the Hospitals Authority for help and encouragement during the past five years. In particular, I wish to thank Mr. E. H. Jones, Dr. W. A. Brown, Mr. Scatchard, Mr. Harris, and the Chairman and members of the Authority's Works Committee.

Finally, I wish to thank Mr. Gillingham, with whom I spent many pleasant hours in search of the fundamentals of modern hospital design.

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REVIEW

AMPHETAMINE IN CLINICAL MEDICINE: ACTIONS AND USES. By W. R. Bett, M.R.C.S., L.R.C.P., F.R.S.L., L. H. Howells, B.Sc., M.D., F.R.C.P., and A. D. Macdonald, M.A., M.D., M.Sc. (Pp. 86. 7s. 6d.) Edinburgh and London : E. & S. Livingstone, 1955.

This book, as its title suggests, deals with the therapeutic uses of amphetamine ("benzedrine"), dextroamphetamine ("dexedrine"), and related compounds. It includes an excellent description of the pharmocological action of the drugs by Professor Macdonald.

The value of the amphetamines in the treatment of such varying conditions as obesity, alcoholism, nacrolepsy and enuresis is indicated.

An account is given of the use of the drugs as "pep pills" or "energy tablets."

The authors state that the book "is intended merely as a guide to the general practitioner as to when and when not to employ this basically useful but frequently misused drug, and in what dosage." It may be said that, on the whole, this aim is fulfilled. However, the danger of the use of the amphetamine preparations, particularly in the presence of coronary artery disease, is not sufficiently emphasized.

J. F. P.

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J. F. P.

Monilethrix

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MONILETHRIX, or "beading of the hair" (Fig. 1)* is a rare inherited abnormality in the formation of hair. It was first reported by Smith (1879) and named by Crocker. The condition is commonly familial, although isolated non-familial cases have been recorded. The scalp hair is usually affected, but many patients showing monilethrix of the pubic and axillary hair and of the eyebrows and eyelashes have been seen. Hyperkeratosis of mouths of follicles is a usual accompaniment, but is not invariably found. It is, however, present in our family. Other congenital abnormalities, particularly of teeth and nails, may be associated, but usually affected people are healthy and their physique good (Cockayne, 1933).

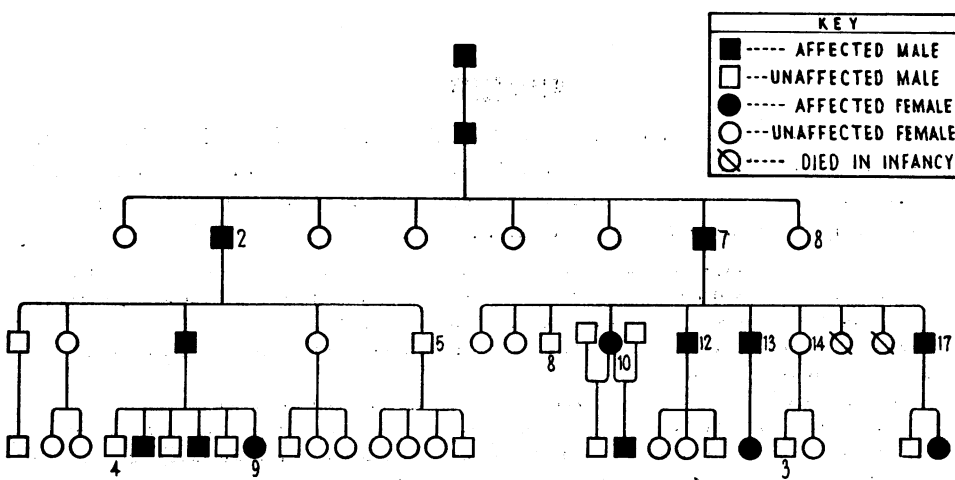

Fig. 2

Numerous cases with a high familial incidence have been reported, e.g., Sabouraud (1892) reported 17 cases in five generations, McCall Anderson (1883) reported 14 patients out of 27 members of five generations, Van Leeuwen (1928-1929) reported 14 out of 42 affected in three generations, and Tomkinson (1932) reported 22 affected in five generations of one family. Some authors have noted improvement after X-ray epilation. Ingram (1934) performed X-ray epilation three times in his case; each produced temporary cure, more prolonged after the third than after the first. He considered, however, that permanent cure was unlikely on further treatment even if it was feasible.

*Figs. 1, 3, and 4 are on the central art insert.

In our family three of seven children are affected with this condition which has been inherited through the father. The paternal grandfather is known to have been affected. The family tree, showing how the condition has been handed down, is reproduced in Fig. 2.

CASE HISTORIES.

1. S. R., born 25th March, 1956.
   This child has dark hair which is quite normal, and was 2-3 inches long at age 6 weeks.
2. M. R., born 25th December, 1954.
   This child had fine dark hair about one inch long at the age of 3 weeks: this then broke off and has not regrown. However, beaded hairs were noticed at birth by the mother. At about the age of 3 weeks the scalp became rough. The child now shows a uniform monilethrix with associated keratosis follicularis, and none of the hairs are more than half a centimetre long. Practically all show beading, and in most cases this can quite easily be seen with the naked eye. The eyebrow hairs are of different lengths, but beading cannot be made out. The eyelashes are sparse, but beading cannot be seen here either. The skin elsewhere is normal. Nails, teeth, and eyes are normal. The hair is light brown in colour (Fig. 3).
3. S. R., born 20th February, 1952.
   This child has fair hair and is quite normal.
4. W. R., born 17th July, 1950.
   The mother says that this child's history is exactly the same as that of his sister M. The condition was not obvious until the age of three weeks. He has light brown hair, with uniform beading over the whole scalp. There is marked keratosis follicularis. There are only a few stumps representing the eyelashes and the eyebrows show hairs of irregular shape and length. The skin elsewhere, nails, eyes, teeth, etc., are normal (Fig. 3).
5. S. R., born 17th May, 1949.
   This child's hair is dark and is normal.
6. D. R., born 2nd July, 1941.
   This child (Fig. 4) has monilethrix of exactly the same pattern as his brother and sister. He has light brown hair. X-ray epilation was carried out on 11th July, 1955; this was followed by a regrowth of monilethrix hairs exactly as before.
7. J. R., born 25th April, 1937.
   He has dark hair and is quite normal.
   Mother : Her hair is medium brown in colour and is quite normal.
   Father : He has suffered from monilethrix from birth and his hair is light brown in colour.

Comment : The degree of monilethrix, the colour of the hair and the presence of keratosis follicularis are all exactly the same in each affected person. In none is there any other associated defect.

The blood groups of the family are :—

S. R. (1956)—Blood not examined.
M. R. (1954)—A_1; M — N + S —; R_2r ; Le (a) —; P — (affected)
S. R. (1952)—A_1; M + N + S —; R_2r ; Le (a) + ; P —
W. R. (1950)—A_1; M — N + S —; R_1R_1; Le (a) —; P — (affected)
S. R. (1949)—A_1; M — N + S —; R_1R_2; Le (a) —; P —
D. R. (1941)—A_1; M + N + S —; R_1r ; Le (a) + ; P — (affected)
J. R. (1937)—A_1; M + N + S —; R_2r ; Le (a) —; P —
Mother —O ; M — N + S —; R_1R_2; Le (a) —; P —
Father —A_1; M + N + S —; R_1r ; Le (a) —; P — (affected)

Comment : There is no sign of linkage.

Conclusions : This family is reported because of the clinical interest in this rare condition and also because it is an example of a very regular dominant gene expression.

I wish to thank Professor Stevenson and his staff for their great help in investigating this family and for preparing the family tree. Mr. D. McA. Mehaffey was responsible for Fig. 1 and Mr. F. G. Wood for Figs. 3 and 4.

