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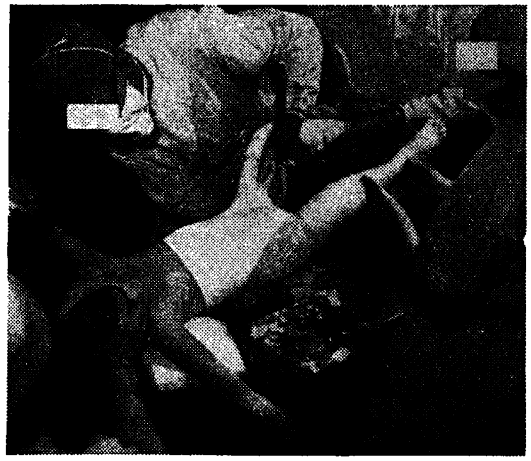

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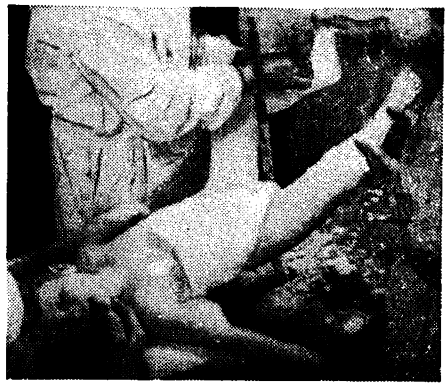

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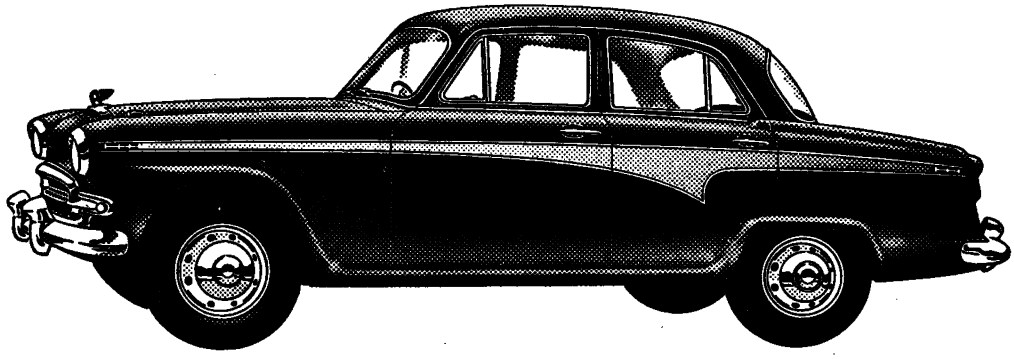

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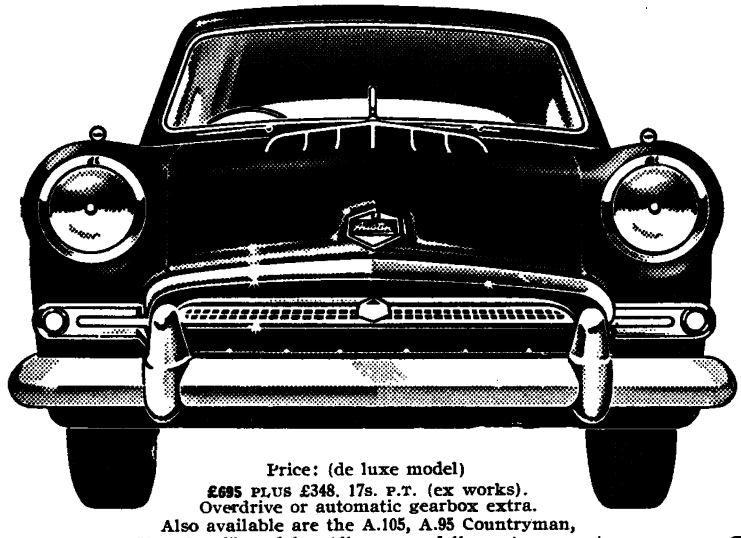

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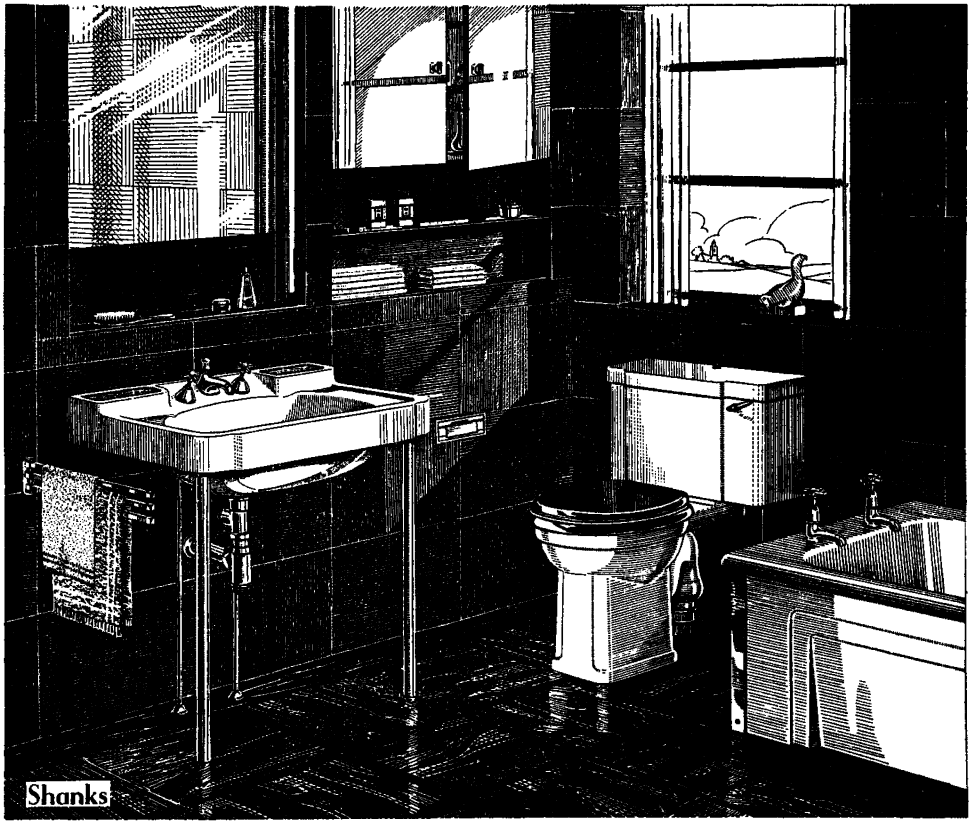

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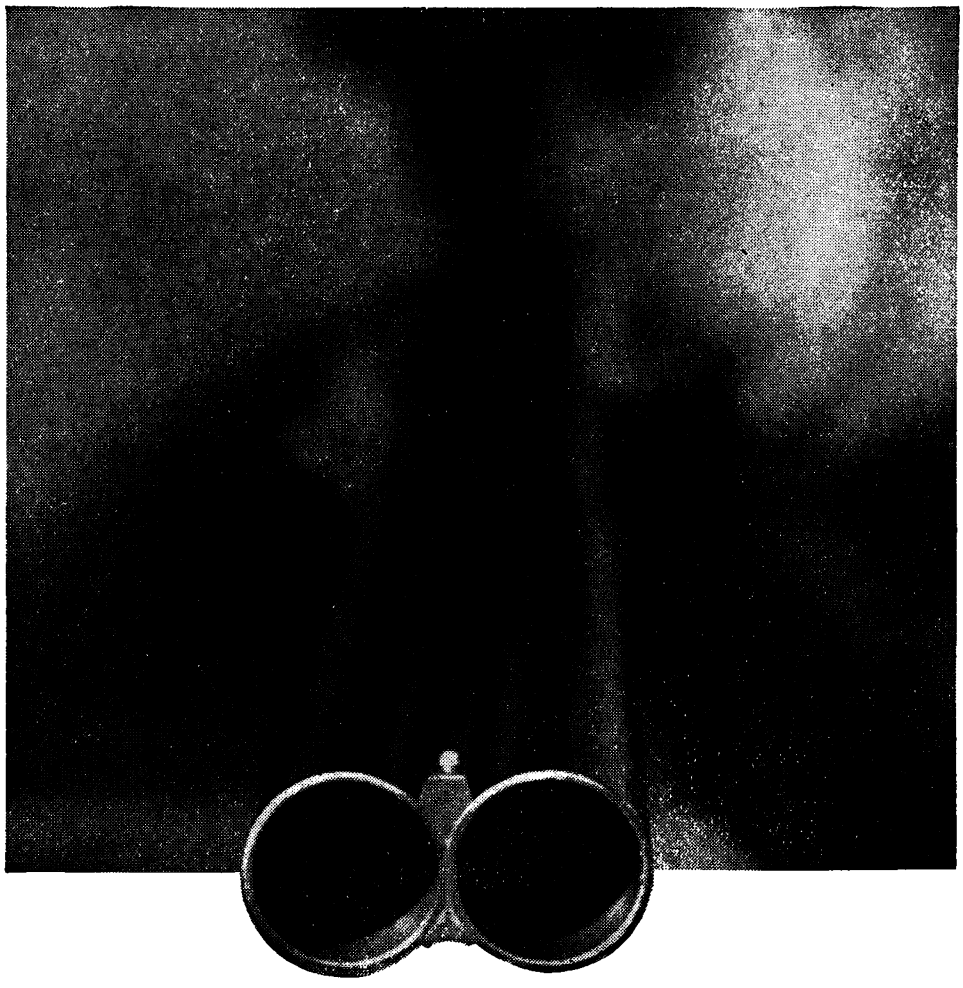

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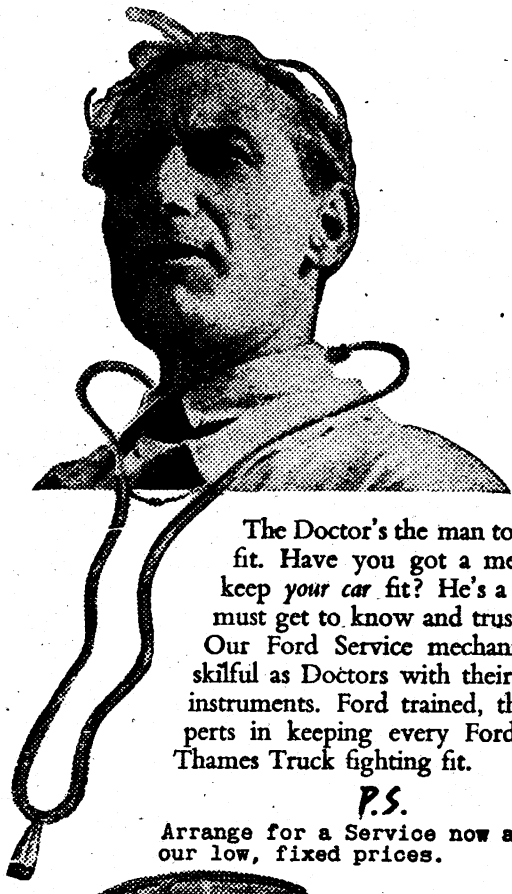

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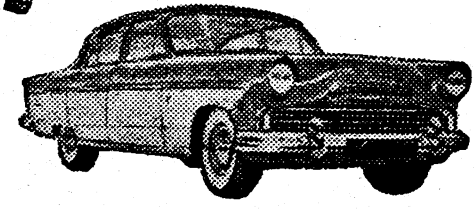

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CONTENTS

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THE
ULSTER MEDICAL JOURNAL

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Vol. XXVII 1st NOVEMBER, 1957 No. 2

Elizabeth Garrett Anderson and Her Contemporaries

By OLIVE M. ANDERSON, M.D.

Presidential Address to the Ulster Medical Society, 21st November, 1957

TODAY, in most countries in the world, there are women practising medicine; I think I am correct in saying that they specialise in every branch; opportunities vary in different countries and even in different parts of the same country. In Australia there is a Flying Doctor Service, carried on by two women who are in general practice; they cover thousands of miles and deal with all types of emergencies. In the first world war, women worked as civilians in Military Hospitals, and in Auxiliary Medical Services, wearing the uniform and rank marks of whichever women's service they were attached to. In the last world war they wore uniform, and were attached to Battalions and to Military Hospitals as ordinary medical officers and as specialists, they were also attached to the Women's Services, but only after the war were they granted commissions in the regular forces.

The advance in the work and status of medical women in our own country and in America, was made possible by the vision, courage and perseverance of three young English women :

Elizabeth Blackwell,
Elizabeth Garrett, and
Sophia Jex-Blake.

The story of Elizabeth Garrett would be incomplete without some mention of Elizabeth Blackwell and Sophia Jex-Blake; they were very different in disposition, but their aim was the same, to open the door of Medicine as a profession to women.

ELIZABETH BLACKWELL.

Elizabeth Blackwell was the third child in a family of nine. Her father was a sugar refiner in Bristol; he was a whig, a nonconformist, and a reformer. He took an active part in the anti-slavery campaign. As the sugar trade was dependent on slave labour, he was not very popular with the other sugar refiners. He himself tried

to grow and use sugar beet. Some time after riots in Bristol, when his refinery was burned down, he decided to go to America, where he had friends. So Elizabeth was brought up in America. Mr. Blackwell believed in equal opportunities for his daughters, and they were educated with their brothers. Elizabeth, as a child, is described as being shy, quiet and strong willed, but she grew up into a pretty and happy girl, fond of dancing and full of charm.