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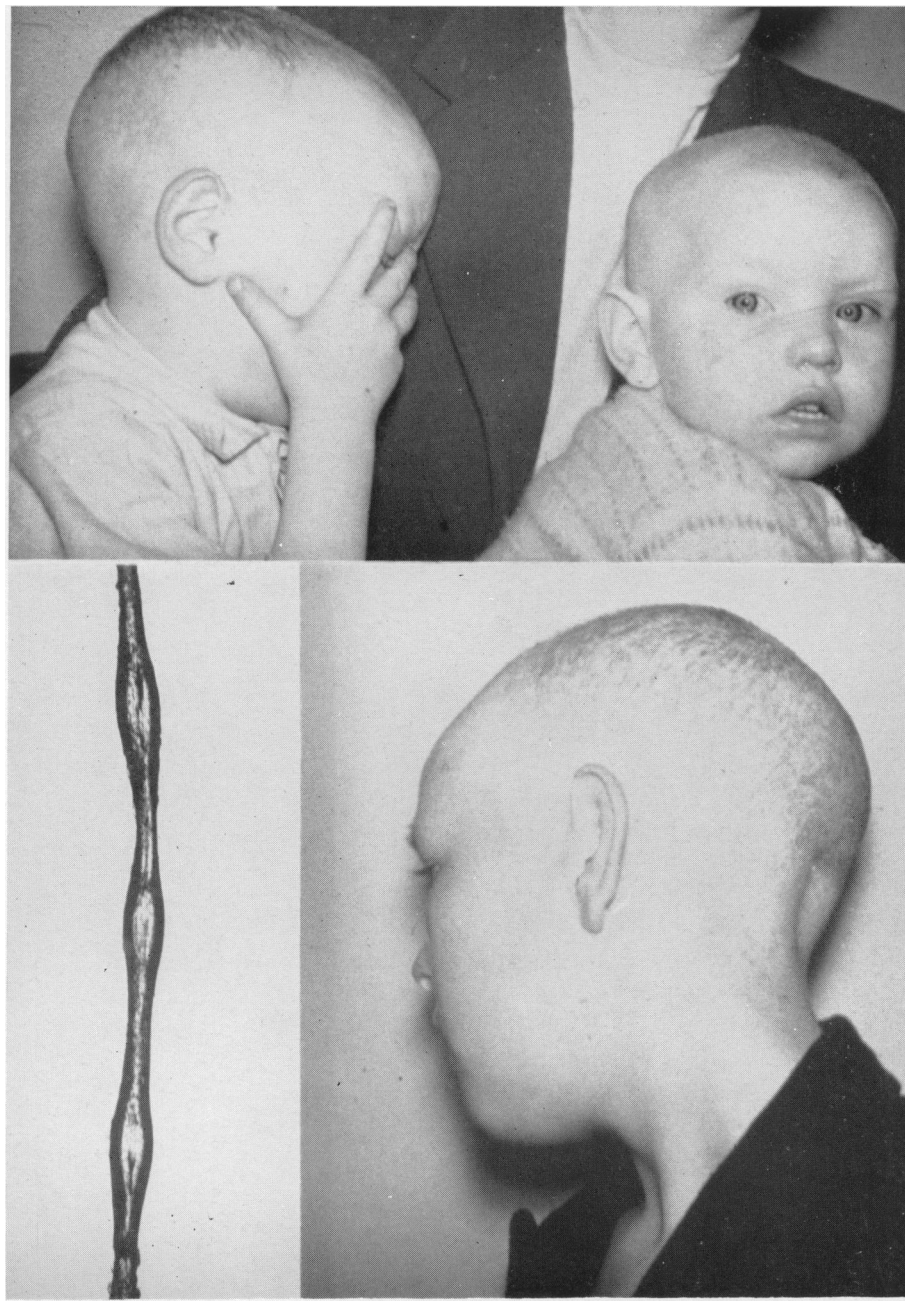

Fig. 1 *(bottom left)*—A hair showing "beading."

Fig. 3 *(top)*—M. R. *(right)* and W. R. *(left)*.

Fig. 4 *(bottom right)*—D. R. (aged 14 years).

Applications of Epidemiological Methods to the Study of Congenital Malformations in Man

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INTRODUCTION.

PLANNED observation of phenomena as they occur must be the main tool of investigation in man, experiments as in animals being impossible, but planned observation and analysis is surely the very essence of epidemiology. Yet it would seem to be characteristic of work on human anomalies that many people are working directly on these, or on relevant problems, in narrow fields and making disconnected contributions to knowledge.

My general thesis is that many good opportunities for epidemiological work are being wasted because the hypotheses arising from different sources are not being tested adequately by the epidemiological method.

In countries which have achieved a very low level of fœtal and early life loss, these anomalies now account for as much as a quarter of all reproductive wastage. Therefore the problems they raise are urgent, and the approach to prevention, however uncertain at the moment, must await a better understanding of the many ætiological factors and consequent identification of specific cause and effect syndromes.

In this connection, it would seem that any holistic hypotheses which seem so attractive to many writers should not be taken too seriously in our present state of lack of knowledge, but rather be thought of as a possibility when we know more. It seems to me that a preconceived holistic theory, involving a kind of unity of lesser viability ranging from abortions, through prematurity and unexplained fœtal deaths to gross malformations, while conceivably applicable at present to certain individual mothers with genital abnormalities, would interfere with the need for the careful clinical and pathological definitive work necessary to isolate specific syndromes of cause, developmental mistake and resultant anomaly.

A. SOURCES OF KNOWLEDGE WHICH GIVE INDICATIONS OF ÆTIOLOGY.

I should like to review the main sources of knowledge which should be determining the planning of observations of human malformations and their environmental and maternal associations, and to point to their applications in the study of malformations in man.

(1) Animal Experimental Work.

Perhaps the outstanding demonstration from animal work has been the large number of tetragenic agents which are completely, or relatively completely, non-specific to the type of defect which they produce. Physical influences, nutritional imbalances, endocrines, anoxia, a wide variety of chemical agents and exposure to ionizing radiations have been shown to be capable of producing malformations when the animal is exposed to them at an appropriate period of her pregnancy. There are two points which stand out, however. The *first* is that there is apparently much more time than agent specificity to the type of malformation produced. The *second* is that the proportion of a litter affected is not only dependent on dosage, but for a given dosage, varies greatly between different strains of animal. In turn this time specificity has been related to events in the embryo, and broadly this suggests that tissues rapidly differentiating at the time of exposure are most susceptible to damage from all the tetragenic agents.

Animal experiments have also shown that the defects produced usually occur spontaneously in the stock and further that there are a considerable number of syndromes which are in fact determined by the mendelian mechanism of a single gene, usually recessive. This last particularly applies to some central nervous system anomalies, and in them it is clear that there are groups of syndromes, distinguished with difficulty, if at all, clinically or even by morbid anatomy, which can be determined by independent (and non-linked) genes.

The embryo-pathology of many of these defects has been very carefully studied by Gruneberg (1947 and many subsequent papers) and others, and the starting point of an anomaly and the steps leading to the fully developed end picture traced in a manner quite impossible in man. Finally, in drosophila work, it has been demonstrated that chromosome damage, induced in the male by radiation, can be transmitted to subsequent generations in a pattern which can be reconciled with a translocation observed cytologically. Perhaps even more interesting is the highly suggestive evidence that chromosome translocations are similarly induced in, and transmitted by, mammal males and that in them, possibly irrespective of the precise situation and form of the translocations induced, one type of descendant shows anomalies of the neural tube (Snell and Picken (1935)).

In brief then, animal work suggests time rather than tetragenic agent specificity to the defect produced, that the action of the agent is not independent of hereditary variations in the strain of animal used, and that there are single gene expressions which can mimic induced defects. Finally, the possibility exists that in man also there may be at times a translocation effect.

(2) Embryology.

Human embryological literature still includes relatively little clear exposition of what is known of the timing of spurts of differentiation of complex and sensitive tissue in the embryo. Indeed too few embryologists seem particularly interested in such problems. The Carnegie Institute publications on "Developmental Horizons in Human Embryos" seem to stand alone as formal attempts to present what is

known in this field in a readily accessible form, but most text books signally fail to consider early developmental pathology or these timings and to relate them to the pathology observed in fœtuses reaching viable ages.

A few landmarks of timings are of course known and accepted, but still it is difficult to get firm agreed views of embryologists on the majority of timings in which obstetricians, pædiatricians and geneticists are interested.

(3) The Contributions of Fœtal and Neonatal Pathology.

It is surprising indeed that much that is fairly well defined in the morbid anatomy of the central nervous system anomalies, particularly the hydrocephaly, anencephaly, iniencephaly, spina bifida, meningocœle series, has been so little taken into account in epidemiological studies. It seems quite illogical to submit data on "hydrocephaly" as a homogeneous entity to elaborate numerical treatment when the morbid anatomy indicates that there are several syndromes and when even clinical observation can, with reasonable accuracy, separate out several distinct types. Thus the Arnold-Chiari malformation of cerebellum, with herniation of the cerebellum and abnormal tongues of vascular tissue into the foramen magnum, seems to be the most common cause of hydrocephalus present at birth in the United Kingdom and North America. It is very commonly associated with marked lumbo-sacral spina bifida which is almost invariably of the meningo-myelocœle type. Further, in cases of large spina bifida, especially meningo-myelocœles, autopsy usually reveals the cerebellar anomaly even if there is no obvious hydrocephalus at the time of death. Probably the condition is detectable in life in a high proportion of cases or even before birth, by X-ray demonstration of cranio-lacunæ which seldom or ever occur in other types of hydrocephalus. Only occasionally is the malformation occult, but it may give rise to trouble in the teens. An odd case has even been reported as a chance autopsy finding in later life.

Quite distinct are the varieties of hydrocephalus from blocking of the æqueduct of Sylvius or the foramina of Magendie which are much less commonly detectable at birth but which characteristically come to notice when the child fails to thrive and the head starts to enlarge a few days or even weeks after birth. Some of these cases are conditioned by simple stenosis of the æqueduct, some by forking and some by neuroglial growth, but so far there is little information on the differentiation of associated clinical signs and symptoms. Spina bifida is not so commonly associated with atresia syndromes and when it is, it appears usually to be associated with a simple meningeal protrusion or with spina bifida occulta.

Gruenwald (1941) suggests that there are different morbid anatomical types of anencephaly; one where the neural tube apparently never closed and there is little evidence that meninges ever covered the remnants of brain tissue; another where there are some meninges covering brain tissue which developed more or less normally up to a certain point, there being ventricles present, and then degenerated and been eroded. Finally, he suggests that there is a type of anencephaly where peri-arterial rosettes may be noted in the brain tissue. Clearly any such separations,

if they can be confirmed and defined, are of the utmost importance in epidemiological investigations.

(4) Observations in Man of Maternal Fœtal Associations.

From a variety of sources a number of fairly firm associations have been established in man and some of these are easy to reconcile with information from animal experimental work. The observations fall conveniently into a few headings :—(a) abnormality of implantation sites, (b) noxious influences in pregnancy, (c) specific disorders of pregnancy, (d) parental age, parity and familial incidence.

(a) *The relationship of anomaly of the fœtus with abnormality of the implantation site.*

A high proportion of abnormal embryos in ectopic gestations has long been accepted (Mall, 1908), but there is evidence that whenever the implantation site is abnormal an unduly high proportion of embryos fail to develop properly. Thus many malformed fœtuses are observed when the mother has uterine fibroids or has malformation of the uterus. An interesting recent observation (Holmes, 1956) is of a child having bicornate uterus born to a mother similarly affected. Finally, there is the less clear-cut association of malformation with placenta prævia. As far as I can discover, Penrose's (1939) suggestion of an ætiological difference between central and lateral placenta prævia has not yet been related to fœtal malformations.

(b) *The relationship of anomalies of the fœtus with noxious influences affecting the fœtus directly or through the mother.*

The remarkable demonstration in man of the association between rubella infection of the mother (and effectively of the fœtus) with defects, the specificity of which depends on the timing of the infection, has stimulated much interest. The relationship attributable to infections earlier in pregnancy than those causing the ear, eye and cardiac defects is, however, much less well established although not necessarily incorrect. There are also the known effects of toxoplasmosis infection of the fœtus and possibly of vaccinia. However, in spite of a good deal of broad reference to the "effects of virus infections in pregnancy," it should be remembered that, as yet, no other infections than the above have been definitely shown to be tetrangenic. There is also the relatively scanty but convincing evidence from collected chance occurrences that therapeutic irradiation of the maternal pelvis in pregnancy can determine malformations (Murphy, 1947).

(c) *The relationship of anomaly of the fœtus with specific disorders of pregnancy.*

Of disorders of pregnancy, hydramnios stands out in sharp relief as closely associated with a considerable variety of fœtal anomalies. Although present opinion appears to attribute hydramnios to a fœtal, rather than a maternal cause, it is remarkable how varied are the fœtal defects in a series of births where a high proportion of mothers have had hydramnios in the relevant pregnancies. Thus, although in most series hydramnios is recorded clinically as occurring in only about 1 per cent. of pregnancies, in a Belfast hospital the following approximate pro-

portions of mothers of malformed fœtuses had hydramnios :—anencephaly 60 per cent., Arnold-Chiari malformation 10 per cent., cleft palate (alone) 6 per cent., achondroplasia recognised at birth 50 per cent., occipital meningocœle (alone) 7 per cent. Further, the peculiarities may be noted of the association of hydramnios with twinning, a subject little investigated. Finally, there is the odd observation of Macafee (1950) confirmed by McMahon and McKeown (1952) of the high proportion of females affected, even in anencephaly, where the mother had hydramnios. Some association of diabetes in mothers and fœtal abnormalities has also been noted, but whether this is direct or a secondary association having hydramnios as the common factor is not at all clear. Finally, there is still difference of opinion about the effect on the fœtus of bleeding early in pregnancy.

(d) *The relationship of anomaly of the fœtus with parental age, maternal parity and familial aggregation of affected offspring.*

The effects of parental age and parity of the mother in varying the rates of congenital malformation in the offspring in man are not at all clear. In some studies this is because adequate control series in respect of normal births have not been available. In others any real effects on specific conditions may have been obscured by attempts to relate groups of clinically similarly afflicted offspring which were really of a heterogeneous morbid anatomy and ætiology.

Estimates so far made of familial incidence are usually confined to the incidence in the sibships of the index cases. In these sibships there seems frequently to be an aggregation of like defects so that the incidence in sibs is five or ten times that prevailing in all births. Perhaps in such estimates too little attention is paid to the contribution of a few exceptional women having several affected children. Thus, in the last year, I have seen one mother who had had five anencephalies and another who has had four children with pyloric stenosis. If such mothers had appeared by chance in a small series they would have contributed very markedly to the estimate of incidence.

The phenomenon of different defects occurring in the same sibship is also far from understood. Some reported instances are explicable as independent chance occurrences because fœtal malformations are relatively common, and certainly families individually reported showing such phenomena should be interpreted with caution. Probably more attention should be paid to the condition of the mother, when such aggregation of different defects occurs. In a few instances maternal genital malformation on fibroids is clearly related. In some of the neural tube syndromes occurring in the same family it seems likely that what are observed are really variations of the same defect.

B. The Types of Epidemiological Approach which have been made in the Past—Their Advantages and Disadvantages.

The difficulties of such investigations are considerable because, whatever be the starting point, fœtal and parental variables have to be related and the latter in turn to environmental variables. It is necessary therefore always to try to have fairly firm hypotheses to test in designing investigations using maternal or fœtal index

cases, and to have clearly in mind what parts of the enquiry are designed to consider the epidemiology of maternal states, and what fœtal states against a maternal background. Further, there is good reason to suspect that racial and/or geographic factors will determine considerable differences in different areas.

There have been many more investigations in recent years, and they seem to fall under a relatively small number of headings determined by kind of information collected and the methods used:—

There is the work done in analysing *series of congenital malformations occurring in hospitals,* using as controls the hospital births of unaffected infants. (Carter (1950), Ingalls, Pugh and McMahon (1954) and Coffey and Jessop (1955).) Essentially, in such investigations, with varying thoroughness and completeness, malformations in general and particular are related to the maternal variables—general health, disturbances of pregnancy, age, parity, and so on. Further, the reproductive histories of the mothers of malformed and non-malformed babies are usually compared. The weaknesses of such studies are readily recognised. There is selection which will vary from hospital to hospital of mothers of normal and of abnormal babies. Very often the diagnoses are in a small proportion by autopsy and the rest clinical. The series recorded are mostly retrospective (Coffey and Jessop being a notable exception) and therefore much depends on the completeness of information collected and the reliability of clinical notes which were not made specifically for the purpose in view. This applies particularly to the history of previous pregnancies and that of the exact condition of the child. Then very important information from the point of view of discerning the pattern of anomalies may be missing. Thus it is very uncommon to have consanguinity of parents or age of father recorded. Put another way, such series being invariably considered retrospectively tend to suffer from all the inherent associated disadvantages. The value of such studies is really exploratory, uncovering as they do suggestive phenomena which are subsequently far better investigated by *ad hoc* enquiries.

There have also been a few studies, most notably those from the Department of Social Medicine in Birmingham, where the *births of infants with anomalies in a defined area of population are related to all the births in the area over a period.* Such studies are big undertakings and are much more valuable in many ways than those which consider only hospital births, mainly because when properly planned they eliminate the biases. Inevitably there are also serious disadvantages, however essential such studies are for some purposes, and it would be unreasonable to expect them, however carefully planned, to answer all the questions we wish to pose on epidemiology. The difficulties lie mainly in obtaining retrospective information about the index pregnancy and even more in getting adequate confirmation of the mother's story about past pregnancies and their results. Even fewer autopsy records will be available than in hospital series.

When such studies are carried out, they must depend on many recorders of information. They cannot very readily deviate to examine the pattern of maternal or fœtal conditions in members of the family outside the sibship of the propositus. Nevertheless, the figures for frequency alone of specific defects, providing the best

checked information can be collected, are most valuable. Repeated under the same conditions in different areas they seem to be the only possible source (other than prospective studies) of defining the differences in frequency and relative frequency of specific defects which are known to exist for some anomalies in different areas and different racial groups.

Another method which has been used is to study *the reproductive performances of a group of mothers who had in common some anomaly of pregnancy or of reproductive organs*. This again is most likely to use hospital cases as a starting point, but that is not, of course, necessary. Under this heading will come the study of the offspring of diabetic mothers, of mothers with heart disease, mothers who had infections during pregnancy, mothers who had toxæmia, hydramnios and so on (Macafee, 1950). Similar problems are encountered of selection and of finding adequate controls as those mentioned previously. It is perhaps surprising how few such studies have been made. Possibly obstetricians still tend to be interested in anomalies of the mother mostly in so far as they effect her safe delivery. When the condition of the child is considered, too often the handling of the data is rather inadequate. Yet the method is surely as valid a starting point for observations as starting with the child, and is indeed an essential check on theories derived from the apparent association of a fœtal anomaly with a maternal condition.