Tragedy came to the family when Mr. Blackwell died at the age of 48, leaving nine children and many debts. The older members of the family opened a school, and in five years paid off the debts and educated the younger children; by 1844 they were able to close the school. Elizabeth wanted to get away from family responsibilities, and took a teaching post for a year. Then a friend, who was dying of cancer, said to her, "If I could have been treated by a lady doctor, I should have been spared much of my suffering." Elizabeth had always been scornful of those who were ailing and not physically fit. At first she felt it would be quite impossible and alien to her whole nature to become a doctor, but the idea remained with her, and finally an emotional crisis helped her to decide. She fell in love, but her lover's views on life were rigid and narrow, and she could not see that they would have any real companionship. So she decided that to study medicine would fill her mind and be an outlet for her energies. The family were consulted and thought of all the difficulties to be met, but decided that if Elizabeth wanted to become a doctor, she would become a doctor, but first the money for training had to be found. So in June, 1845, she took a teacher's post in North Carolina. It was ten days' journey from her home. Two younger brothers drove her in the family carriage, over rough roads and through rivers. They arrived late one night, and the brothers returned home the following morning. It is recorded that Elizabeth, sick and exhausted, was overcome by "an agony of feeling"; her courage gave way to doubt. Suddenly the answer came—hope and peace filled her soul, and a deep conviction that her life was accepted and that she would be guided and helped.

After two years in North Carolina, during which time she had read many medical books, Elizabeth went to Philadelphia to begin her search for medical training. She stayed with a Dr. Elder, who helped her with the study of anatomy and encouraged her in her efforts to get training. She applied to twenty-nine schools and was refused by all but one. Some of the professors, when approached, were very non-committal; one replied "That there were difficulties, but he did not think that they were unsurmountable." "You cannot expect me," he said, "to furnish you with a stick to break our heads with."

The Geneva school of Medicine in New York State, the Medical Faculty of which, when considering her application, felt it too great a responsibility to make a decision themselves, put the matter before the students, who, on 20th October, passed the following resolutions: "Resolved that one of the radical principles of a Republican Government is the universal education of both sexes, that to every branch of scientific education the door should be open equally to all; that the application of Elizabeth Blackwell to become a member of our class meets with our entire approbation, and, in extending our unanimous invitation, we pledge ourselves

that no conduct of ours shall cause her to regret her attendance at the Institution." Elizabeth lost no time in accepting the offer of the Medical School, and started work on 6th November, 1847, and took her degree in January, 1849.

At the last, the Senate hesitated and was unwilling to grant her a degree, but the Dean of the Medical Faculty said, "She paid her tuition, didn't she? She passed every course, each and every one with honours. And let me tell you, gentlemen, if you hold back I'll take up a campaign in every medical journal." The Senate gave in, and Elizabeth got her M.D. Many people attended the graduation ceremony to see "the woman doctor"; they saw, to their surprise, a small, slight, attractive woman, happy in her success. The next step was to try and get some postgraduate experience, and Dr. Blackwell, as she now was, decided to go to Paris. On her way to Paris, Elizabeth spent some weeks in London, to which her fame had spread, and was taken to see all the sights, entertained to lunch, dinner and dances, and thoroughly enjoyed it all. At a special soiree she met many of the most distinguished London doctors; if they expected to meet a "blue stocking," what they saw was a small, slight and attractive young woman in a "modest crinoline with pale blue frills and flowers in her hair."

Paris was a disappointment, as no hospital would admit her as a postgraduate student. She das advised to apply to La Maternite, a training school for midwives, and was admitted on the same terms as student widwives. Here the staff were helpful, and she gained some valuable experience in midwifery. After about six months in Paris she returned to London, and was fortunate in being admitted to St. Bartholomew's Hospital, where the only department closed to her was that of Midwifery, as the Professor of Midwifery did not approve of a lady studying medicine. Elizabeth worked hard, but she also made friends, and was introduced to Florence Nightingale and Lady Byron, and had many social contacts. In July, 1850, she decided to return to America and to start practice in New York. No landlord wanted to give her rooms, so she applied to the women's department of the largest city dispensary, but was rejected. After many disappointments she got a flat and put up her plate, but no patients came. She wrote to her sister Emily, "A blank wall of social and professional antagonism faces a woman physician and forms a situation of singular and painful loneliness, leaving her without support, respect or professional council."

Elizabeth had become the first woman doctor; what was it all worth; even the University of Geneva had changed in its outlook, and the new Dean refused to admit women, so that her sister Emily could not gain admittance. But Elizabeth would not accept defeat, and, backed by some Quaker friends, she took a small room in a poor district of New York and opened her own dispensary. The response was overwhelming. The conditions the people lived in were appalling, and Dr. Blackwell not only doctored her patients, but lectured and exhorted them, trying to teach them the elements of hygiene.

Emily Blackwell had been admitted to Rush College, Chicago, and then to Cleveland, Ohio, where she graduated in 1853. After graduation she went to Scotland and worked with Sir James Young Simpson, gaining postgraduate

experience in midwifery and gynæcology. Meantime Elizabeth had come in contact with a Polish woman, Marie Zakrewski, then a midwife, who found herself destitute in New York. Elizabeth got her admitted to the University of Cleveland, from which she graduated in 1856, and about this time Emily came back from Europe, and now, with the help of Emily and Marie Zakrewski, and the financial help of friends, it was possible to bring to life a dream—the opening of her own hospital, and on 12th May, 1857, the "New York Infirmary for Women and Children" was opened, and was the beginning of a Medical School for women. In August, 1858, Dr. Blackwell went to London to give three lectures (to the Langham Place Group) on "Medicine as a Profession for Ladies"; she noticed a bright intelligent young lady whose interest in the study of medicine was aroused, Miss Elizabeth Garrett.

Though she got her name on the *British Medical Register* and was urged to stay in London, Elizabeth went back to America in the belief that Elizabeth Garrett would carry the torch.

ELIZABETH GARRETT.

We must now leave Dr. Elizabeth Blackwell, as she goes back to America to work amongst the poor of her city, and to forward the education and training of medical women in the country of her adoption.

Elizabeth Blackwell had said that she left the "torch" in the capable hands of Elizabeth Garrett. The meeting between the two ladies had been almost a chance one. Hearing about "the Lady Doctor" from America, Elizabeth's interest had been aroused, and she was invited by a friend in London to meet Dr. Blackwell, and afterwards she attended the lectures on "Medicine as a Profession for Ladies." Dr. Blackwell was attracted by the "bright and intelligent young lady, Elizabeth Garrett," and assumed that she wanted to take up medicine as a career. Elizabeth herself felt very much overwhelmed and that she was being thrust into work that was too big for her, but the seed was sown, and we will see later how it grew to fruition.

Elizabeth Garrett was born in London in the year 1836; she was the second daughter in a family of six daughters and four sons; her father, Mr. Newson Garrett, and his forebears came from Suffolk, and were gunsmiths and makers of agricultural implements. While the family was still young they moved to Aldeburgh (by boat) and Mr. Garrett became involved in many business enterprizes, owning his own fleet of barges. The family was a happy one. Mrs. Garrett was a very active and capable woman, and although she had a big family to look after, she often helped her husband in his office, writing his letters, as her "handwriting was neat and clear, her spelling and grammar correct," she had been fortunate in having more education than her husband. She was a very religious woman and a pillar of the local church; indeed, although it was the custom for the father of a family to conduct 'family prayers,' this duty was undertaken by Mrs. Garrett, as on one occasion Mr. Garrett, having come almost to the end of a long chapter, turned over two pages at once and started on another; he quickly closed his Bible, and brought the family prayers to an end with, "for what we have received may the

Lord make us thankful.' " He was never allowed to read (family) prayers again.

Mr. Garrett, himself without much education, spared no trouble or expense in the education of his children. Like Elizabeth Blackwell's father, he believed in giving the girls the same opportunities as the boys, so when Elizabeth was 13 and Louie, her older sister, 15, they were sent to a boarding school, "The Academy for the Daughters of Gentlemen" at Blackheath, kept by Miss Browning and her sister, aunts of Robert Browning. At school they had all the extras, including a hot bath once a week, which was had in a laundry tub before the kitchen fire, screened by a towel horse, so they were known as the "bathing Garretts." Miss Browning was in advance of her time and believed in plenty of fresh air, and used to go through the classrooms opening windows. French was always spoken, and the general standard of teaching was not very good. But after two years, when Elizabeth and her sister left, their education *finished,* they were thirsty for knowledge, and had made friends who in different ways influenced their lives.

In 1792, Mary Wollstoncraft wrote *a Vindication of the Rights of Women.* She appealed to women for worthy conceptions of self-respect, and to men to break the chains from women and to accept from them rational fellowship instead of slavish obedience. "It is time," she wrote, "to strike a revolution in female manners; to restore their lost dignity and make them labour, and by reforming themselves, reform the world." If women took exercise their bodies would become strong, and a reasonable education would cultivate their minds. Why should they not enter spheres of paid work, instead of eating out their hearts in idleness? "Women might certainly study the art of healing and be physicians as well as nurses," and again, "Women must have a civic existence in the state, married or single." "Let women share the rights and she will emulate the virtues of man." England was shocked, Mary Wollstoncraft was far in advance of her time, and her programme is not completed yet. Five years later she died, and during the next fifty years there was little improvement in the position of women. Then, gradually, the idea dawned that women had rights as well as men, and the organised women's movements began about 1850. The demand for votes for women came in 1867.

Elizabeth became interested in the women's movement in her early twenties, and to it she gave untiring support. "No one has time for everything," she said, and "the passion of my life is to help women." In conversation with her friend Emily Davies, "Women can get nowhere," said Emily, "unless they are as well educated as men; I shall open the Universities to them." "Yes," agreed Elizabeth, "We need education, but we need an *income* too, and we can't earn that without a profession." "I shall start women in medicine," and they agreed that Millicent, who was a younger sister of Elizabeth's, should get the Parliamentary vote for women.

Miss Davies became the first mistress of Girton College, Elizabeth the first woman to qualify as a doctor in England and open the door of medicine to women, and Millicent, later Dame Millicent Fawcett, became President of the National Union for Women's Sufferage Societies, and the success of the movement for the enfranchisement of women was in great part due to her wise guidance.

Having decided on her career, the next step for Elizabeth was to get her training. Although her father did not approve, he would not let her fight alone, and together they walked down Harley Street calling on the leading consultants, only to be met with—"Why not be a nurse?" "Because I prefer to earn a thousand, rather than twenty pounds a year." No one offered to help, some laughed, some were rude; this opposition made Mr. Garrett determined that *they* must succeed, and he spared neither time nor money in the effort. Mrs. Russell Gurney, wife of the Recorder of London, had promised Dr. Blackwell, before she went to America, that she would interview any women who volunteered for medical training. An introduction was arranged for Elizabeth to meet Mrs. Gurney, and it was suggested that she should go into Middlesex Hospital as a nurse for six months in a surgical ward, as that would be a severe test. It was in the days when the frock coat worn for the ward round was changed for an old coat before entering the operating theatre, and the surgeon washed his hands after the operation and not before. Sterilization was unknown and suppuration of wounds was accepted, and was called "laudable pus," gangrene was frequent, and it was said that out of every three or four cases operated upon, one died.

Elizabeth came to London in June, 1860, and in August entered the Middlesex Hospital complete with linen apron and notebook. She met with consideration and kindness; the Matron set the tone and the nurses welcomed and helped her. The Medical Staff introduced her to the dissecting room and operating theatre. She was allowed to help the sisters do the dressings, to set the table and spread the ointments. One of her problems was how to treat the other students, not to be too frigid or stiff, and yet an absence of stiffness might be misconstrued. It would be best if they would just forget her sex and treat her as a student. She was given a room in the hospital, and in this she did her study and dissecting. Later Elizabeth was accepted for a special course of lectures and demonstrations in chemistry, and for this she paid fees, but she was not allowed as a regular student for the whole course. She was also admitted to lectures on Materia Medica, and the Treasurer took the lecture fees and became more friendly. The Senior Physician took her on ward rounds. Elizabeth wrote to a friend—"He is horribly unpunctual, but he can be heard and is a good doctor." As the months passed Elizabeth became more confident, but in June, 1861, one year after her entering, she began to be dissatisfied with her progress, and the medical staff became less friendly. She obtained a certificate of honour in each class examination, which was a mistake, but she could not claim the prize, as she had not attended all the lectures. The examiner, in sending her the results, added, "I entreat you to use every precaution in keeping this a secret from the students." Then the trouble arose: The Visiting Physician asked his class a question which none of the men could answer; Elizabeth gave the right reply and the students were angry and petitioned for her dismissal. A counter petition was sent to the Committee, but she was told that she would be admitted to no more lectures, though she could finish those for which she had paid fees. The Lecturers regretted that this decision had been arrived at, in "the case of a lady whose conduct had, during her entire stay in the hospital, been

marked by a union of judgment and delicacy which commanded their entire esteem." Elizabeth had received an undertaking from the Apothecaries Hall that she would be admitted to a qualifying examination for the licence when she had completed her studies according to the regulations of the court, which renders *an apprenticeship of five years* to a qualified practitioner imperative. Elizabeth, who wanted a University degree as well as a licence, decided to spend the winter in studying and preparing for matriculation at London or St. Andrew's. When Elizabeth applied to St. Andrew's University, she found that there was no matriculation examination, but a fee of £1 was paid for a ticket of membership of the University; this she succeeded in getting, but the fee was returned to her. However, as her name was already written in the University Book, Elizabeth sent back the fee with a covering letter saying that until the question was decided legally, she would retain the ticket. Then the legal argument began; the Lord Advocate of Scotland gave as his opinion that it was not impossible for the Senate to admit women—they could use their discretionary powers, but Sir Fitzroy Kelly, Solicitor General and Attorney General, gave as his opinion that, according to their charter, the University could not admit a woman, so the Senatus refused Elizabeth permission to attend classes. After this setback, Elizabeth went to Edinburgh and worked for a while with Professor James Young Simpson and Dr. Keiller, but the University refused to admit her as a student and she returned to London, and continued to work for her examination of the Apothacaries Hall, deciding that when she got her Diploma she would try for a foreign degree; she had a great desire to be able to write *M.D.* after her name.

Then started a weary round of trying to get instruction in anatomy, medicine and surgery, from professors and lecturers, and to get permission for clinical work in the hospitals. The London Hospital admitted her as a "nurse" for six months, and the Medical Staff allowed her to do ward rounds, but this soon came to an end. Then several members of the Medical Staff of the Middlesex Hospital gave her permission to do ward rounds, but this only lasted five months, as the Medical Committee objected to the ward rounds.