Further, in considering these relationships, it seems essential to extend study to consider the familial incidence of the maternal anomaly if the true significance of the total familial pattern of the fœtal condition is to be seen in perspective. For example, hydramnios may be a familial condition and might be associated with different fœtal malformations in a given family.

Another series of observations which are often made are those on *bizarre families which are reported as curiosities in the medical literature*. Unfortunately such families are seldom adequately investigated or at least reported, so that unique information is lost. This is probably because the clinician who meets such an odd family has no particular interest or insight into the wider implications of his observations. Yet some of these families are of extreme interest and importance as in the example of the reporting by Bickers and Adams (1949) of a family with hereditary stenosis of the æqueduct of Sylvius which suggested for the first time that the pattern could be explained on the basis of an irregular dominant gene. Perhaps editors of journals could do more to improve the standard of such reporting than anyone.

C. A Résumé of the Gaps in Knowledge and in Past Epidemiological Work.

A number of points have been made in the course of this paper and it seems worth while stating them in summarized form. *First,* it has been suggested that most, if not all planned investigations of these phenomena in man would benefit immeasurably if carried out in an area where proper data were continually being collected about the reproductive pattern of all mothers so yielding the kind of background information made available in Birmingham (Record and McKeown,

1949). It does not seem too unreasonable to think that, with relatively little expense, health officers could collect and collate the necessary data from the home and hospital births in their areas. It may be remarked that health departments still tend to accumulate a wealth of social information, much of it apposite to past problems and in any case very difficult to interpret. Many appear uninterested, however, in the information on which an interpretation of the reproductive patterns of the areas depends.

Second, it seems clear that, in general, too few investigations have been planned and carried out to test specific hypotheses arising from the variety of sources already mentioned. There seem to have been very few enquiries indeed having as their starting point maternal characteristics and considering not only the mother's reproductive performance, but the familial incidence of the maternal characteristic and the reproductive performance of the *whole* family. Investigations using fœtal conditions as their starting point suffer from similar failures to investigate beyond the sibship of the propositus. It is remarkable that so little has been done to use autopsy findings as the source of index cases in collecting familial data. Thus "hydrocephalus" is still used as a diagnostic entity for which associations are sought, although at least a start has been made with the identification of several pathological types—most unlikely to have a common ætiology.

It seems likely that occipital meningocœle, Arnold-Chiari malformation, lumbo sacral meningomyelocœle and one type of anencephaly tending to iniencephaly and cranio-spinal-rachisis have a high incidence not only in sibs but in more distant members of the family. Poleman (1951), Dunn and Salter (1944) and Hiilsemaa (1955) have reported such instances and I have a number of families showing this pattern in my own series where autopsy records have been available for several malformed cousins. Little attention seems to have been paid to the observation of Murphy (1947) that in no instance did he encounter these central nervous system anomalies in the relatives of both parents; a finding so far confirmed in my own experience.

In atresia of the æqueduct group, the picture is quite different. In simple stenosis and forking of the æqueduct, the cases are isolated or occur with little variation in a high proportion of sibs or in other members of the family. A number of families I have seen conform to the suggestion of a single irregular dominant gene mechanism as suggested by Bickers and Adams (1949). All these observations need to be repeated and expanded. Studies of the offspring of twin brothers and sisters would be interesting.

Third, biologists keep assuming that recessive lethal genes in man contribute appreciably to fœtal wastage. So far there is little evidence for or against this hypothesis. Although a few lethal recessive genes are known, each is of very low frequency, with the exception of that determining fibrocystic disease of pancreas, and between them they cause a very small proportion of fœtal deaths. Until consanguinity data are available for a very large series of births it is difficult to see how these suggestions can begin to be investigated systematically.

Last, as has been pointed out, the relationship of abortion to fœtal anomalies in viable sibs in the same sibship has barely progressed beyond the stage of speculation.

D. Some Specific Suggestions for Epidemiological Investigations.

1. The rôle of hydramnios is clearly of the greatest importance and studies of the condition should be undertaken urgently, including the reproductive patterns of the index mother, of her sibs and of her husband's sibs.

It seems important to see whether, in a given family, hydramnios appears to be an inherited characteristic and in a given family, how dependent are any fœtal anomalies on hydramnios.

2. Other maternal anomalies such as fibroids and bicornate uterus could be studied by similar methods.

3. Using present autopsy separations of types of hydrocephalus and making some provisional separations of types of anencephaly it should be possible from any large maternity hospital having an adequate number of autopsies to plan investigations using fœtuses with deformed morbid anatomy as propositi.

In all the above, there is much need to relate such defined conditions to maternal states and gynæcological conditions and to carry out comprehensive familial investigations involving all cousins at least.

Such material is particularly suitable for the admittedly difficult task of trying to see if in some families at least the pattern could be reconciled with that determined by a translocation effect in animal work. It might be possible to show different varieties of anomaly, and although diminished fertility could not be demonstrated it would be worth while trying to see if in an otherwise regular menstrual history missed periods could be recalled (corresponding to implantation mole).

4. Serial examination of embryos recovered from spontaneous abortions could profitably be followed by using the abortion in the same way as a malformed fœtus for a comprehensive familial investigation.

5. There seems to be a worth while opportunity for statistical analysis of pairs or multiple defects syndromes, attempting to relate groups of defects occurring in a single child with each other and with what is known of embryological timings might yield valuable information as to the duration of action of numerous effects causing these malformations.

6. There is still room for prospective studies of the results of infections early in pregnancy and every opportunity should be taken to try to follow mothers through from the earliest possible times in pregnancy. To record, as is often done at present, only the month of pregnancy at which infection occurred when the week or even day must be known seems very unsatisfactory.

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REVIEW

A THERAPEUTIC INDEX. By C. M. Miller, M.D., M.R.C.P., and B. K. Ellenbogen, M.D., M.R.C.P. (Pp. xii + 148. 12s. 6d.) London: Baillière, Tindall & Cox, 1955.

It would appear that the aim of this work is to provide a pocket-book from which the practitioner or hospital resident will be able to obtain quickly a guide to the treatment of all the conditions he may meet. These conditions are dealt with alphabetically and range from "acid in the eye" to "trichinosis." This wide range of subject matter necessarily means that many important and common conditions receive inadequate attention.

In a short reference work of this type it may be considered curious that thrombophlebitis received only one quarter of the space devoted to tabes dorsalis.

The main criticism of this book is that the dangers of certain therapeutic measures advocated are not indicated. The intravenous administration of 1 mgm. of digoxin recommended for the treatment of left ventricular failure would certainly be hazardous when such failure followed myocardial infraction.

Despite its limitations, this index may be of some value to busy practitioners and housemen.

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J. F. P.

Ruptured Intracranial Aneurysms

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Though there were numerous references to ruptured intracranial aneurysms and to various forms of apoplexy in the early literature, widespread recognition of the clinical syndrome of spontaneous subarachnoid hæmorrhage and of the importance of intracranial aneurysms in its causation dates from the years following the stimulating observations of Symonds (1923, 1924). Since then numerous excellent papers and several monographs have greatly expanded our knowledge of these aneurysms and their complications, whilst improved neurosurgical techniques have allowed some measure of effective treatment. At the same time it has become clear that in a small proportion of cases spontaneous subarachnoid hæmorrhage may result from a number of other conditions of which the most important is intracranial angioma.

By far the most common and important form of intracranial aneurysm is the "berry" or "congenital" variety. During the years 1937-56 one hundred and two cases of ruptured berry aneurysms have been recorded in the post-mortem files of the Institute of Pathology, Queen's University, Belfast. A review of these cases confirms many of the well-established facts about this condition, but also emphasises a number of less well-known points and raises several controversial issues.

Incidence.

These one hundred and two cases occurred in a consecutive series of 11,200 autopsies giving an incidence of approximately 0.9 per cent. As neonates accounted for somewhere in the region of one-third of the total number of autopsies, and since only five cases of ruptured aneurysms occurred in persons below the age of 20, the incidence in adults is clearly somewhat higher. In addition, eleven cases of subarachnoid hæmorrhage for which no cause was found were recorded in the same series of autopsies, and it is likely that an aneurysm was missed in at least several of these. In fifteen further cases unruptured "berry" aneurysms were noted; the majority of these were incidental findings. This figure is obviously well below the true incidence of berry aneurysms as a detailed examination of the cerebral vessels was not carried out as a routine and also because the brain was not removed in an appreciable number of cases.

There was no significant seasonal variation in the incidence of ruptured aneurysms.

Age and Sex Distribution.

In recent years it has become clear that while berry aneurysms may rupture at any period of life, the peak incidence occurs between the fifth and seventh decades and not as formerly thought, in young adults. This fact is clearly illustrated by a

number of large groups of cases of both spontaneous subarachnoid hæmorrhage and ruptured intracranial aneurysm reported in the literature (Taylor and Whitfield, 1936; Richardson and Hyland, 1941; Hamby, 1948; Ask-Upmark and Ingvar, 1950; Dinning and Falconer, 1953; Stehbens, 1954; Walton, 1956); and also in the present series as shown in Table 1.