After six years of almost constant study, and having passed with credit her preliminary examination, Elizabeth had completed the curriculum for a Medical Diploma and, in the autumn of 1865, applied to the Society of Apothecaries for admission to the final examination. The Board wished to refuse, but Mr. Newson Garrett threatened legal action, and Elizabeth was allowed to enter; she passed with credit and obtained the Diploma L.S.A., and became the second woman to have her name on the Medical Register. After this the Society of Apothecaries altered their regulations; in future all candidates must have worked in a recognised school of medicine, and women were excluded from these. No other woman appeared on the Register until 1877, twelve years afterwards. Mr. Garrett took a house, No. 20 Upper Berkley Street, and furnished it; Elizabeth put up her plate, "Elizabeth Garrett, L.S.A.," and *had a night bell.*

Elizabeth's practice grew; many of her friends and their friends came to her. In this she was more fortunate than Elizabeth Blackwell. As well as her private

practice she opened "St. Mary's Dispensary for Women," in a poor, crowded part of Marylebone; the patients were asked to pay a small fee, and for this they got their treatment and medicine. In the first few weeks she had between sixty and ninety women and children on each consulting afternoon. She also visited the patients in their homes and took midwifery cases in the district. She was fortunate in having the advice and help of the honorary consultants of St. Mary's Hospital when she needed it. In 1870 ten beds were added and the Dispensary was renamed, "The New Hospital for Women." Again, in 1874, more room was needed, and new premises were acquired in Marylebone Road, which provided twenty-six beds. At this time Miss Morgan, M.D., and Mrs. Louisa Atkins, M.D., both of Zurich University had joined the staff.

In 1868, the University of Paris admitted women to degrees in medicine. In spite of her busy life, Elizabeth started to study again and, in French, she passed all her preliminary examinations in quick succession, and got her M.D. for a thesis on "La Migraine." At the oral examination which followed, the examiners expressed surprise that she had not known of Dr. Graves of Dublin. "Mademoiselle," they said, "you do not know your great men." "But monsieur," she replied, "we have so many," so they smiled and forgave her.

Her practice well established and the work organised at St. Mary's Dispensary, Elizabeth offered for and got a vacancy on the Medical Staff of the Shadwell Hospital for Children (now the Princess Elizabeth of York Hospital). Shortly afterwards she was appointed Medical Representative on the Board of Management, and it was while serving on this Board that she met her husband, Mr. J. G. Anderson, who belonged to a shipping firm. About this time the Municipal Franchise was opened to women, and the Working Men's Association persuaded her to stand for the School Board, which she did, and was successful. She had to make many speeches, about which she said, "Bless us, it is a tough and toilsome business." Elizabeth polled 47,000 odd votes, against her opponent's 13,000.

In December, 1870, her engagement to Mr. J. G. Anderson was announced, and they were married on the 9th February, 1871. In relation to her marriage, Elizabeth wrote to a friend, "I am sure that the woman question will never be solved in any complete way so long as marriage is thought to be incompatible with freedom and an independent career, and I think there is a very good chance that we may be able to do something to discourage this notion."

It is an interesting fact that Elizabeth was able to persuade her husband to start their married life in *her* house. He seems to have been a remarkable man; there never seems to have been any question of her giving up her profession, and they were very happy. Though busy in their work, they found time for many social engagements, parties, dances and concerts, and for travel abroad.

Finding herself busy with her practice and her young family, Mrs. Anderson, as she now was, resigned from the Shadwell Hospital; this she always regretted It was not until the year 1929 that another Medical Woman was appointed to the Medical Staff.

Mr. and Mrs. Anderson had three children, two girls and a boy; a great sorrow came to them when the second little girl died at 15 months of tubercular peritonitis.

Mrs. Anderson became Dean of the London School of Medicine in 1883; she was then 49, and held this post for twenty years, when she became President, and remained in office until her death in 1917.

By precept and example she taught the ethics of the Medical Profession. "The first thing women must learn," she said, "is to behave like gentlemen!" She was vigorous in mind and body, did not shrink from responsibility, inspired confidence; her judgment was good and fair; she had a good business head and was a good committee member; she was an excellent beggar and collected literally thousands of pounds for the school and the New Hospital for Women.

One of the early duties of the new Dean was to present the first two students of the school who had qualified for the degree of London University, Mrs. Mary Scharlieb and Miss Edith Shove; for this ceremony she persuaded her father to come to London. Mrs. Scharlieb had won a gold medal and a scholarship. In 1896, there was an entry of fifty new students, and the Board had to face the question of rebuilding, at a cost of £20,000, and in 1901 the London School of Medicine became one of the colleges of the newly constituted University of London.

In 1902 Mr. and Mrs. Anderson gave up active work and returned to Aldeburgh. There Mrs. Anderson was busy with her garden, and was said to be the best member of her own outdoor staff. She introduced home industries to Aldeburgh, and arranged concerts of classical music.

In 1907, Mr. Anderson died and left her very lonely. He was Mayor of Aldeburgh, and Mrs. Anderson was invited to finish his year of office; this she did. In 1914, although old and frail, she went up to London to see her daughter, Dr. Louisa Garrett Anderson, and Dr. Flora Murray leave for France with the first unit of the Women's Hospital Corps.

In her old age her family remained near her, and a faithful friend and nurse tended her. From youth to old age she had worked for one cause only, that of women. To her little grandson she said, "Colin, I have had a very happy life."

Of her, her daughter said, she carried happiness within her, and by her work brought happiness to other women.

Elizabeth Garrett Anderson's name is perpetuated for all time in the Elizabeth Garrett Anderson Hospital, which was the New Hospital for Women, and started as St. Mary's Dispensary, a venture of faith.

Sophia Jex-Blake.

Sophia Jex-Blake was born in 1840; as she was a child who did not fit in at home, she was sent away to school, and seems to have had a stormy time, but she grew up into a young woman, intelligent, abounding in energy, and with little or no outlet for it. Her parents hoped that she would marry, but they were very religious and very strict, and she was not allowed to go to dances, theatres, or have any form of worldly pleasure. When Sophia was 18 she went to visit some cousins, and while there heard of Queen's College, and in her quick, impulsive way,

she decided to go, and made her plans. Her parents were upset, but Sophia got her way, and accepted an appointment to teach mathematics.

As her main aim was to reform education, she went first to Germany and then to America to study different methods. In America she met Dr. Sewall, one of Elizabeth Blackwell's disciples, and became intensely interested in Medicine as a career, and had entered the Medical School in Boston, when her father's death changed her plans, and she gave up her study and came home to be near her mother. While at home she studied and got some coaching.

As London University had recently rejected the admission of women, Sophia decided to go to Edinburgh, fortified with letters of introduction to members of the Medical Staff. She was joined by four other women, and they were allowed to matriculate, and for a while all went well until the class examinations. Four out of the five women had gained honours, and one, Edith Pechey, had come at the top of the list and won the Hope Scholarship. Edith Pechey got a bronze medal, and the man immediately below her on the list was awarded the scholarship, on the grounds that the women had been *separately taught* ! From now on, the course of the women, who were joined by two others and so were known as The Septem (Seven against Edinburgh), was one long story of facilities granted and then withdrawn. Sophia Jex-Blake was a good fighter, but had not the tact of Elizabeth Garrett. She was almost idolized by the other six; nothing daunted her, and she was extremely kind and helpful to the members of the group. In May, 1876, Mr. Russell Gurney, the Recorder of London, introduced an Enabling Bill; this received the Royal Assent in August, 1876, and it enabled any University in Great Britain and Ireland to admit women to its examinations. Now the problem was, which Universities would act on their new bill, Edith Pechey and Edith Shove went to Ireland and came back with the promise that the Irish College of Physicians and the Queen's University had agreed to admit women to their degrees and diplomas. The following year Sophia Jex-Blake and Edith Pechey received their degrees in Dublin, and in 1877 their names were added to the Medical Register.

It was clear that there was no possibility of women getting any clinical training in Edinburgh, or of their being admitted to the final Medical examinations, so Sophia Jex-Blake and Isabel Thorne came to London, and some of the others went to Zurich and Paris. Sophia proposed at once to form a separate school of medicine for women. A number of leading medical men had promised to join the staff, men who were already recognised teachers at other schools. A provisional council was formed, and Mrs. Garrett Anderson was asked to join it and did so, serving the school to the end of her life. The Council met at 69 Wimpole Street, in the house of Dr. Anstie, with Miss Sophia Jex-Blake as Secretary, on 22nd August, 1874. Dr. Anstie became the first Dean of the School. Money was collected, and 30 Henrietta Street was bought, furnished, and equipped, and on the 12th October, the London School of Medicine for Women was opened, with fourteen students.

In May, 1875, the Provisional Council handed over to the Board of Governors. By a rotation of classes the curriculum was covered in three years, and at the end of the first session Lord Shaftesbury presented the prizes.

A Medical School for Women was an accomplished fact, but there was no hospital willing to give them clinical teaching. The New Hospital for Women was not big enough; no examining board would admit them to their examinations. Then came the Medical Act of 1876, already mentioned, which gave Universities the right to admit women to their examinations for degrees and diplomas.

The problem of a hospital was solved when the Royal Free Hospital, after much negotiation, entered into a five year tentative agreement with the School. The Medical School was to pay £715 a year to the hospital, £500 in fees to the staff, and the balance to the general expenses of the hospital. The founding of the London School of Medicine for Women, and the agreement with the Royal Free Hospital, bear testimony to the perseverance and untiring efforts of Sophia Jex-Blake in the cause of Medical women.

Sophia Jex-Blake had done all the secretarial work for the school; now an official Hon. Secretary was to be appointed. Mrs. Isabel Thorne was chosen. Sophia was disappointed, but approved of the appointment; she herself went to Edinburgh, though she remained on the Board until 1896. In Edinburgh she started practice, and with her usual energy and foresight, formed a School of Medicine for Women, and founded a Hospital for Women and Children. Towards the end of her life, Sophia Jex-Blake suffered all the weariness and discomfort of congestive heart failure, but when able, still went out for her drives into the country. It was after one of these, feeling a bit more tired than usual, she sat down in her chair and went to sleep for the last time.

A brass tablet to her memory in St. Giles Cathedral, in Edinburgh, reads :

> "Sacred to the memory of Sophia Jex-Blake, M.D., by whose energy, courage, self-sacrifice and perseverance, the Science of Medicine and the Art of Healing were opened to women in Scotland."

May I quote from Rudyard Kipling (Today—1914) :

> "No easy hopes or lies, shall bring us to our goal,
> But iron sacrifice, of body, will, and soul.
> There is but one task for all—for each one life to give.

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Medical Ethics

By Reginald Hall, M.D., F.R.C.P.I.
Royal Victoria Hospital, Belfast

Opening Address, Winter Session, Royal Victoria Hospital, Belfast, 1957-58

It is customary at the beginning of this address to refer to the changes which have taken place in the Staff of the Hospital during the year which has elapsed since the last Annual Oration.

We have first to record with regret the death of a former member of our Dental Staff, Mr. William Muirhead Hunter, which took place on 26th May of this year. Mr. Hunter was a native of Stranraer who qualified in dentistry in Edinburgh. Having served in the First World War, he came to Belfast to practice, and was appointed to this hospital in 1920 as one of the first members of our Honorary Dental Staff. He was also one of the original lecturers in dentistry in Queen's University, and for many years held the position of Executive Officer of the Dental Staff. He retired from the active Staff in 1952, and we honour his memory as one of the founders of our Dental School.

Two former members of the Visiting Staff, Professor Mayrs and Sir Frank Montgomery, reached retiring age during the year and we now welcome them to our senior ranks.

Professor Mayrs joined the Auxiliary Staff as Pharmacologist in 1927. His activities were mainly confined to the University Department, but when his special knowledge was needed in connection with hospital patients, his advice was always helpful and willingly given. We wish him many happy years of retirement.

Sir Frank Montgomery became a member of the Visiting Staff in 1925, and has been Senior Radiologist since 1929. In an outstanding career of public and professional service composed of so many highlights it is possible today to refer only to some of the brightest : for example, in 1913 and 1914 his service to Ireland as a rugby international; his service to his country in the First World War from 1915 to 1918 when he was awarded the Military Cross and the French Croix de Guerre with bar; his service to this and other hospitals from 1925 to the present time in developing the Radiology Departments, and as a member of various committees; and his service to the Government, medical profession and people of Northern Ireland from 1948 to 1956 as the first Chairman of the Hospitals Authority. This difficult position called for the highest qualities of tact and ability, and we must count ourselves fortunate that he was available. His administrative talents have been acquired by Queen's University, first as a Senator and now as pro-Chancellor. His knighthood in 1953 was richly deserved.

He has recently discharged another duty in the field of sport, when, as Captain of the Royal County Down Golf Club, he presided over the international golf matches held at Newcastle last week. We hope he will be long with us as a retired member of our Staff, and we offer him our best wishes.

While referring to our Elder Statesmen, we must record our pleasure at the timely honour of knighthood which has been bestowed on another Honorary Consultant, Sir Samuel Irwin. This fitting recognition of many years of service to the profession and to the community has been widely acclaimed, and we hope he will be long spared to enjoy it.

We have thus established a higher grade of Extraordinary Honorary Consultant, the qualifications for which include the holding of an Irish international rugby cap and a knighthood.

We welcome two additions to our Visiting Staff, Professor Gibson and Professor Wade. Professor Gibson is one of our own graduates, who after some years of absence, has returned to the fold, with a high reputation in his chosen field. With him as the first holder of the new Chair of Mental Health we look forward to developments in a service, which, up till now, has been regarded rather as the Cinderella of medicine. Professor Wade, a graduate of Cambridge University, with a very distinguished academic background, comes to us from the United Birmingham Hospitals, to take over the newly designed Chair of Therapeutics and Pharmacology. We hope that both these new members will have many happy years on the Staff of the Hospital.