TABLE 1.

	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	?	Totals
Males	1	1	4	4	10	13	4	–	–	37
Females	–	3	6	11	16	11	11	4	3	65
Totals	1	4	10	15	26	24	15	4	3	102

It is apparent that a considerable proportion of aneurysms will rupture in the age period when primary intracerebral hæmorrhage is common. Stehbens found that the arithmetic mean age of 353 cases of primary intracerebral hæmorrhage was only 6.5 years older than that of 180 cases of ruptured berry aneurysm.

A number of reports suggest that there is a significant female preponderance in spontaneous subarachnoid hæmorrhage and ruptured intracranial aneurysm though only rarely has the excess been comparable to that in the present series (Wilson, *et al.*, 1954; Dinning and Falconer). In only one large group has an appreciable male preponderance been described (Helpern and Rabson, 1950). The available statistics do not indicate whether this female preponderance is due to a higher incidence of intracranial aneurysm in females, to an increased tendency for rupture to occur, or to a combination of both factors.

Period of Survival.

The time elapsing from the onset of the hæmorrhage to death in those cases in which this could be accurately assessed and in which there had been no operative intervention is shown in Table 2.

TABLE 2.

Sudden	1-12 hours	12-24 hours	1-3 days	4-7 days	1-2 weeks	3-4 weeks	5-7 weeks
6	17	10	8	13	7	9	3

It can be seen that approximately 45 per cent. of deaths occurred within twenty-four hours and that roughly one-fifth of these were sudden in the sense that death appeared to occur within a matter of minutes.

The importance of spontaneous subarachnoid hæmorrhage as a cause of sudden or unexpected death is shown by the fact that both Simpson (1947) and Helpern and Rabson found that between 4 and 5 per cent. of such deaths resulted from this cause; Dinning and Falconer collected two hundred and fifty cases of sudden or unexpected death due to ruptured "berry" aneurysms from Simpson's forensic practice. Numerous clinical reports indicate that death following spontaneous subarachnoid hæmorrhage is most likely to occur in the two weeks following the initial hæmorrhage and the present figures support this conclusion.

Situation of Ruptured Aneurysms.

Table 3 shows the distribution of the present series of aneurysms.

TABLE 3.

Middle cerebral artery	37
Anterior cerebral and anterior communicating artery	36
Internal carotid at the level of the posterior communicating branch	11
Bifurcation of the internal carotid artery	7
Internal carotid artery	2
Posterior communicating artery	4
Bifurcation of the basilar artery	2
Junction of the vertebral and basilar arteries	1
Superior cerebellar artery	1
Posterior inferior cerebellar artery	1
	102

It can be seen that almost 93 per cent. of the aneurysms were situated on the anterior part of the Circle of Willis. Aneurysms were almost equally distributed between the right and left sides of the circle. The great majority occurred at points of arterial bifurcation.

These figures, while generally comparable to most surgical and post-mortem figures concerning the distribution of berry aneurysms, emphasise a point made by Robertson (1949), Dinning and Falconer, and others: namely, that in most post-mortem series as compared with surgical series there is a dearth of aneurysms situated in the supraclinoid portion of the internal carotid and an excess of aneurysms situated on the middle cerebral artery. In the present group only 11 per cent. of aneurysms were situated at the junction of the internal carotid and posterior communicating arteries, whilst in a recent surgical series of comparable size 44 per cent. were located in this situation (Falconer, 1954). One explanation of this discrepancy is that it is very difficult at necropsy, when the basal cisterns are filled with blood clot and the arterial topography distorted to decide where the internal carotid artery ends and the middle cerebral artery begins (Dinning and Falconer). Against this is the fact that, in the present series, the great majority of middle cerebral artery aneurysms were situated at the first and second bifurcation of that artery and therefore sufficiently far removed from the internal carotid to avoid confusion. A more readily acceptable explanation would be that middle cerebral aneurysms are less susceptible to arteriographic diagnosis than internal carotid aneurysms. In addition, the natural death rate of aneurysms at the junction of the internal carotid and posterior communicating arteries has been noted to be somewhat lower than that in most other situations (McKissock and Walsh, 1956).

Multiple Aneurysms.

In a review of 2,237 cases of intracranial aneurysm collected from reports in which the percentage of multiple aneurysms was clearly specified, Bigelow (1955) observed that slightly over 10 per cent. were of multiple lesions, while in a further

fifty-six cases of intracranial aneurysm collected from the autopsy files of the Albany Hospital, New York, he found the incidence of multiple aneurysm to be 16 per cent. Wilson, *et al.* (1954), noted multiple aneurysms in just over 20 per cent. of their large series of intracranial aneurysms. The fact that detailed search may reveal an even higher percentage is suggested by Stehbens' finding of multiple aneurysms in 25.5 per cent. of forty-seven cases examined personally. In twenty-five of the cases of multiple berry aneurysm referred to by Bigelow the aneurysms were symmetrical and bilateral; the internal carotid or middle cerebral artery was involved in twenty-three cases, the anterior cerebral in two. There was a slight male preponderance. In the present series multiple aneurysms were present in ten cases (10 per cent.) and all were females. In eight of these two aneurysms were present, in one three, whilst in one case the number was not stated. In five of those cases with two aneurysms they were symmetrically placed on the right and left middle cerebral arteries.

The association of "berry" aneurysms and intracranial angiomas has occasionally been described. A case of subarachnoid hæmorrhage in which these two lesions were present is recorded on the files of this department (see art inset). It was not included in the present series as the source of hæmorrhage was not definitely established.

Characteristics of the Ruptured Aneurysm.

In the majority of cases the records gave some indication of the size of the ruptured aneurysm by either a measurement or by comparison with such objects as a "pea" or a "walnut." The range was from a few millimetres to some four centimetres; the majority appear to have been less than 1 cm. in diameter. This is similar to the experience of others (Wolfe, 1953; Dinning and Falconer; Williams, *et al.*). Williams, *et al.*, state that the size of the aneurysm does not appear to influence the incidence of rupture significantly, and a review of the present cases, together with fifteen cases of unruptured berry aneurysms, shows no reason to doubt this conclusion. In several cases aneurysms were noted to be loculated or foliate in appearance, but the majority appear to have been saccular. In only a small proportion of cases (28 per cent.) were aneurysms examined histologically. In all of these the aneurysm sac consisted mainly of fibrous tissue. In several, small amounts of elastic or muscle tissue were present in the wall of the sac, whilst in a number of cases such changes as hæmosiderosis, inflammatory cell infiltration, fibrinoid necrosis and calcification were described. Atheromatous intimal thickening and old and recent thrombus formation in the sac were also observed.

Other Changes in the Circle of Willis.

In only eight cases (8 per cent.) were malformations of the Circle of Willis described in association with aneurysms. In two of these cases there was a hypoplastic posterior communicating artery, in one a hypoplastic posterior cerebral artery, while in five there were minor abnormalities of the anterior cerebral and anterior communicating arteries. In the majority of the other cases it is clear that the cerebral vessels were not adequately examined from this standpoint. Falconer and Bigelow have each found anomalous development of the Circle of

Willis in 33 per cent. of their cases, whilst Wilson, *et al.*, noted anomalies in 118 out of 124 cases.

No detailed reference was made in the majority of cases to the degree of atheroma and arteriosclerosis. There was no reason to believe that the incidence of these degenerative changes differed from average.

Pathological Changes Produced by Rupture.

In forty-two cases (42 per cent.) hæmorrhage was entirely confined to the subarachnoid space or associated with only slight hæmorrhage into adjacent brain tissue. In thirty-one cases there had been considerable bleeding into both the subarachnoid space and the adjacent brain; in twelve of these there was direct rupture into the ventricular system. In a further twenty-three cases rupture was almost entirely or completely intracerebral and in the majority of cases involved the ventricles, often with subsequent escape of blood into the basal cisterns from the fourth ventricle. In the six remaining cases there was some degree of subdural hæmorrhage. In only three cases was this considerable and in no case did it appear to be the most significant site of bleeding. In three of these six cases subdural and subarachnoid hæmorrhage were combined, whilst in the other three cases there was also conspicuous intracerebral hæmorrhage. The high incidence of severe intracerebral hæmorrhage (57 per cent.) reflects the experience of most workers (Robertson; Richardson and Hyland; Hamby; Wilson, *et al.*; Stehbens; Williams, *et al.*), and indicates that in a number of cases clinical distinction from primary intracerebral hæmorrhage may be difficult. Roughly 70 per cent. of those aneurysms situated on the middle cerebral artery and approximately 50 per cent. of those situated on the anterior cerebral circulation and the terminal portions of the internal carotid artery showed significant intracerebral hæmorrhage. While the close apposition of the brain and protrusion of the aneurysm into cerebral tissue are clearly the most important factors in dictating this complication, a further important influence is indicated by the fact that ten out of twenty-three cases in which rupture had been almost completely or entirely intracerebral, local meningeal fibrosis resulting from previous subarachnoid hæmorrhage formed a barrier to further hæmorrhage in this site. In several of these cases the clinical history indicated that subarachnoid hæmorrhage had occurred some weeks previously.

In all, twenty cases showed evidence of previous hæmorrhage as indicated by meningeal fibrosis and hæmosiderosis, or in three cases by the formation of a false aneurysm sac within the cerebral tissue. This is probably considerably lower than the true incidence as recent hæmorrhage may mask evidence of old hæmorrhage while in other cases evidence of old hæmorrhage may not have been sought for or noted. The clinical histories of a number of cases dying more than a few days following the initial hæmorrhage suggested that further hæmorrhage had taken place. The post-mortem protocols generally contained insufficient reference to the age of the hæmorrhage to allow accurate confirmation of this point. In five cases recent cerebral ischæmic lesions were noted. In two the softening was adjacent to the site of the ruptured aneurysm, in two it affected

the vascular territory of the vessel on which the aneurysm was situated (middle cerebral), whilst in one case in which the ruptured aneurysm was situated at the junction of the left posterior communicating and internal carotid arteries there were bilateral recent softenings in the anterior portion of the basal ganglia. The occurrence of such ischæmic lesions in association with ruptured aneurysms is widely recognised, though their incidence varies considerably in different reports (Wilson, *et al.*; Walton). It seems likely that vascular spasm due to irritation rather than pressure or thrombosis accounts for the majority of these lesions.

In four cases in which there was extensive intracerebral rupture, uncal herniation was associated with numerous small hæmorrhages in the midbrain and pons; the hæmorrhages presumably resulting from lateral pressure on the midbrain. This complication of ruptured berry aneurysm is referred to be Feigin (1955).

Other Post-mortem Findings.

In the majority of cases death was directly attributable to the intracranial hæmorrhage, though in a small proportion of cases death was clearly precipitated by arteriography or operative treatment.

In the fifty-eight cases in which a full post-mortem was carried out severe pulmonary œdema and terminal pneumonia were common findings. Of a variety of other pathological conditions described, only two—congenital abnormalities and hypertension—were of significant frequency. Malformations were present in seven cases (10 per cent.) and consisted of one case of each of the following conditions: congenital cystic disease of the kidney and liver with an aneurysm of the splenic artery, congenital cystic disease of the kidneys, congenital cystic disease of the liver, syringomyelia, coarctation of the aorta, angioma of the spinal cord, and multiple pancreatic spleniculi. From the many reports on this subject it is obvious that there is a higher incidence of congenital malformations in association with berry aneurysm that would be expected in a random sample of the population. This relationship is particularly striking in respect of anomalies of the Circle of Willis and the kidney, and also coarctation of the aorta. Its existence lends strong support to the view that the occurrence of berry aneurysms is at least partly related to a developmental vascular defect. The subject is reviewed by Bigelow (1953) and Walton.

Some degree of arterial hypertension was noted in a considerable proportion of cases on admission to hospital following the ictus. As is well known, however, the blood pressure is often raised during the acute phase of the illness and subsides as the condition improves. Post-mortem evidence of hypertension in the form of left ventricular hypertrophy was found in twenty of the fifty-eight cases having a full post-mortem examination. Table 4 shows the age distribution of hypertensives in relation to the age distribution of the total number of post-mortems.

TABLE 4.

Age	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of cases	1	3	6	12	11	12	9	4
Hypertensives	–	1	–	1	6	5	5	2

Fifty per cent. of those cases over 40 years of age were hypertensive while only two (9 per cent.) of cases under 40 years were affected. A number of other cases, of course, may well have had functional hypertension with no organic changes. Previous statements concerning the presence of hypertension in cases of ruptured berry aneurysm have been contradictory. Falconer (1954) stated that its incidence was not appreciably raised, while Wolfe (1953) found evidence of left ventricular hypertrophy in only eight out of forty-seven cases and Russell (1954) in twelve out of ninety-six cases. On the other hand, Wilson, *et al.*, noted left ventricular hypertrophy in twenty-seven of forty patients below the age of 40, while Stehbens on autopsy evidence considered 57 per cent. of one hundred and fifty-six cases of berry aneurysm, the majority of which had ruptured, had pre-existing hypertension.

The 50 per cent. incidence of left ventricular hypertrophy in the 40-60 age group in the present series appears somewhat higher than might be expected in a random sample of this age group in the general population, but with such a small number of cases no conclusions can be drawn. It is worthy of comment that the peak incidence of aneurysmal rupture (fifth-sixth decades) occurs at an age period when the incidence of essential hypertension is rising steeply, thus suggesting that hypertension may be of some importance in precipitating rupture in this age group either as a direct result of the raised arterial pressure or by its accentuation of vascular degeneration.

A significant relationship between the occurrence of ruptured "berry" aneurysm and pregnancy has been suggested. In the present series only one case showed this association.

Other Causes of Spontaneous Subarachnoid Hæmorrhage.

Excluding cases in which a primary intracerebral hæmorrhage had ruptured into the subarachnoid space, spontaneous subarachnoid hæmorrhage not associated with berry aneurysm was noted in 27 out of the 11,200 post-mortem cases reviewed. The causative lesions are listed in Table 5.

TABLE 5.

Bacterial endocarditis (with a ruptured mycotic aneurysm)	2
Bacterial endocarditis (no aneurysm found)	2
Staphylococcal septicæmia (no aneurysm found)	1
Meningitis (no aneurysm found)	1
Syphilitic arteritis	2
Angiomatous malformation	2
Angiomatous malformation associated with an aneurysm (? source of hæmorrhage)	1
Atheromatous aneurysm	1
Purpura	1
Eclampsia	1
Sagittal sinus and cortical vein thrombosis	2
Origin unknown	11
	27

Ruptured aneurysms therefore accounted for just over 80 per cent. of these cases of spontaneous subarachnoid hæmorrhage. In only two cases was an angiomatous malformation definitely the cause of bleeding; this low incidence is similar to that noted in other post-mortem series of spontaneous subarachnoid hæmorrhage (Taylor and Whitfield; Richardson and Hyland; Wolfe; Walton) and contrasts with an incidence of around 10 per cent. in clinical series (Falconer). It is likely that this discrepancy is largely explained by a lower mortality rate in ruptured angioma as compared with ruptured aneurysm. In addition to the causative lesions listed in Table 5, spontaneous subarachnoid hæmorrhage has occasionally resulted from a number of other systemic and intracranial conditions (see Walton).

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I wish to thank Professor J. H. Biggart, at whose suggestion this review was undertaken.

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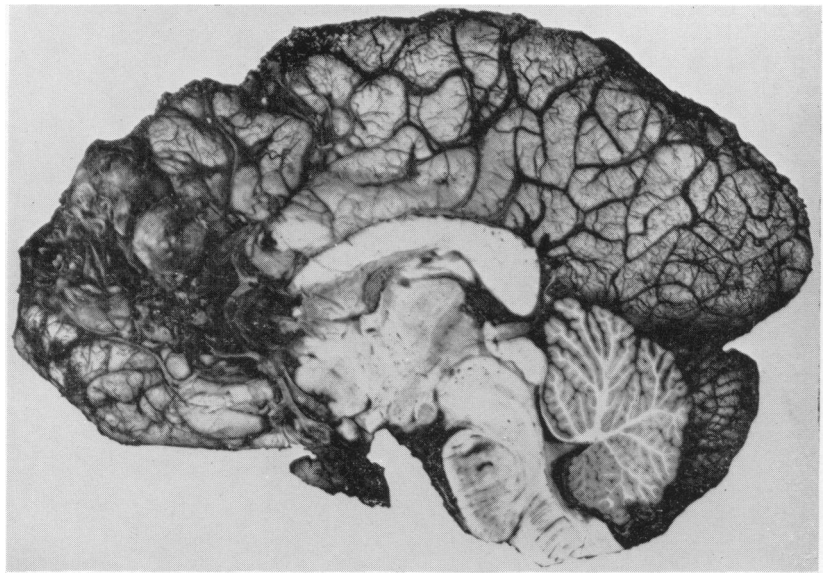
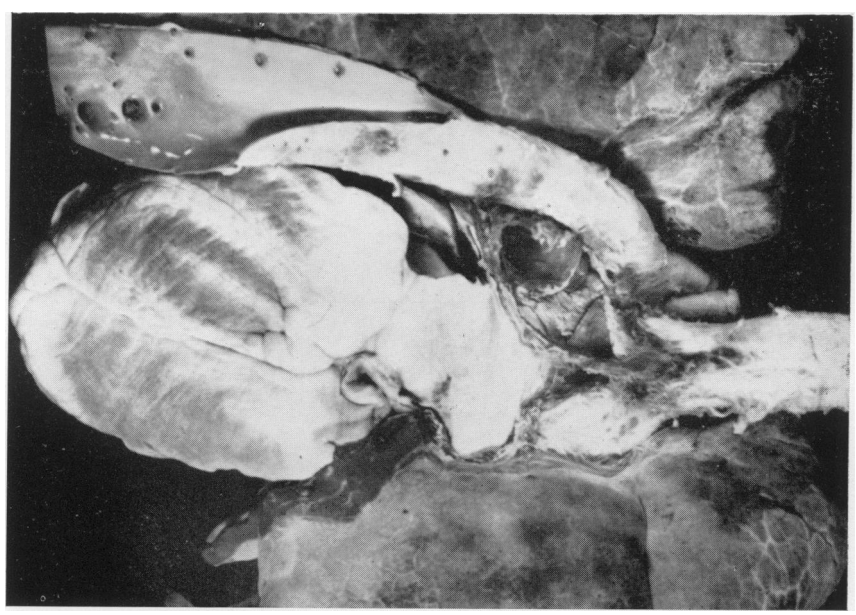
Ruptured Intracranial Aneurysms



A "berry" aneurysm of the anterior cerebral artery associated with an angioma in the frontal lobe.