My next duty as spokesman for the medical staff is to extend a warm welcome on their behalf to all medical students, and particularly to those who are coming to this hospital for instruction for the first time. For you who are new to clinical work the beginning of your first hospital term must be regarded as a major event in your lives, and is the goal achieved as a result both of your training at school and of your preliminary course at the University. These have been simply the preparation for the more adult experience on which you are now embarking. So far your lives have moved in the academic atmosphere of more or less abstract learning, perhaps to a degree which we would not regard as completely satisfactory. But your horizon is about to be broadened through contact with patients in the extern departments of this and other hospitals and with sickness at the bedside. You will see cases of organic disease which you will learn to diagnose by clinical methods, and you will also have the opportunity of noting how physical changes result in some cases from known concrete causes, and in others (and perhaps less obviously) from the impact which mental strain, environmental conditions, and social problems can have on the physical and mental well-being of patients: and indeed how some people become patients because of such factors.

You will also learn to appreciate that while the main object of medical practice is to cure people who are sick, efforts are constantly being made to discover why some people keep well while others fall ill; and how one can prevent the latter from becoming ill. At one time medicine was mainly concerned

with the type of disease which the patient had, but now it is equally concerned with the type of patient who has the disease. Both aspects of illness require attention.

In hospital you will observe the many special methods which are used in the elucidation of difficult cases; but I should impress on you at once, and you will find this emphasized by your clinical teachers, that you must always rely as far as possible, and certainly in the first instance, on the well-established methods of careful history-taking, close observation, and thorough clinical examination, which are the basis of good medical practice, and which you will find sufficient in the great majority of cases to lead you to a proper diagnosis. Many of the special investigations which you will see applied to abstruse cases in the wards are not available except in hospital, and so should not be allowed to become a major part of your diagnostic armamentarium in your early years.

I should also mention that when dealing with hospital patients it is important to remember that you are seeing them divorced from their own environment. They often come to hospital in fear, often expecting the worst, apprehensive day by day as the investigations multiply, in case these may eventually lead to the conclusion that they are suffering from some incurable complaint. So they must not be regarded simply as units of disease presenting a diagnostic or a therapeutic problem. It is important for you to blend the academic approach with a considerable amount of friendliness, cheerfulness, and encouragement, for it is only in this way that the doctor fulfils his true function.

I feel also that I should be neglectful if I did not draw your attention to the fact, if you are not already aware of it, that the Belfast Medical School has a very high reputation among medical teaching centres, so that when you eventually graduate you will appreciate that you have acquired a qualifiction with which you may be well satisfied. That this is so must be regarded as a tribute to the thoroughness and care which past and present members of the hospital staffs have given to the instruction of students. In this hospital, teaching methods are constantly under review by the Staff in conjunction with the University, and they are very conscious of the tendency for the curriculum to grow as knowledge increases. New methods of instruction and adjustments of time schedules are constantly being attempted so that you may get the most out of your clinical course.

Some years ago, the author, Eric Linklater, in giving an opening address in one of the provincial medical schools, said :— 'I think you should be congratulated on your choice of profession. You will have many superficial advantages. Unlike most professional men, you will be able, if you wish, to talk shop without boring your audience. For your audience will inevitably consist of persons who are subject to almost every ailment from arterio-sclerosis to a sensation of fullness after food—and any reference to such things or to the organs from which they emanate, will be of interest to them.' But apart from the truth of this jocular observation, I am sure you will all find a deep and abiding satisfaction in the practice of medicine.

With these preliminary remarks I now come to the main part of my address. In my search for a theme I have read many of the annual addresses which have been given in the past. By tradition, they have an historical flavour. Some have dealt with the history of medicine in general, and others in its relation to a particular speciality; while some of the most interesting have referred to aspects of the history of our own medical school. Many of the most enjoyable have been given by present members of the Staff. I have derived much pleasure and benefit from perusing them, and I am sure that an effort should be made to collect and bind them so that they would be more readily available to those who may feel the urge to read them, as I did, when preparing an address such as this, or for those who might have sufficient interest to read them for their literary and informative value.

Having read them, I was impressed by two things. First, by my own inadequacy to carry out on behalf of the Staff the task which the passage of time has allotted to me today; and I would echo the words used by Oliver Goldsmith when dedicating his poem "The Deserted Village" to Sir Joshua Reynolds. He wrote:—"Dear Sir, I can have no expectations in an address of this kind either to add to your reputation or to establish my own." Secondly, I was impressed by the range of subjects which had been covered, and consequently by the difficulty in finding a topic which had not been fully dealt with before.

It occurred to me, however, that it might be of some interest, especially to the student, to consider the ethical traditions in medicine, and particularly to trace the history and say something of the implications of those rules of conduct both customary and statutory which the profession has observed for so long.

The term medical ethics is difficult to define precisely for it deals with many aspects of our professional life. In general it refers to the relations of the doctor with individual patients and with society as a whole. At some points it has legal implications, while at others it touches the social obligations of the doctor. But I hope to show that these social obligations do not, as one American writer facetiously suggests, concern themselves principally with the necessity of having well-polished shoes and pressed trousers, in avoiding the smell of alcohol and tobacco in the presence of a patient, and never in any circumstances using the split infinitive!

Medical etiquette, on the other hand, is a more restricted term, and as a rule refers to the relationship of doctors towards each other.

Historically, we usually think of medical ethics as having its origin in the Hippocratic Oath, and while credit must be given to Hippocrates for establishing medical ethics on such a sure foundation, it must be realized that rules of medical conduct and practice had existed for almost two thousand years before Hippocrates. There is, for example, today in the Louvre in Paris a pillar of stone on which is engraved the oldest general code of laws in existence. It deals with matters of property both civil and religious, and there are many references to the medical profession. This stone had stood in the Temple of Babylon, and from the enactments of the code we gather that the medical profession must have been

in a highly organised state four thousand years ago, for not only was healing regulated by rules, but a scale of fees was laid down and penalties were exacted for malpraxis. For example, the code states: "If a doctor shall treat a gentleman and shall open an abscess he shall receive 10 shekels of silver. If the patient is a slave, the master shall pay 2 shekels of silver." But then comes the debit side so far as the doctor is concerned. The code goes on: "If the doctor shall open an abscess and in so doing shall kill the patient, then his hands shall be cut off." In the case of the death of a slave, however, a replacement was all that was called for. It is evident, therefore, that only the most skilful undertook surgery in Babylon, and penalties of this kind tended to raise the standard of medical practice.

The situation of doctors in Egypt at this time was much the same. Here books on medical practice were kept in the temples, and the priest-physicians merely looked up the appropriate remedy for the presenting malady. So long as the treatment given was that specified in what we might call the "National Formulary" the doctor was held blameless even if the patient died. But if the doctor showed any individuality in his approach to the case, and did not adhere to the rules and regulations, then death of the patient meant death to the doctor. Fortunately, disciplinary committees have less power now than they had in those early days!

For almost two thousand years rules of this kind governed medical practice, and it was only then that Hippocrates appeared on the medical stage and founded the code with which his name will always be associated. By the Oath which he propounded he crystallized the basic principles which govern the ethical standards of the medical profession, and apart from the few instances in which his name is linked with certain physical signs, it is in this connection that he is best known to thousands of doctors. But before dealing with the Oath, it may be well to sketch the background and indicate the stature of the man responsible for it.

It is not generally known that there are many distinguished persons referred to in classical works who bear the name of Hippocrates. Some were generals, some were philosophers, and one was a renowned mathematician, who apparently devoted his life to the problems of squaring the circle and doubling the cube, but although he evidently made considerable efforts in this direction, he never got a satisfactory answer. Posterity should remember him, however, as the first man to use letters instead of numerals in dealing with geometrical problems; and so a man called Hippocrates must share with Euclid the responsibility for causing so much trouble to generations of students at school. We can trace eight persons named Hippocrates who were physicians, but the one we refer to when we speak of the Father of Medicine was, what the Americans would call Hippocrates II. He was the son of a physician called Heraclides and he was born on the Greek island of Cos in the year 460 B.C. The date of his death is generally agreed to be in the region of 360 B.C., so he lived for about one hundred years.

It must be admitted at once, that we know very little of the man himself. Some have suggested that when one is considering so many shadowy figures at a

distance of two thousand five hundred years, the distinction between those who were real and those who were mythological becomes difficult, and indeed one doctor a few years ago had the temerity to express his disbelief in the very existence of the man in an article which he entitled "Hippocracy." But although much detail of his life is lacking the existence of Hippocrates II is well vouched for. He lived at an age of extraordinary intellectual development in Greece; he had for his contemporaries Pericles the statesman, Sophocles and Euripides the poets; and the philosopher Socrates with his disciples Plato and Xenophon. Even in this distinguished company, Hippocrates was regarded as an outstanding personality.

He has been called the Father of Medicine, but he was only so in the historical sense; he was not the author, creator, or even the founder of medicine. When he was born there was a great literature on medicine and surgery; but it was in him that this backgound was embodied for the first time as the ideal of medical practice, and his character and ideals have served the world as the model for the practitioner in all succeeding ages.

When we speak of the works of Hippocrates we refer to those medical records which had been accumulating from the earliest times until they were collected together as a guide for Hippocrates and others from the fifth to the second centuries B.C., and which have ever since been beacon lights for practitioners of medicine. The fact that he was not the author of all the original seventy books which made up the collection (sixty-one of which still exist) does not detract from their value, as his influence was behind them all.

The best known section of his writings is that contained in the Book of Aphorisms. These aphorisms embody the results of long-continued practice grounded on empiricism and careful observation. He introduces them with the almost hackneyed statement:—"Life is short and Art is long, opportunity fleeting, experiment dangerous, and judgment difficult." The book is generally regarded as one of the most remarkable in the whole compass of medical literature, and formed the ground-work of medical theory and practice for upwards of twenty-four centuries.

In the study of the works one cannot fail to remark his high standard of ethical conduct, his insistence on prognosis, his accuracy of observation, and his clarity of recording cases. He travelled much in the course of his practice, but his clinical work was mainly carried out at the so-called Temple of Health in Cos, which may be regarded as the counterpart of the great modern teaching hospital. All the evidence shows that his externs were very busy and extermely popular and, as we all know, externs have remained so ever since.

This then is the background of the man who, among other things, founded the professional code of conduct.

The Hippocratic Oath was an indenture binding the pupil to his master. The original version is lost, but the form now accepted is a translation from the French version by Peter Lowe in 1599. In a leading article a few years ago the *British Medical Journal* pointed out that probably very few medical men know

the details of the Hippocratic Oath, and noted that it was rare to find it recorded in histories of medicine. For example, Garrison, who has written what is regarded as an authoritative work on medical history, does not reproduce it. For the sake of completeness, therefore, and so that you may note how the more modern code, which I will refer to later, differs from the so-called original, I will read the following—pruned of some of its more flowery and out-dated phrases—which may be taken as embodying the main features of the translation :—

"I swear by Apollo invoking all the gods and goddesses to be my witnesses, that I will carry out according to my ability and judgment this Oath and this indenture :—

I will use treatment to help the sick according to my ability and judgment but will never use it to injure or wrong them.

I will not give poison to anyone though asked to do so, nor will I suggest such a plan. Similarly will I not give a pessary to a woman to cause abortion.

I will not use the knife on sufferers from the stone but will give place to such as are craftsmen therein.

Into whatsoever houses I enter I will do so to help the sick, keeping myself free from all intentional wrongdoing and harm.

Whatsoever in the course of practice I see or hear, or even outside my practice, that ought never to be published, I will not divulge, but will consider such things to be holy secrets.

Now if I keep this Oath and break it not, may I enjoy honour in my life and art, among all men at all times, but if I transgress and forswear myself may the opposite befall me."

This code has variously been referred to as the "high-water mark of professional morality," and as "a monument of the highest rank in the history of civilization." Certainly for twenty-five centuries, it has been the "credo" of the profession and its continual observance, more than any other single factor, has given rise to the confidence and high regard which the public have for the profession.

When we look forward from the time of Hippocrates to the Middle Ages, we find further reference to the conduct of medical practice, but of a rather different and often amusing kind. For example, in a work entitled "The Doctor's Visit," dated A.D. 1140, it is stated :—"When called to a patient, commend yourself to God and the angels. On the way learn as much as possible from the messenger, so that if you discover nothing from the patient's pulse, you may still astonish him and gain his confidence by your knowledge of the case. On arrival, ask the friends whether the patient has confessed, for if you bid him to do so after the examination, you will only frighten him. Then sit down, take a drink, and praise the beauty of the country and the house, if they deserve it, or extol the liberality of the family. Do not be in a hurry to give an opinion for the friends will be more grateful for your judgment if they have to wait for it. If asked to dinner, do not hasten to take the first place unless it is offered to you. Send often

to enquire for the patient that he may see you do not neglect him for the pleasures of the table, and on leaving, express your thanks for the attentions shown to you." This writer was evidently a very shrewd man and doubtless had a flourishing practice.

A great teacher of Bologna about this time was William of Salicet. In his advice to physicians he directed them to be "reflective, quiet, and with downcast countenance, giving an impression of wisdom."

A further writer of a later period, known to be a diligent pupil of the aforesaid William expected to be well paid for his services. He tells us that when treating an accident "the friends should be excluded as they may faint and cause a distrubance." "But," he adds cheerfully, "sometimes a higher fee may be obtained from persons fainting and breaking their heads, than from the principal patient."

It was not until 1803 that a part of the graduation ceremony in any medical faculty in Britain required the acknowledgment by the graduate of what is known as the *Sponsio Academica* — or Hippocratic Oath. This formal promise or declaration was introduced in that year by Edinburgh University and has since been adopted by our own University and by the other Scottish Universities. It has changed its form of words through the years, evidently to suit the changing conception of the times; and briefly it calls for loyalty to the University, a high standard of medical practice, and an injunction against disclosing information obtained about patients in the course of professional duties.

An enquiry into the customs of English and Welsh Universities reveals that, with the exception of Birmingham University, no oath or vow of professional conduct is called for from graduates; but the Royal Colleges generally require members and fellows to sign a declaration which imposes, in effect, honourable conduct and loyalty to the college.

On going further afield we find that the Oath is administered in the older continental universities, e.g., Berlin, Leyden and Padua, and in the Canadian and South African universities. In Australia, graduates were required to acknowledge it at one time, but this practice has now been discontinued. It is not used at all in the United States of America, where the American Medical Association has its own comprehensive code of ethics, first introduced in 1847.

So matters regarding the Hippocratic Oath stood until it was considered afresh by the World Medical Association. It may be of interest to note that this Association was established in 1947, and collectively represents about 700,000 medical graduates in over fifty countries. The principal activities of the Association have been in the fields of medical ethics, medical education and social security. The pattern for such an international body was set by the United Nations at inter-governmental level, and one of its specialised agencies is the World Health Organisation, a powerful force in the development of medicine backed as it is by government authority and money. In this setting the World Medical Association acts as the guardian for the National Medical Associations, and so for the individual practising doctor.

Six years ago, in 1951, the Association evolved what is known as the Declaration of Geneva. This is an international code of ethics in the style of a modern Hippocratic Oath acceptable to all member nations. The code was also agreed to by the British Medical Association, who in turn have passed it over to the Universities and Colleges with a request that their newly-qualified graduates should have an opportunity of acknowledging it.

Briefly this new code is as follows :—

A doctor must by his conduct in all matters set a high standard. In the pursuit of his profession he must not allow himself to be influenced primarily by motives of profit. He shall neither instigate nor condone any advertisement relative to his professional status or work except as allowed by the national code of ethics in his own country. He shall not accept conditions of service which do not ensure his professional independence; and he shall not participate in any division of fees unknown to the patient. He shall not in any circumstances do or permit to be done anything that would weaken the physical or mental resistance of the human being except for the prevention and treatment of disease. When called on to give evidence or to certify, he shall only state that which is true or is in accord with his professional opinion. He must always bear in mind the importance of preserving human life from the time of conception until death. He should not hesitate to propose or to accept consultation with a medical colleague when, for any reason, it appears desirable in the interests of the patient. Except when required by the law of the country concerned, a doctor shall not disclose, without the consent of the patient, information which he has acquired in the course of his professional relationship with the patient. He must give medical treatment in an emergency unless he is assured that it can and will be given by another. He should maintain friendly relations with his colleagues, paying due regard to their opinion and achievements; and shall in no way undermine the confidence reposed in them by their patients. He must not seek to attract patients to himself from his colleagues by means other than the normal establishment of a good professional reputation.

Those who have long been members of the profession will recognise that the items of this modern code of ethics do not contain anything that has not been habitual conduct for the great majority of doctors who have learned them by precept and example; and I expect it is mainly for this reason that the British Medical Association's request that the Declaration of Geneva should be a part of the graduation ceremony has not met with widespread acceptance in Britain. But as I have mentioned, a modified form is in use in our own University, and there are some who feel that the student might with advantage be introduced to it when he first comes to hospital.

One of the most important items of the professional code is that which deals with information acquired as a result of the doctor-patient relationship, and the suggestions in this connection contained in the Declaration of Geneva have been clearly and precisely re-stated for the doctor by the Central Ethical Committee of the British Medical Association in the following terms :—"A practitioner shall

not disclose voluntarily without the consent of the patient, preferably written, information obtained in the course of his professional relationship with the patient. This includes information concerning criminal abortion, venereal disease, attempted suicide and concealed birth." The State has no right to demand information except where notification is required by statute, such as in the registration of births and deaths, and in the case of certain infectious and industrial diseases. I will show later, however, that while in this country a doctor should not disclose such information voluntarily, he may be compelled to do so in a court of law.

The rigid application of this clear policy makes the answer to many difficult ethical questions easier, and the following examples taken from an address given by Dr. E. C. Dawson in 1954 serve to illustrate the type of problem which can arise :—

1. A doctor diagnoses epilepsy in the case of an engine-driver who controls the engine of a main-line passenger train. The patient refuses permission to the doctor to disclose his disability to the railway authorities, and makes clear his intention to continue earning his living as a driver of passenger trains. Has the doctor an overriding duty to ignore his patient's wishes and report his state of epilepsy to the railway authorities?
2. A doctor attending a woman for abortion finds that it was criminally induced by a professional abortionist; he learns also the abortionist's name and address. The patient forbids the doctor to report the matter to the police or even disclose the abortionist's identity. Has the doctor a duty to disregard the patient's wishes and report the abortionist to the police?
3. A doctor treats a man who is suffering from rupture. Later the patient is involved in a minor accident at work, and successfully and fraudulently claims industrial injury benefit and a pension in respect of the rupture, which he asserts resulted from the accident. The Ministry accepts his claim. The doctor knows that the rupture was neither caused nor aggravated by the accident. Has the doctor a duty to report this knowledge to the Ministry?

Applying the ruling of the British Medical Association which follows the Hippocratic tradition, the answer in each case is in the negative, although it must be admitted that in the case of the epileptic engine-driver a strong case would appear to exist for disclosure of information on the grounds of public safety.

You may recall that some time ago the Police were investigating the deaths of a number of rich women in Eastbourne which had taken place over a period of twenty years. The Police stated that their investigations were being hampered by the fact that doctors who had attended the women had refused to come forward and give information which they had obtained in the course of their professional duties. This refusal was supported by the British Medical Association who made it clear that the doctors were obliged by their professional code to say nothing to the Police unless permission to do so was granted by the patients' executors.

Well-intentioned enquiries about patients may be made by relatives, friends, and the Press; by others, perhaps not so well-intentioned, for example, solicitors,

insurance companies, employers and business partners; and by those contemplating marriage. In the absence of consent by the patient, replies must be carefully considered. If information is improperly disclosed an action for damages may follow.

The Declaration of Geneva takes note of the fact that the law in a particular country may compel a doctor to disclose professional secrets in court. That is the law in Britain, and it is clearly set out in Vol. 22 of Halsbury's "Laws of England." There it is stated :—"The relationship between a medical practitioner and his patient does not excuse the doctor, whatever medical etiquette may require, from the obligation, if called upon, to give evidence in a court of law. He is in the same position as any other person who is not specially privileged in this respect by law. He may be asked to disclose upon oath, information which came to him through his professional relationship with the patient; and he may be committed to prison if he refuses to answer."

In view of this statement it is reasonable to enquire if the secrets of other professional men are dealt with in a similar manner by the law, and in doing so we find that the only class of secrets that are privileged in our courts are those entrusted to a legal adviser by his client, but even here, only in narrow and special circumstances. A leading English legal text-book states: "Legal professional advisers are permitted to withhold verbal or written communications passing between themselves and their clients provided they are acting in their professional capacity for the purpose of giving legal advice, but not otherwise." In this connection, Lord Brougham, an eminent judge, as long ago as 1838, said, "It might not be very easy to discover why a like privilege has been refused to others, especially to medical advisers."

It is interesting to compare the legal position of the doctor with that of the priest, for as I have mentioned earlier, our professional forbears combined the duties of both priest and physician in ancient Egypt. The same legal text-book states :—"The question whether ministers of religion and in particular Roman Catholic priests have any privilege in giving evidence of confession has not been authoritatively decided. The tendency of judical dicta is that while in strict law the privilege does not exist, the minister should not be required to give evidence as to a confession made to him." From this we see that the legal profession and the Church have been granted privileges in law which the doctor, and particularly the psychiatrist, does not possess.

In an enquiry into the practice of over twenty other countries one finds that with the exception of India, Denmark, and some North American States, where the legal institutions are largely based on our own, doctors are not required to divulge secrets in court, and indeed may be penalized for doing so.

In Britain in 1937, a Bill was introduced to Parliament designed to alter our law in this respect, but it failed to pass a second reading.

It will be seen then, that on the subject of medical confidences, the paradoxical situation in this country is that the law may on the one hand sustain an action for

damages against the doctor who wrongfully discloses information voluntarily, while at the same time compelling him to reveal similar information in court if it deems it to be for the general good. It is this kind of fine legal distinction which the average person finds both bewildering and irritating.

While we might hope that a change in the law may eventually come about, and so enable the judiciary to deal more kindly with our professional secrets, it is clear that we should be careful to put our own house in order. A more careless attitude regarding secrecy has occurred with the advent of the State influence in medicine. Reports are made to employers and to the State; copious records are circulated between hospital and hospital, and between one lay person and another, and the patient's record card changes hands through a central office each time he changes his doctor. So the Hippocratic tradition in this connection now involves a more complex machinery than was previously envisaged; and we should satisfy ourselves that not only the medical student, but the nursing staff, clerks and other medical auxiliaries are made aware of the special position which they occupy in relation to the patient's private affairs.

In considering the thorny problem of hospital records, it should be made clear that while ownership of the records is vested in the Minister of Health, and possession is vested in the Hospital Management Committee, the documents are confidential, and no third party has an automatic right of perusal. While certain Government departments may require information enabling them, for example, to decide the financial rights of the patient, this can only be given with the patient's written consent.

It is encouraging to note, however, that in the last one hundred years, no allegation of infamous conduct regarding breach of confidence has been brought before the General Medical Council, and very few actions for civil damages have taken place.

Other aspects of the ethical code deserve further mention, for example, those concerned with advertising and with therapeutic trials. Both may pose difficult problems.

With regard to self-advertising, the Central Ethical Committee of the British Medical Association are constantly being presented with difficulties arising in connection with the media of sound broadcasting and television. You will have noted that as a rule anonymity on the part of the doctor is required, but it has been agreed that in exceptional circumstances a departure from this rule would be justified as, for example, when a medical practitioner broadcast in an official capacity on medico-political matters of national interest. There have been types of broadcast programmes in which a member of the public discussed clinical details of cases, sometimes under treatment, and received immediate comment from a panel which included a medical practitioner. It is felt that such programmes might have serious consequences and be detrimental to both patients and public, and so should be avoided. It is likely, however, that this ruling will have to be modified, and so bring it into line with the change that has taken place with regard to doctors writing for the Press.

As regards therapeutic trials, in law and in ethics a doctor is not entitled to treat a patient without the patient's consent, and the nature of any trial procedure must be fully explained before consent is obtained. On occasions this may limit the field of investigation, and as an example I might cite the test case brought before the Central Ethical Committee of the British Medical Association, in which it was proposed to test the effect of certain implants in patients who had had repeated miscarriages, by treating alternate patients with implants of the test substance and an inert compound. It was made clear that it would not have been possible under the conditions of the trial to explain the nature of the investigation to the patients, and so it was decided that it would be both unethical and illegal to conduct such a trial.

The independence of the practitioner as set out in the Declaration of Geneva may seem so self-evident as not to require discussion, but circumstances such as those brought out in the Nuremburg trials show that vigilance is necessary. In time of war doctors may be pressed into service by the State and may be instructed to carry out procedures which are against ethical standards. The evidence at the Nuremburg trials clearly showed that this had been a common occurrence. Inmates of concentration camps had been subjected to experiments by doctors who had forsworn their Hippocratic Oath. Their unethical procedures included the immersion of victims in very cold water causing death; they had performed experiments involving high pressure chambers, poison bullets, contagious diseases, and the sterilization of men and women by X-rays and other means. A further item consisted in the murder of 112 Jews to procure a collection of skeletons. The defence pleaded that these procedures had a scientific value, but the prosecution stated that the doctors were engaged, not in the practice of medicine, but in the practice of thanatology, which they defined as the science of procuring death.

In connection with the injunction against weakening the physical, and especially the mental resistance of the individual, we have only to recall the use of thiopentone and narcoanalysis in some countries in obtaining evidence for the courts in the case of criminal prosecution. The so-called "truth-drugs" can be very dangerous and unethical weapons.

These are examples, admittedly extreme, of the possible effects of State interference in lowering the ethical standards of the profession, but we should guard against the more insidious and perhaps less obvious inroads on professional freedom.

In the time at my disposal I can only mention other problems, mainly of a moral nature, which can arise in the conduct of practice. For example, how much is to be told to patients and relatives regarding the fatal nature of an illness; when should birth-control be advocated; when should pregnancy be terminated; when should drugs be used to suppress or to increase instinct; when should life be prolonged at the cost of increased suffering by some palliative operation? These and many similar decisions must be made daily, based on ethics and experience.

This then is a necessarily short and very imperfect synopsis of that customary body of experience which has accumulated over the years since the time of Hippocrates, the conclusions and counsels of which have come to be called, loosely, medical ethics.

An historical review of this subject would be incomplete if it did not refer to the statutory as distinct from the customary aspects of professional conduct. By the Medical Acts of 1858 and 1950 Parliament established the General Medical Council, and so gave the force of law to certain aspects of medical affairs which up till then had been ill-defined. The functions of the Council as set out in these Acts are mainly to keep the Medical Register, to supervise medical education, and to prepare and publish the British Pharmacopœa; but it is probably best known to the profession as a whole by the disciplinary powers with which it is invested to control the conduct of medical practitioners. There is no doubt that its existence backed as it is by control over professional life and death, has a very sobering influence on the potential transgressor. By the way in which it has conducted its affairs it has set an excellent standard for the rest of the world. In France, for example, in 1945, there was established what is known as the Order of Doctors which has largely been modelled on it.

I have attempted in this address to review an important, and to some extent changing aspect of the doctor-patient relationship. The student will realize that the medical profession occupies a special position of privilege and respect in the community because of its tradition of service to humanity, and I have tried to show that entry into medicine carries with it obligations to the profession and to society beyond the routine tasks of the diagnosis and treatment of disease.

I began this address by referring to Hippocrates, and I will conclude it by quoting a few sentences from a little-known pronouncement by the Father of Medicine. He calls it the Order (or Etiquette) of Medicine, and in it he states :—

"The medical student should be gentle by birth, excellent by nature, young in years, of good understanding, and pleasant conversation, sound in judgment when consulted, and self-controlled when angered. He should be sympathetic and kind with the sick and a faithful guardian of secrets, because many patients tell us about diseases in themselves which they do not wish to be known to others. He should walk neither hastily, for this is a sign of levity, nor slowly, for this indicates faint-heartedness. When summoned to a patient, he should sit down cross-legged and question him about his condition with becoming gravity and deliberation, and not in a distracted or agitated manner."

Each student can now judge for himself how he measures up to this yard-stick proposed for him by Hippocrates.

Personal Experiences in Heart Disease in Childhood

By Dr. Paul D. White
Boston, Mass.