Traumatic Rupture of the Bronchus



The ruptured bronchus seen from behind.

REVIEWS

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CARDIOVASCULAR INNERVATION. By G. A. G. Mitchell, O.B.E., T.D., M.B., Ch.M., D.Sc. (Pp. xii + 356; figs. 202. 55s.) Edinburgh and London : E. & S. Livingstone, 1956.

A PROPER understanding of the control of the blood-flow to the body as a whole and to the organs individually is of importance to all engaged in medical practice, as the health of the tissues is based on the maintenance of an adequate blood supply. The advances in neuroanatomy which have taken place over recent years have come about as a result of experimental and analytical procedures by many workers using both animals and humans for their subjects. This experimental and clinical evidence is freely referred to throughout the text, but *man* remains the subject of the book. A very full account of the central nuclei and connections of the autonomic part of the nervous system is given, and the widespread integration of this system within the cerebrum is emphasised. The author has tried to bring about a synthesis of knowledge concerning structure and function and their clinical applications. He shows, for example, that the totality of the response to emotional stimuli can be related to the intermingling in the cortical areas of visceral and somatic representation. The tracts in the brain and spinal cord, and the peripheral distribution of the efferent and afferent components of the autonomic system are dealt with fully. The possibility that there may be a continuous outflow (and inflow) of autonomic nerves throughout the whole length of the spinal cord may come as a surprise, but there is strong evidence that this may be the case. Clear line and half-tone illustrations, often from photographs of the author's own preparations, are lavishly distributed throughout the book. Useful tables of the sympathetic and parasympathetic innervation

HUTCHINSON'S CLINICAL METHODS. By Donald Hunter, M.D., F.R.C.P., and R. R. Bomford, D.M., F.R.C.P. Thirteenth Edition. (Pp. xv + 452; figs. 95, plates 25. 18s. 6d.) London : Cassell, 1956.

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OPHTHALMOLOGY : A Textbook for Diploma Students. By Patrick D. Trevor-Roper. (Pp. 683. 75s.) London : Lloyd-Luke (Medical Books), 1955.

THIS new textbook, which is based on the current teaching and practice of Moorfields Eye Hospital and its academic offspring, the Institute of Ophthalmology in London, will be welcomed by all those whose interest is in acquiring a thorough basic knowledge of the subject. The field to be covered is extensive and the result is that discursive forays and elegant elaborations have been eschewed.

The first quarter of the book, dealing with anatomy and physiology, sets out in sufficient detail and with adequate illustration, these essential preliminaries to a good grasp of ophthalmology. A section on optics follows, in which the refraction of the eye is discussed and the estimation and correction of refractive errors described. This goes into sufficient detail to render the subject intelligible without elaborate mathematics.

The clinician will find the latter half of the volume of great interest. This comprises two sections—Diseases of the Outer Eye and Diseases of the Inner Eye. It is here that the pleasing format and layout of the volume is particularly enhanced by the excellence of the illustrations, of which there are over four hundred and fifty in the book. The large majority are original drawings or photographs, of which nearly all have been prepared by the Department of Illustration at the Institute of Ophthalmology. Both photographs and drawings are of the first-rate quality we are accustomed to expect from the Institute.

The text of these two sections includes descriptions of all the commonly occurring eye diseases, including many which have been recently elucidated. Among these are retrolental fibroplasia, toxoplasmosis, sarcoidosis and the retinopathies. Under the latter heading the latest views on diabetic retinopathy and its relation to Kimmelstiel and Wilson's disease are described.

There is a valuable chapter on the treatment of external diseases which expresses in concise form the present views on therapeutics. The author recommends the anti-fungal drug sodium propionate (10 per cent. drops or ointment) as the best general anti-infective agent apart from the antibiotics.

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MANAGEMENT OF LIFE-THREATENING POLIOMYELITIS. Copenhagen, 1952-56. Edited by H. C. A. Lassen, M.D. (Pp. xi + 179; figs. 55. 22s. 6d.) Edinburgh and London : E. & S. Livingstone, 1956.

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This book is a record of the experiences of the team during and since the outbreak. It embraces comprehensive observations by clinicians, metabolic physicians, laryngologists and physiotherapists, and contains a good summary of autopsy findings in one hundred and fifteen cases. It is inspiring and monumental as a record of experience with poliomyelitis not to be envied, but it is not to be regarded as a textbook treatise on the disease. Much progress in mechanical respiration was inspired by the work done in Copenhagen and for this alone many must be grateful.

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To understand hearing and equilibration fully it is necessary to examine in detail the component parts concerned. This the Bulletin does clearly with chapters on temporal bone microtomy, the labyrinthine fluids, and the electro-physiology of the central auditory pathway. The physiological mechanisms of equilibration and hearing are then explained.

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Much of the detail is fascinating; for example, it has been proved that endolymph contains relatively high potassium and low sodium concentrations and is very similar to intra-cellular fluids elsewhere in the body. As the nutrition of the organ of Corti and other specialised structures depends largely upon this fluid, it follows that any damage to the secretory stria vascularis cells which produce it, e.g., by ischæmia, toxic substances, etc., may adversely affect the actual end organs of hearing and equilibration. In this connection the important work of J. C. Seymour on vascular disease of the cochlea and vestibule in animals and man and its connection with the clinical manifestations of Méniere's disease and other perceptive hearing disorders has not received the attention it deserves in this publication.

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Every clinician dealing with the diagnosis of inner ear disorders should read this Bulletin.

T. J. W.

AIDS TO THE NURSING OF VENEREAL DISEASES: A Complete Textbook for the Nurse. By E. M. Ryle-Horwood, S.R.N. Second Edition. (Pp. xi + 156; figs. 35. 8s. 6d.) London: Baillière, Tindall & Cox, 1956.

STUDENT nurses meet venereal disease cases in the general wards as well as in special clinics and are expected to acquire a sound basic knowledge not only of the disease processes, their investigation and treatment, but to have some knowledge of the many other factors which are important to successful case finding and holding.

This book, written by a nursing sister, successfully provides, with the aid of a chapter by a male nurse, a brief and lucid picture of the diseases concerned, their investigation and the methods generally adopted to secure the attendance of familial and sex contacts.

One does not hesitate to recommend this volume as comprehensive, accurate and suitable for the needs of nurses in training.

F. S. B.

THE NUFFIELD FOUNDATION: Report for the year ended 31st March, 1956. (Pp. 160.) Oxford: The University Press, 1956.

THE Foundation makes grants for research in pure science, medicine, social research, education and the care of old people. It also makes grants and provides scholarships designed to strengthen the links between many parts of the British Commonwealth. The work noticed in this report covers a wide field and ranges from toadstool flora to the Police College. Interesting work in medicine includes support of a biomechanical unit to study the use of new materials for the provision of artificial parts of the body, such as the heart-lung machine. In medicine, as in other aspects of the work of the Foundation, the predominant interest is in social problems.

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STUDENT nurses meet venereal disease cases in the general wards as well as in special clinics and are expected to acquire a sound basic knowledge not only of the disease processes, their investigation and treatment, but to have some knowledge of the many other factors which are important to successful case finding and holding.

This book, written by a nursing sister, successfully provides, with the aid of a chapter by a male nurse, a brief and lucid picture of the diseases concerned, their investigation and the methods generally adopted to secure the attendance of familial and sex contacts.

One does not hesitate to recommend this volume as comprehensive, accurate and suitable for the needs of nurses in training.

F. S. B.

THE NUFFIELD FOUNDATION: Report for the year ended 31st March, 1956. (Pp. 160.) Oxford: The University Press, 1956.