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* *The Menary Lecture, Queen's University, June, 1957*

It is with great appreciation that I have accepted your kind invitation to deliver the Menary Lecture here in Belfast today. It was suggested that I speak of my experiences in the field of heart disease in childhood. There is here, I am sure, no need for me to review the historical aspects of the subject prior to the beginning of the twentieth century. It was in the old world that almost all medical advances in this field took place, until recent years, and since the turn of the century our labours in the States have been largely supplemental, and happily, on occasion, co-operative.

I shall present to you my own experiences in the field, starting, as a matter of fact, with my own boyhood, when soon after the turn of the century I was terribly distressed by the serious illness and death of my small sister, Dorothy, from fulminating recurrent rheumatic fever with pancarditis. Her death, at the early age of 12, was one of the reasons why I took a special interest both in pædiatrics and in heart disease. It was soon after her death that I decided to study medicine, and later on, during my internships at the Massachusetts General Hospital, that I decided to enter the field of pædiatrics. I was somewhat deflected from this early decision by an opportunity to study for a year in London in cardiac physiology and electrocardiography, at the University College Hospital, with Thomas Lewis. It was during that same year of 1913 to 1914 that I had the great privilege of visiting, on occasion, the clinic of Sir James Mackenzie at the London Hospital, and to become acquainted with John Parkinson, who was then Mackenzie's right-hand man, and who has remained a close friend of mine ever since.

For many years I was privileged to direct the Children's Heart Clinic at the Massachusetts General Hospital, and to visit, on occasion, with my colleagues at the House of the Good Samaritan in Boston. In those earlier years our main interest in children was, of course, with rheumatic heart disease. We did recognize a few congenital heart patients, but we knew very little about this difficult

*The Menary Lecture in the Department of Child Health was founded under the will of Mrs. A. J. C. Menary. The holder is required to deliver a lecture on some clinical aspect of child health.

subject then, and we could do even less for the patients. Important aspects of the Children's Heart Clinic at the Massachusetts General Hospital just after the first World War and through the 1920's and 1930's included first, the magnificent work accomplished by a Women's Committee for the Home Care of Children with Heart Disease, second, the Social Service planning of Miss Ida Cannon, who was a sister of Walter Cannon, former Professor of Physiology at Harvard, and also first assistant to Richard Cabot, who established hospital social service, as well as the famous CPC records and clinical ministry at the Massachusetts General Hospital, and third, an early appointee as Social Service Chief of this Children's Cardiac Clinic, Miss Edith Terry, who for many years sparked several pioneer projects for the children, and for the families of our small patients. One of the most interesting and helpful techniques ever devised for both spiritual and physical health of these children, was the In-Bed Club with its jacket, magazine, and visiting and school teaching programmes. In fact, this was so successful that it was finally decided that there should also be an Out-of-Bed Club into which these children would like to graduate from the In-Bed Club. The idea spread through the country and allied chapters were established in other cities. I shall never forget how, on one occasion through occupational therapy, one of our small patients, a boy of 10 or 11, acted as the sole contributor to family funds, while in bed, by making belts and purses, during the illness of both his father and his mother. This gave to him, and the whole family, great satisfaction, as one can well imagine. Fortunately, there is now less need for this Committee of women, and for our social workers, due to a decrease in the severity and the amount of rheumatic heart disease in our midst in New England.

On the other hand, the problem of congenital heart disease has been increasing, so that there is still a great challenge of heart disease in childhood. For the next generation, at least, we shall still have to contend with it, I am sure, despite all our advances in treating active rheumatism, in surgery for mitral stenosis, aortic valve deformity and congenital defects which will challenge the best of our surgeons, and in epidemiology. We are beginning to accept the challenge of the study and prevention of the fundamental factors in these diseases. This last challenge will need also the attention of human geneticists of which we have far too few today.

I have just mentioned the fact that rheumatic heart disease has seemed to be on the down-grade while congenital heart disease has become more of a problem. There are some statistical errors here to which reference should be made. It is, I am sure, quite true that the rheumatic problem is decreasing. For example, we no longer have a long waiting list at the House of the Good Samaritan; in fact, there have been empty beds there of late years. On the other hand, there has not been an actual increase in congenital heart disease. We have simply become more able to diagnose the various defects, some of which used to be called rheumatic (for example, congenital aortic stenosis). At least as important, I suppose, is the fact that these children born with cardiac anomalies, such as occur in blue babies, used to remain in their home communities because there

was nothing which could be done for them in treatment, but now they have, in the last decade, flocked to the medical centres where they have been diagnosed, and often improved or cured by surgery. This explains, I am sure, the increase that we found statistically in the percentage of congenital cardiac patients among our total cardiac population in New England in the course of 25 to 30 years (White 1953). In the 1920's congenital heart disease comprised only 1.5 per cent. of all our cardiac patients, while in the 1950's it had risen to 7.9 per cent. Meanwhile, in that same period, rheumatic heart disease was decreasing from about 33 per cent. to 22 per cent.

Rare Kinds of Heart Disease in Childhood.

Now let me discuss in more detail these two particular kinds of heart disease, that is, rheumatic heart disease and congenital heart disease, and my experience with them. There are, to be sure, other kinds of heart disease besides these two varieties, even in childhood, but they are relatively uncommon, and some of them have been almost wiped out. For example, diptheritic heart disease, which used to kill a generation ago and which could still kill if diphtheria were common, is now rare. Death came in the past by the destructive effect of the diphtheria toxin on the myocardium itself. Also, co-called "congenital hypertrophy of the heart," which used to be an occasional finding, is now rare as such, because it has been, for the most part, subdivided into several minor categories, for example, glycogen storage disease (von Gierke's disease), endomyocardial fibroelastosis, and rare instances of the effect of virus diseases such as mumps which can cause a-v and bundle branch block. I recall very well looking, many years ago, at infants' hearts which showed, with or without congenital defects, a markedly thickened and whitened endocardium, wondering what in the world caused it. This is now generally classified as endomyocardial fibroelastosis. It is not limited to childhood. I myself have encountered two older adults, one in the fifties and one in the seventies, with this condition which I don't think was congenital in their cases. One of these patients, under my observation for about twenty years, finally died of congestive failure after years of coronary insufficiency with bundle branch block. The coronary arteries were found to be but little affected at autopsy, but marked endomyocardial fibroelastosis was present at his age of 74. This condition is of unknown cause; it used to be ascribed to fœtal endocarditis, but of late it has been thought more likely due to chronic ischemia.

And now to discuss in more detail the major types of heart disease in childhood, namely, the rheumatic and the congenital.

Rheumatic Heart Disease.

Our knowledge of rheumatic heart disease has developed considerably during the past generation. One interesting evolution of old thoughts about its relationship to bacteria is the confirmation, on the basis of well established fact, that the hemolytic streptococcus is primarily responsible, producing a reaction of the collagen tissues of the body to its by-products. A long chain of observers, from the last years of the nineteenth century right up to the time of Coburn's findings in the twenties, have presented an interesting chapter in medical history.

There still remains, however, the puzzle of the chain of reaction from the time of the implantation of the streptococcus to the onset of rheumatic fever, an interval that is often quite clearly limited to a period of ten days to a fortnight. Whoever discovers the immunological and biochemical evolution in this chain may thereby afford us the opportunity to break that chain and to prevent rheumatic fever in the relatively small percentage of individuals who are candidates for that disease.

A second interesting finding in the last generation has been that of the familial inheritance of susceptibility to the disease. This has been found to vary from one-third to two-thirds of the patients studied. Probably about 50 per cent. is a reasonable average in the studies reported, that is, about 50 per cent. of the families of patients with rheumatic fever or rheumatic heart disease have in their membership other individuals similarly affected over one or two generations. It is, therefore, as important for us of the medical profession to spend as much time in recognizing the candidates for rheumatic fever as in defining and applying protective and preventive measures. Hence, one cannot be too careful in the study of such a patient in obtaining accurate family histories. So far as possible one should include examination of other members of the family. In this connection I have recently suggested that it would be well, not only for practising physicians to take more complete and adequate family histories, but also that families should keep better records of their own health and longevity. Such a procedure was common a generation or two ago in New England, and, I dare say, in Old England too. Blank pages, properly labelled to record births, marriages, deaths, and other family events, were bound in the midst of the family Bible. The return to such a practice could be very useful for our descendants, whether incorporated in the family Bible or not. When I spoke of this recently, someone suggested that it might be worth while to revive the family Bible itself. Perhaps they both could be revived together.

In the 1930's Drs. Duckett Jones, Edward Bland, and I came to realize, from our study of the youngsters both in the Children's Heart Clinic at the Massachusetts General Hospital and in the House of the Good Samaritan in Boston, that many of the signs, including cardiac enlargement and murmurs of various sorts, could readily come and go when the heart dilated under the stress of rheumatic activity. This was not infrequently found then, and still can be found in cases of severe rheumatic myocardial disease, often with pancarditis. It is especially interesting to find that even mitral diastolic murmurs, which we used to think were diagnostic of mitral stenosis or attributable to the effect of aortic regurgitation demonstrated by Austin Flint, could be due to temporary dilatation of the left ventricle, often lasting for weeks or months during the acute rheumatic attack. On occasion with recovery these murmurs, both mitral systolic and mitral diastolic, and even in a few instances, aortic diastolic, would disappear. There once were controversies about such findings, but now I am sure we all recognize the firm establishment of this possibility. Perhaps one of the most important follow-up studies ever made has been that of the cases at the House of the Good Samaritan by Bland and Jones. When I was in Moscow last September, I found that even there this particular follow-up study was considered as the basis for an hour's

teaching. It is, in fact, so important that I would like to quote now from the Summary and Conclusions of the last reports by Bland and Jones (1951).

> "From a twenty-year study of 1,000 patients with rheumatic fever and/or chorea, followed since childhood, the major events of the two decades have been summarized and compared with the experience of others.
>
> "On recovery from the initial illness, 653 patients had signs of rheumatic heart disease. By the end of twenty years the signs of heart disease had disappeared in 108 (16 per cent).
>
> "The remaining 347 patients recovered from their initial illness without detectable heart disease (potential rheumatic heart disease). By the end of twenty years 154 (44 per cent.) had acquired signs of valvular disease.
>
> "During the first ten years 202 succumbed, and by the end of the second ten years 301 had died. Rheumatic fever and congestive heart failure accounted for 80 per cent. of the fatalities, and bacterial endocarditis for an additional 10 per cent.
>
> "A greatly enlarged heart or congestive failure early in the disease exacted the highest toll, with an 80 per cent. mortality in twenty years. Pericarditis, subcutaneous nodules, and acute arthritis occupied intermediate positions, with 63, 37, and 27 per cent. mortality, respectively, in two decades. In contrast, chorea was associated characteristically with a benign form of the disease (12 per cent. mortality).
>
> "Recurrence of rheumatic fever or chorea occurred in approximately one in five during the first five years, one in 10 during the next five years, one in 20 during the third five year interval, and much less frequently in the final five year period.
>
> "A pure form of mitral stenosis evolved in 117 patients, but in only 12 has evidence of serious pulmonary hypertension appeared (acute pulmonary œdema).
>
> "It is encouraging that three out of four of the 699 survivors have little or no limitation."

One of the most puzzling of all the problems has been that of trying to establish criteria for the activity of the rheumatic process. A well known paper of the late Duckett Jones, published in 1944, is also worth quoting very briefly :—

> "For the present it would seem advisable to limit the diagnosis of rheumatic fever to patients with rather distinct clinical manifestations. It is suggested that the following constitute reasonably certain diagnostic criteria :—
>
> 1. Any combination of the major manifestations (carditis, arthralgia, chorea, nodules and a verified history of previous rheumatic fever).
>
> 2. The combination of at least one of the major manifestations with two of the minor manifestations (fever, abdominal or præcordial pain, erythema marginatum, epistaxis, pulmonary changes and laboratory abnormalities).

3 The presence of rheumatic heart disease increases the diagnostic significance of the minor manifestations, when no other cause for these manifestations exist.

"Small, though probably insignificant, errors may be found with these criteria. Numerous clinical entities as enumerated may be confused with rheumatic fever. Clinical observations and, wherever possible specific diagnostic tests should be applied in any diagnostic problem."

There are three other experiences in connection with rheumatic heart disease that are worthy of special mention in this lecture. The first concerns the treatment of the active process by the salicylates and the hormones, the second that of a change in severity of the arthritis since the 1920's, third, the treatment of chronic rheumatic valvular disease by surgery.

In the spring of 1918, when I served as internist and cardiologist at U.S. Base Hospital No. 6 (the Massachusetts General Base Hospital Unit) of the A.E.F. at Talence, near Bordeaux, there was an epidemic of streptococcus sore throat among the American troops stationed in south-western France. Shortly afterwards a convoy of about six dozen soldiers, acutely ill with rheumatic fever, came to the hospital. Dr. Richard Cabot, Chief of the Medical Service, then suggested that we try an interesting experiment, which we did. Half of these soldiers were put in one ward and treated with massive doses of the salicylates, chiefly in the form of aspirin. The other half of the cases were put into another ward and treated with analgesics and narcotics. Those who received aspirin were, within 24 to 36 hours, made completely comfortable with reduction of fever, while those treated with pain relieving drugs of other sort, continued to be miserable although sedated. Their pains were not adequately relieved and they continued to be febrile. It was impossible to maintain this experiment for more than a few days, because it was so evident that the salicylates were at least semi-specific in their effect. We almost thought that they were curative, but, of course, the active process itself and the heart disease were not completely relieved, even though the symptoms were.

A few decades later when the hormones, ACTH and cortisone, were introduced and were hailed with enthusiasm as curative for many conditions including rheumatic fever, these experiments were reinstituted. All of you know of the co-operative study carried out a few years ago in Britain and the U.S.A., which demonstrated quite clearly that both the salicylates and the hormones have a favourable effect on the rheumatic activity, although not specific enough to be considered as cures. There has been some dispute since as to greater specificity of the hormones. From observation of cases at the House of the Good Samaritan I have the belief that the hormones are more specific than salicylates, but they can sometimes have unfortunate secondary effects. Dr. Massell, of the House of the Good Samaritan, believes, from his experience, that there has been some definite saving of lives of youngsters with very fulminating rheumatic fever, through the use of the hormones. We still need something better than either drug in the treatment of the acute process and, more important still, we need some

specific therapy that will interrupt the chain of events from the time of the onset of a streptococcus sore throat up to the onset of rheumatic fever.

The second subject mentioned above is that of the change that seems to have come in the last generation in the severity of the active rheumatic process itself. Perhaps there is some tendency to exaggerate the findings in the "good old days" when we used to have more snow, bigger blizzards, and larger hail stones. Many of us who are older can look back and remember youngsters with fulminating polyarticular rheumatism, so sick and uncomfortable that even moving the bedclothes produced acute pain. Just why there has been an amerlioration of the active process, so far as the joints themselves are concerned, I do not know. It is true that aspirin is so universally used for any ache or pain that that may be the answer, but on the other hand the process itself may have become less active. Incidentally, it used to be thought that rheumatic activity and rheumatic fever were rare in the tropics and subtropics and this may well have been true so far as the fulminating process was concerned, but on careful study of many individuals who live in tropical or subtropical areas, for example, in the southern part of the U.S.A., or in Mexico, or in India, or in the Philippines, a lot of rheumatic heart disease is found. Very recently, when I was in the Near East, I found there too, pure mitral stenosis suitable for surgical relief in patients who lived in the oasis at Damascus or in other similar places in those semi-tropical countries.

In closing this discussion of rheumatic heart disease in childhood, I want to bear witness and pay tribute to the magnificent pioneering of the cardiovascular surgeons of our day. I had the privilege, even before 1920, to be a fellow resident of that remarkably able young surgeon, Elliott Cutler, at the Massachusetts General Hospital in Boston. Later he became assistant to Harvey Cushing at the Peter Bent Brigham Hospital, and in the 1920's pioneered in efforts to relieve mitral stenosis surgically. This effort failed due to lack of adequate technique and anæsthesia of the day, but happily attempts were revived, and this time successfully, by thoracic surgeons who, during the Second World War, had rich experience in handling hearts and lungs of soldiers and officers who were wounded. This allowed a certain group of vigorous and able pioneers to attempt again relief of mitral stenosis surgically. As a result of this new attack during the last six to eight years, many thousands of cardiac patients crippled by pulmonary congestion from mitral stenosis have been so wonderfully benefitted, that the operation for "pure" mitral stenosis has become almost routine in many cities throughout the world.

On the other hand, the other valve commonly affected in rheumatic heart disease, namely the aortic, has presented a different story. Neither aortic regurgitation nor aortic stenosis has yet become routinely amenable to surgery, but forward steps have been made to change this dark picture of only a few years ago. One of the first of these was through the introduction by Hufnagel of his famous ball valve. This has helped a good many individuals, but it is only, of course, part of the answer. The valve, like other devices introduced as a foreign body, is not always safe, and it also only partially corrects the difficulty, namely that of the regurgitation in the lower half of the body; this does, however, remove about half of the extra work of the heart, and I have seen considerable reduction of

heart size and complete clearing of symptoms in some patients so treated. What we really need, of course, is the introduction of a proper valve or the repair of a damaged valve in its proper location. Thus, so far as aortic regurgitation is concerned, we are still groping, but we have much promise through the research work of many individuals studying to correct this difficulty.

Aortic stenosis has been attacked surgically now for quite a few years, but until the last year or so I have felt that the risk of the surgery was greater than the risk of not doing it, except in the case of a few young people with congenital aortic stenosis. During the last year, however, I have come to realize, as a result of the decrease in the risk of the operation and improvement of the results, that the time is coming, in fact is here now, when the risk of not doing the operation may be greater than the risk of the surgery itself. Just recently, that is, within a few weeks, a young man from Canada, aged 29, with calcareous congenital aortic stenosis, has been wonderfully helped by Dr. Harken in Boston. However, we have not really reached a satisfactory stage in the treatment of this condition.

Finally, we may hope that preventive measures applied to the candidates for the disease through their collagen tissue reaction to the hemolytic streptococcus, may radically reduce the need of cardiovascular surgery within the next generation. This is, of course, our ultimate aim.

Congenital Heart Disease.

And now let us turn to the other important type of heart disease in childhood, namely congenital cardiovascular defects. In my medical student and hospital interneship days, forty or more years ago, we did know of a few of the congenital deformities of the heart and great vessels. The best known was patency of the ductus arteriosus, but we were not aware of some of its complications. We also knew about the simple and actually less common type of the ventricular septal defect, which we called Roger's disease, the small calibre of which was usually well supported for many years, despite its intense murmur with thrill found characteristically at the left sternal border. The large defects which we now encounter so commonly must have been called something else, perhaps triloculate hearts. And while speaking of two and three chambered hearts we did know of their existence and found one now and again, but we could not diagnose them antemortem. We had, I think, heard of atrial septal defects discovered postmortem, but we had not yet reached the stage of their recognition as a clinical entity, although, during the First World War, Maude Abbott, and later Lutembacher, recognized the combination of mitral stenosis, and an atrial septal defect called after the latter observer.

Cyanotic congenital heart disease, the morbus cæruleus or maladie bleue, was, of course, in those earlier years of the present century recognized and called as such. It came to be known generally as due in the great majority of cases as the tetralogy of Fallot—the combination of pulmonary stenosis, ventricular septal defect, dextroposition of the aorta, and the right ventricular hypertrophy. Fallot described the condition in Marseilles in 1888, but it had been well delineated already 111 years earlier in 1777 by Sandifort. Such is a common story of so-

called priority and the attachment of names to clinical syndromes and pathological entities. In time other congenital cardiovascular causes of cyanosis were named, for example, the combination of a high ventricular septal defect with overriding of the aorta but no pulmonary stenosis. This was called Eisenmenger's syndrome, but it is, of course, only one variety of a ventricular septal defect. Then there was the so-called triology of Fallot with pulmonary stenosis, a large right ventricle, and a large atrial septal defect—a patient of mine with this condition, proved postmortem, lived to be 74 years old. A rare case of a tri- or biloculate heart with cyanosis would be encountered, but we did not recognize, at least at all clearly, in those early days, cases with cyanosis due to a reversal of shunt which commonly developed months or years after, and not at, birth. Examples of this now well known, of course, are instances of large patent ducti of Botalli and atrial septal defects with pulmonary hypertension.

Finally, uncomplicated pulmonary stenosis, though sometimes diagnosed, was considered rare in contrast to our current experience, while congenital aortic stenosis was practically always called rheumatic or calcareous. We did not know anything clinically about coarctation of the aorta, tricuspid atresia, Ebstein's anomaly of the tricuspid valve, pulmonary veins draining into the right atrium, a left sided or double superior vena cava, a congenital aneurysm of a sinus of Valsalva, anomalies of the coronary arteries, or a common arterial trunk.

Before leaving a general discussion of congenital heart disease, I would like to present one more quotation from my Discourse presented on May 21st, a month ago, at the annual meeting of the Massachusetts Medical Society in Boston. It was entitled Genes, The Heart, and Destiny (White 1957).

> "By so-called congenital heart disease we really mean both truly inherited defects and those acquired in utero. There are no satisfactory terms to indicate this in common use today, but they should be introduced as soon as we are able to distinguish between the two. Both groups together might better be called ante-natal rather than congenital; those really inherited in the genes of the germ plasm might be eventually labelled 'hereditary,' or 'inherited,' or 'intrinsic congenital.' By strict definition 'congenital' should be the term to apply. The defects acquired during fœtal life might be called 'acquired in utero, or fœtal,' or 'extrinsic congenital' or even 'connate' as suggested by the dictionary. At present, however, we know next to nothing about the ætiologic factors actually behind either group or how to distinguish between them, and, indeed, there may be a mixture of the two, even when German measles in the first three months of pregnancy is responsible. In such a case it is conceivable that an inherited resistance to German measles or its lack, may be just as responsible for its occurrence, as exposure to the infection itself. In laboratory animals various other causative factors, such as vitamin deficiencies, anoxia and exposure to excessive radioactivity, are being tested and studied, but there is a great deal still to be learned."

Now, in the last part of my lecture, let me present some of the current thoughts and experiences of myself and of my colleagues about a few of the more

important congenital defects of the heart and aorta; beginning with one of the oldest and best known, namely *patency of the ductus arteriosus.*

In the old days, patency of the ductus arteriosus was, for most of us, a simple condition for which we could do nothing except give common sense advice. We rarely saw long survival, that is, into old age, although there have been exceptions. In a paper which I presented at the Pædiatric Research Conference on Congenital Heart at the University of California Medical Centre in Los Angeles, in the fall of 1954 (White 1954), I referred to my own series of nearly one hundred private cases as follows :—

> "My first private case, on December 19, 1920, was a woman of 64 who was ill with pneumonia; she lived until April, 1922, when she died of heart failure; autopsy showed a rather narrow lumen in the ductus and a slight to moderate degree of calcareous aortic stenosis. Several other of my patients with this condition have died of left ventricular failure—a woman died in 1925 after childbirth, at age 31; another succumbed on the operating table during the early days of surgery for this condition, at age 26. Several patients have had subacute bacterial endocarditis, generally fatal before the advent of antibiotics. One young man of 25, however, was cured in 1941 by ligation of the ductus. Confirmation of the cure in this case was obtained by autopsy five months later, following death in an automobile accident. Twenty-eight cases have been operated on successfully, although one ductus recanalized and required re-operation.
>
> "At least five of my patients, first seen over 25 years ago, are in good health today; they are four men, now aged 58, 52, 65, and 78 years, and one woman aged 64. One boy, whom I first saw when he was 5 years old in 1928, had a murmur characteristic of ductus patency, but was perfectly well with no evidence of any cardiac abnormality at the age of 28."

Two other points of importance about this deformity in our experience are: (1) that although we do see some long survivors, and although there may be no symptoms of trouble whatsoever right into middle age, nevertheless I always advise surgical correction now whenever I see such a patient, unless the patient is very old or obviously too sick to operate upon. (2) The next consideration is that of the reversal of shunt. I used to wonder whether or not a thrombosis in the ductus arteriosus might explain any clearing up or change of murmur. This is still a possibility, but the more common cause, which is itself nevertheless rare, is the neutralization of pressures in the pulmonary artery and aorta due to pulmonary hypertension secondary to pulmonary artery sclerosis. Usually there is not a fast flow of blood from the pulmonary artery into the aorta, but there is enough to give rise to cyanosis in the lower part of the body. This we did not know anything about or pay any attention to a generation ago. In such cases, of course, obliteration of the patent ductus is contraindicated.

Ventricular Septal Defect. An even more intriguing congenital deformity which we used to regard as simple, is the ventricular septal defect. This for us, years ago, was synonymous with the maladie de Roger, but with experience in the last

two or three decades from study of ventricular septal defects at autopsy, at operation, and by cardiac catheterization, makes it evident that actually Roger's disease includes the minority of cases with a ventricular septal defect. Since this is so and the ventricular septal defects that are more important clinically are larger and higher and may even involve the mitral valve, we have now come to regard the condition as much more serious and demanding surgical correction, which, happily, is beginning to be applied. Within the past two weeks I have seen a patient, in the Cardiac Clinic at the University of Minnesota, much limited by such a septal defect, and plans were being made to operate using the pump oxygenator. It has become a procedure almost routine there, although not many cases have as yet been done. While in Minneapolis I was told that Dr. Lillehei of Minneapolis was about to tour Europe for the purpose of lecturing on and actually demonstrating his technique for such operations.

These cases, as I have already noted, may or may not have cyanosis. Most of them do not, but if the aorta is somewhat dextroposed over the septal defect, then cyanosis can occur without pulmonary stenosis. At any rate, there is a strain on both ventricles, usually more on the right side, and the heart can be quite enlarged with failure or bacterial endocarditis threatening.

Atrial Septal Defects. An atrial septal defect I did not diagnose at all until 1933 in my second five thousand private cardiac cases. Not once in the first five thousand patients did I make such a diagnosis, so that this is a new clinical entity to most of us. Generally it is quite easy to diagnose with a much enlarged right ventricle and the characteristic great fullness of the pulmonary arc and lung hilus shadows. However, many patients continue surprisingly well and active, right into middle age, but very few survive into old age. Therefore, again surgical correction with the new techniques is in order and is being successfully carried out either by refrigeration, now improved by Brock's technique of cooling the blood rather than the patient, or by the use of the pump oxygenator. Until recently, however, surgical operations were done rather blindly. Now they can be carried out under direct vision with these new techniques of preparation. Excellent results are already accumulating.

Tetralogy of Fallot. The tetralogy of Fallot, which we knew about a good many years ago but which we sometimes called simply pulmonary stenosis in the early days, has been treated surgically and successfully by several techniques. The first was that of Blalock and Taussig by vascular anastomosis shunting blood back into the lungs from the systemic circulation, the second accomplishing the same result by Potts through direct connection of the aorta with a pulmonary artery, and the third, which is probably the simplest and now most popular, is that of Brock, by correcting the pulmonary valve or infundibular stenosis itself. One of the difficulties of the first two techniques is that one is introducing another factor of strain, that is, an additional shunt. Many of the patients who have been operated upon during the last ten years have done well, but it is still too early to prophesy finally about the ultimate success of any of the procedures. Eventually more complete correction of the difficulties with the new techniques may be envisioned.

Pulmonary Stenosis. Little need be said about uncomplicated congenital pulmonary stenosis, except that it is much more common than we used to think. Often, however, it is of such slight degree that there is no great burden for the heart, and life can continue into old age. Sometimes this seems to be more a physiological diagnosis than an anatomical one, in other words, there are slight degrees of pulmonary stenosis which are hardly evident, even at autopsy. This has been found by cardiac catheter studies. Severe grades, however, involving either the pulmonary valve itself or the infundibulum do need correction by Brock's technique.