THE Foundation makes grants for research in pure science, medicine, social research, education and the care of old people. It also makes grants and provides scholarships designed to strengthen the links between many parts of the British Commonwealth. The work noticed in this report covers a wide field and ranges from toadstool flora to the Police College. Interesting work in medicine includes support of a biomechanical unit to study the use of new materials for the provision of artificial parts of the body, such as the heart-lung machine. In medicine, as in other aspects of the work of the Foundation, the predominant interest is in social problems.

NEURO-OTOLOGY, being British Medical Bulletin. (Volume 12, No. 2; pp. 91-159. 15s.) London: British Council, 1956.

THIS British Council publication shows clearly, first, that otological research is in a very active state in the United Kingdom, and second, that the no-man's-land of the inner ear is at last being penetrated. Much of the research is now bearing fruit in the sense that many of the results are now applicable to clinical medicine.

To understand hearing and equilibration fully it is necessary to examine in detail the component parts concerned. This the Bulletin does clearly with chapters on temporal bone microtomy, the labyrinthine fluids, and the electro-physiology of the central auditory pathway. The physiological mechanisms of equilibration and hearing are then explained.

Loudness, recruitment, fatigue and adaptation—all of great importance to the clinician doing diagnostic audiometry—get a lucid chapter each. Nystagmus in its vestibular, optokinetic and positional forms is clearly explained. There is a very clear exposition also of the methods of executing and evaluating caloric and rotation vestibular tests. Diseases of the eighth nerve system are excellently set out and the bulletin concludes with an interesting chapter on hereditary forms of labyrinthine disease in mice.

Much of the detail is fascinating; for example, it has been proved that endolymph contains relatively high potassium and low sodium concentrations and is very similar to intra-cellular fluids elsewhere in the body. As the nutrition of the organ of Corti and other specialised structures depends largely upon this fluid, it follows that any damage to the secretory stria vascularis cells which produce it, e.g., by ischæmia, toxic substances, etc., may adversely affect the actual end organs of hearing and equilibration. In this connection the important work of J. C. Seymour on vascular disease of the cochlea and vestibule in animals and man and its connection with the clinical manifestations of Méniere's disease and other perceptive hearing disorders has not received the attention it deserves in this publication.

The Bulletin is printed and illustrated clearly, and the team of experts who have produced it are to be congratulated. They have managed to produce something more than a résumé of recent research, they have produced a work which will be a reference volume for some time to come.

Every clinician dealing with the diagnosis of inner ear disorders should read this Bulletin.

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THE format of this little book remains unaltered, although sections of it have been rewritten since the last edition.

As the author himself points out, it should in no way be used as a textbook of obstetrics, but it has served generations of medical students, in previous editions, as a rapid means of revision, and it can be confidently predicted that it will continue to do so, due allowance being made for regional and national differences in emphasis.

The few simple illustrations add considerable value to the text—is it too much to hope that these might be increased in number in future editions without unduly raising the price? G. B-L.

PERIPHERAL VASCULAR DISORDERS. Edited by Peter Martin, V.R.D., M.Chir., F.R.C.S.(Ed.), R. B. Lynn, F.R.C.S., J. Henry Dible, M.B., F.R.C.P., and Ian Aird, Ch.M., F.R.C.S. (Pp. 856; figs. 568. 110s.) Edinburgh and London: E. & S. Livingstone, 1956.

THIS is a very thorough, simple, and yet erudite book on peripheral vascular disorders, written by four editors and five other contributors. The contributors consist of one anatomist, one physiologist, one pathologist, one anæsthetist, one radiologist, and three surgeons, an all-round team of competent authority.

The opening chapters are on the anatomy of the peripheral vascular system and its nervous supply, and it is divided into two parts. The first chapter has one of the best descriptions available of the innervation of peripheral blood vessels, the fruit of meticulous work, by Professor Mitchell of Manchester. It is long, beautifully illustrated and well written. The next chapter is by the same author. It is put in for the sake of completeness only and contains an adequate account of the ordinary anatomy of the peripheral arteries. The physiology is done in the lucid style which we are accustomed to find in the writings of Professor Henry Barcroft, and summarizes very well the large amount of work that he has done on this subject, and a clear account of the literature.

This sound, scientific introduction typifies the careful and exact way in which the authors have set about their task. Sound anatomical and physiological teaching enriches almost every chapter.

The clinical section on the methods of examination and investigation of cases is done well and illustrated with clear diagrams. It is in chapters such as this that the high cost of colour reproductions is to be regretted, for so much could have been added to the value of these and other chapters by the liberal use of colour photographs, reproduced large enough to show clearly the clinical appearances. The radiology is clearly described and excellently illustrated.

The chapters on pure pathology are written by Professor Dible, again with the clarity and dogmatism that characterizes his writing and makes it so valuable to the student. The chapters that follow the pathological exposition deal with the clinical and surgical aspects of athero-sclerosis and Buerger's disease. They give excellent accounts of the clinical manifestation of the disease, though do not deal with the surgical technique. This is left to the last chapter.

The section on embolism, on trauma of peripheral vessels, on Reynaud's phenomenon are interesting. The description of the vaso-spastic responses to environmental cold are clearly set forth, but the chapter suffers a little from not having taken into account the recent work of Greenfield and his colleagues on the fundamental nature of the responses to cold.

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This is a valuable and useful contribution to surgical pathology. The author presents conflicting viewpoints fairly. The literature cited is modern and, despite such curious omissions as the failure of reference to the textbooks of Lever and of Allen from the section on skin, is in general balanced. The histology of the tumours is carefully described and almost all the illustrations are of very high quality and do show what they are said to show.

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It is salutory that the author has presented Thomas in his true light, that is to say, as a man of steel and an able doctor, and not, as many ill-informed have considered him, as a bone-setter—for the trade of which, by the way, he had a certain amount of disrespect—and as a maker of splints. Rather, Thomas is presented as a strong character who has grown in stature and in appreciation by the medical profession ever since his death.

But the book is very much more than a biography; it is a challenge to the present generation of orthopædic surgeons to consider whether orthopædic practice has not become too mechanical, for it has increasingly to deal not with primary conditions, which nature aided but not dictated to would have cured, but with the ill-effects of previous and badly conceived treatment. This is where reconsideration of the work and life of Hugh Owen Thomas is so important to our

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THE whole field of orthopædics and fractures is attempted in the two hundred and eighty-six pages of this addition to the Aids Series. It illustrates many of the advantages and not a few of the disadvantages of such "cramming." It is small enough to slip into the jacket pocket, and there is a good index. The layout of the subjects suffers, with little variation of print size, which is smallish, and with a tendency for important subjects to be less obviously indicated than expected. The print is unrelieved by a single illustration or drawing. Such drawbacks are inevitable if the volume is to be kept small and at the same time be reasonably comprehensive. Regarding the subject matter, dogmatism appears from time to time, as it must in any abbreviated discourse. The author has given a balanced opinion on most subjects and he does not ride any "hobby-horses." A few obvious points of criticism in the orthopædic section must be made. There is an unexpected conservatism in the treatment of tuberculosis. In capsulitis of the shoulder, short-wave diathermy is said to be helpful in the acute phases—the reverse is more often true. In treating fractures, it is surprising to read that blood transfusion during Blade plate operations for femoral fractures is "often necessary." It will not be accepted by many surgeons that bumper fractures of the tibia should be immobilised in plaster for ten weeks, nor that compression arthrodesis is the method of choice for the ankle joint.

The book is designed for the student, and it will be of great assistance especially for quick reference. R. I. W.

THE PRINCIPLES AND PRACTICE OF MEDICINE. Edited by Sir Stanley Davidson, B.A.(Cantab.), M.D., P.R.C.P.(Ed.), F.R.C.P.(Lond.), M.D.(Oslo). Third Edition. (Pp. viii + 1079; figs. 73. 35s.) Edinburgh and London : E. & S. Livingstone, 1956.

IT might have been thought that a new textbook of general medicine was not required. The fact that the volume under review has run to three editions and two reprints in four years indicates not only the need for a well-selected and well-presented modern text, but also that the Medical Department of the University of Edinburgh has supplied this need. The layout of the present edition follows that of the previous volume. The chapter on neurology has been rewritten and the other sections revised in the light of advancing knowledge. This book may be recommended not only for its excellence of style and clarity of presentation, but also, and importantly in these days when medical books are so expensive, for its modest price. R. A. W.

THE LIFE OF HUGH OWEN THOMAS. By David Le Vay, M.S.(Lond.), F.R.C.S. (Pp. vii + 136; plates 12. 25s.) Edinburgh and London : E. & S. Livingstone.

THIS book is a historical biography of a great man, and as such it represents countless hours of research and visitation by the author, who has obviously not spared himself in collecting material which he has presented in a clear and extremely well-written form. The profession owes Mr. Le Vay a great debt for this work.

It is salutory that the author has presented Thomas in his true light, that is to say, as a man of steel and an able doctor, and not, as many ill-informed have considered him, as a bone-setter—for the trade of which, by the way, he had a certain amount of disrespect—and as a maker of splints. Rather, Thomas is presented as a strong character who has grown in stature and in appreciation by the medical profession ever since his death.

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