Aortic Stenosis. Congenital aortic stenosis did not enter our experience until the 1930's. My first diagnosis of congenital aortic stenosis was in November, 1934. In the past, undoubtedly, as stated by Campbell, congenital aortic stenosis has been confused with rheumatic and calcareous aortic stenosis. It is probably not actually a rare condition. It too, may be well supported for a good many years, but eventually, if of high degree, the strain on the left ventricle becomes too great and left ventricular failure and death can result in middle age or indeed even in youth. Happily, as I have already mentioned under rheumatic heart disease, surgery is becoming more practical for aortic stenosis, especially of the congenital type, even though the valve is calcified. Of course, the ideal procedure would be to replace the damaged valve by a new one. This remains for the future.

Coarctation of the Aorta. Only once in my first five thousand cases, and that was toward the end of the series, did I diagnose coarctation of the aorta. It was a new clinical entity in the middle of my career. I diagnosed my first case in February, 1933, in a law student 23 years old. As in his case, hypertension in youth has been, in the majority of cases, due to this congenital defect, and this became evident, especially during the Second World War. However, until Crafoord and Gross independently introduced surgical correction of the condition in 1945, we had no treatment for it except limitation of activity and common sense advice otherwise. One of the early difficulties with the surgical approach was the finding of occasional cases with too long an area of coarctation or an additional defect, such as an aortic aneurysm below the coarctation that required replacement by a long blood vessel graft. Therefore, it was only when blood vessel banks came into use that we could feel confident about the correction of coarctation of the aorta in every case. Incidentally, we have found that it can be the site of bacterial endarteritis. As in the case of mitral stenosis and patency of the ductus arteriosus, coarctation of aorta has now become a condition to be routinely cured by surgery unless the patient is very old, or for other equally important reasons.

In closing this second part of my address, I would like to repeat the brief conclusions of my paper presented at the University of California Medical Centre at Los Angeles. They are as follows :—

> "The clinician, pathologist, experimental embryologist, and surgeon, all encounter a confusing variety of congenital cardiovascular anomalies. Out of the chaos of a generation ago, however, has come some order through

the efforts of many workers. Marvellous advances have been effected in diagnosis, cure and palliation, but the solution of the main problem still eludes us.

"I would suggest three thoughts. First, there is every degree of almost every defect, and the prognosis is often largely related to this difference of the degree of trouble. For example, if a ductus arteriosus is very large, the the future of the patient is bleak without speedy correction, while if of small calibre, it may allow a long, active life. One of my patients in this latter group still runs a large business and plays golf without symptoms, at the age of 78 years.

"Second, there are combinations of defects, or indeed degrees of a single defect, that are incompatible with life. If we include those cases for whom we can do nothing in our clinical statistics, we should be inclined to be more humble.

"And third, we should spend more time, clinically and experimentally, in trying to understand the pathogenesis of these defects. An ounce of prevention will be here, as elsewhere, worth a pound of cure."

This brief survey of my own experience with heart disease in childhood, has, I hope, been of interest to you, not only because of its historical aspect, but because here and there I have presented some current viewpoints about diagnosis, treatment, and prevention, which may be of practical value to you. Thanks very much for listening to me.

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Air Sampling in a Hospital ventilated by THE PLENUM SYSTEM

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COLEBROOK (1946) has shown that the provision of clean air, especially in operating theatres and dressing rooms, is an essential condition for the prevention of wound infection. To achieve this it is necessary to have an adequate and controlled ventilation rate and the air introduced should be free from bacteria. Such conditions are being provided in modern operating theatres but in most hospitals the usual method of ventilation is by windows and is often referred to as "natural ventilation."

Most of the field studies on the bacterial content of hospital air have been done in such institutions and the present investigation was undertaken with the object of finding out the level of bacteria carrying particles in the theatres and wards of a hospital which has a controlled system of ventilation, namely the Plenum system. At the same time, because of the availability of a mobile unit designed for the sterilisation of air by recirculation over U.V. light, an attempt was made to assess the value of U.V. light used in this way as a means of reducing the bacterial content of the air in the hospital wards. The effect of U.V. light in one operating theatre was also investigated.

METHODS USED.

The slit sampler used (Bourdillon, Lidwell and Thomas, 1941), draws air on to the surface of a rotating agar plate at the rate of 1 cubic foot per minute. Samples of air were taken in the following places: the main air duct and a small subsidiary duct, certain large and small wards and some operating theatres.

The culture medium used was 5 per cent horse blood agar. Plates, after exposure, were incubated aerobically at 37°C. for twenty-four hours, when colony counts were made.

They were incubated for a further twenty-four hours and re-examined with the object of recording colony types resembling pathogenic and non-pathogenic bacteria. During the period of sampling, plates were run usually at intervals of two and a half minutes and the rate of rotation of the plate was usually thirty seconds: in some experiments a two-minute rotation was used. Frequent notes were made of the conditions prevailing and of any changes occurring during the period investigated and a frequency curve was drawn for each session of sampling.

RESULTS.

Main Air Duct and Subsidiary Ducts.

Tests were carried out in April and May, 1956, under "winter" conditions: one intake fan was running in the ventilation shaft and the ventilation changes in the

wards were seven and a half per hour. Under "summer" conditions two intake fans were running and the ventilation changes in the wards were eleven to twelve per hour. Under "winter" conditions the air current in the duct was like a gale blowing at the east end, strongly felt in the middle and still perceptible at the west end. Samples were taken at the east end, half-way down the duct and at the west end, and also from an air duct leading directly upward to an inlet in ward 20.

The colonies which were seen resembled those of common aerial contaminants with a few moulds. They were few, the numbers varying from nil on two occasions to fifteen on one occasion. The total amount of air sampled was 76 cubic feet, and the average number of bacteria per cubic foot of air, taking all samples together, was 2.27.

The lowest counts were found in the small air duct leading directly to ward 20 at the furthest end of the duct from the intake fan.

Wards.

The large wards are uniform in size, being 94 ft. long by 24 ft. wide by 14 ft. high, with a cubic capacity of 31,584 cubic feet. Each has nine air inlets and twenty grilles for air exit, and each contains twenty-two beds. Four different wards were investigated, two medical and two surgical. The slit sampler was placed on a trolley beside a bed half-way down the ward, 3 ft. 4 ins. above floor level and about 5 ft. from the wall. Each plate was exposed for a half minute.

Conditions in a small ward and a clinical room were also investigated. Each has one air inlet situated near the ceiling and one outlet grille at floor level. The ventilation rates were seven and a half changes per hour in winter and twelve changes per hour in summer.

The small ward was a two-bedded male surgical ward, 16 ft. long by 12 ft. wide and 11 ft. 7 ins. high, with a cubic capacity of 2,224 cubic feet. It has one door which opens on to the short corridor leading from the large male ward to the main hospital corridor. The clinical room was situated off the short corridor leading from a large gynæcology ward to the main corridor. Its size is 17 ft. 3 ins. long by 8 ft. 4 ins. wide by 8 ft. 6 ins. high, and its cubic capacity is 1,221 cubic feet. It is used for the examination of out-patients and for side-room tests. The floors of the wards were not highly polished but slightly sticky, and blankets were not treated with oil or any other special substance.

All air sampling was done under "winter conditions" and the slit sampler was placed at the same height as in the large wards, between the beds in the small ward and about the middle of the clinical room.

The results of tests done with the normal ward routine in progress under "winter" and "summer conditions" are summarised in table 1.

Frequency curves were made from the results found in each sampling session and the examples shown in fig. 1 illustrate the values found under these different working conditions. From both tables and figures one can see that high bacterial counts are associated with increased activity in the wards and that there is a

TABLE 1.

WARDS.

	Ward	Date and Time	Total Amount Air Sampled Cu. Ft.	Average Number of Colonies per Cu. Ft. of Air	General Conditions
Winter Conditions	2 Male Medical	14/2/56 11.30	9.50	86.52	Bed-making, curtains, floor polishing.
	2 Male Medical	2/3/56 14.30	12.0	104.66	Bed-making for 30 minutes; ward quiet, then visitors.
	8 Male Medical	15/2/56 11.30	9.00	94.55	Sweeping floor, dressing wound, lumbar puncture being done.
	12 Male Surgical	27/2/56 11.30	27.25	109.35	Bed-making, curtains, much activity.
	12 Male Surgical	2/2/56 11.30	7.5	49.05	Floor polishing, curtains, moderate activity.
	12 Male Surgical	7/2/56 11.20	26.0	118.69	Bed-making, curtains, floor polishing.
	18 Female Surgical	22/2/56 11.50	8.0	27.0	No curtains, very quiet.
	12 Side Ward	2/12/56 12.00	20.0	57.7	Generally quiet, trolley with patient also in ward.
	12 Side Ward	16/12/56 12.15	24.0	106.14	Bed-making.
	Clinical Room	24/2/56 14.45	5.5	56.9	Moderate activity, curtains.
Summer Conditions	2 Male Medical	9/8/56 11.50	12.0	95.08	Curtains being taken down, mattress removed.
	12 Male Surgical	10/8/56 11.45	11.5	65.04	Bed-making, curtains, moderate activity.

Results of air sampling in large and small wards under winter and summer conditions, without re-circulation of air over U.V. light.

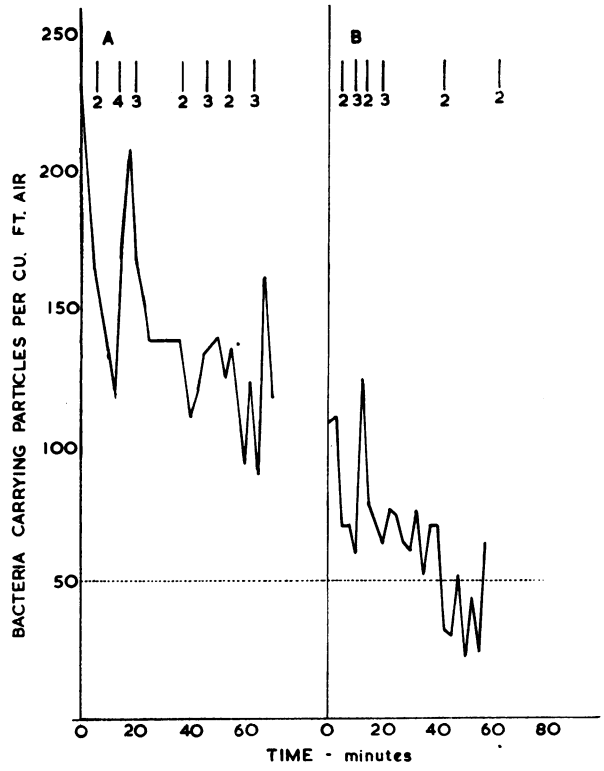

Fig. 1—Illustrates the findings during air sampling in a male surgical ward under winter conditions (curve A), and summer conditions (curve B).

marked variation in the average numbers of bacteria found in different sampling sessions, the lowest in any session being 27 and the highest 118.

It is difficult to classify degrees of activity, but for comparison the following grades may be used :—

1. *Quiet* - This denotes the minimum amount of movement either by patients or staff.
2. *Moderate* would include the usual ward activity of persons going to and fro, carrying out minor treatment without excessive amount of movement of patients, staff, objects or clothes.
3. *Marked Increase* connotes much rapid movement of patients or staff with passage of trolleys and stretchers, moving of curtains, sweeping and dusting.
4. *Maximum* Bed-making, and when this is associated with the morning and evening work in the wards activity is at its maximum.

In the frequency curves (shown in figs. 1 to 7), these degrees of activity are denoted by the numerals 1 to 4 so that one may co-relate activity and the bacterial counts.

Operating Theatres.

Three theatres ventilated by the same Plenum system were investigated under "summer" and "winter conditions" as well as during operating sessions and periods when the theatre was not being used or being cleaned. For purposes of comparison a sampling session was done in a fourth theatre, situated in another hospital with its own system of controlled positive pressure ventilation.

During sampling, plates were run at intervals of two and a half minutes, the rotation period of each being a half minute. The sampler was placed on a trolley 3 ft. 4 ins. above the floor and at a distance of about 6 ft. from the head of the patient.

Most sampling was done in *theatre A*. Its dimensions are 25 ft. long by 16 ft. 3 ins. wide by 11 ft. 7 ins. high, and its cubic capacity 4,500 cubic feet. The ventilation rate was 2.9 changes per hour in winter, and in summer eleven to twelve changes per hour. It was fitted with two U.V. lamps suspended from the ceiling at a height of 7 ft. 3 ins. from the floor. The lamps were usually screened from below. The screens can be removed and the lamps used as a source of direct U.V. light. Circulation of air was assisted by two fans situated on a shelf 9 ft. above the floor.

The theatre is situated between two of the short corridors which connect the large wards to the main hospital corridor and it communicates with each by double doors. During operations it is usually necessary to have these doors open because of the discomfort felt by the staff if they are kept shut. Screening curtains are drawn across the doorways and there is no effective barrier to the entry of contaminated air from the corridors. Sterilisation of instruments is done in this theatre—there is no anæsthetic room and surgeons have to scrub up and prepare for operations in the theatre. It is used for general and emergency surgery. There is a good deal of equipment in it.

Theatre B is a little smaller than theatre A. Its dimensions are 24 ft. 4 ins. long by 20 ft. 8 ins. wide by 9 ft. 6 ins. high, with a cubic capacity of 4,100 cubic feet. It opens off the short corridor from ward 20 and has only one pair of swing doors.

Sterilisers are in a separate room and there is a small alcove for surgeons to scrub up in, opening off the theatre. The ventilation rate is seven changes per hour in winter and eleven to twelve in summer. This theatre is also used for general and emergency surgery.

Theatre C had a cubic capacity of 5,300 cubic feet. Its size is 32 ft. 3 ins. long by 24 ft. 6 ins. wide by 11 ft. 6 ins. high. It is situated on the north side of the main corridor away from the wards and has separate sterilising and scrubbing-up rooms. It communicates with the main hospital corridor through the anæsthetic room. Its main use is for gynæcological surgery and major dental operations. The ventilation rate was 4.4 changes per hour in winter and eleven in summer.

Theatre D.—This is part of a recently reorganised theatre suite in an adjacent hospital. It has a system of controlled positive pressure ventilation in which the air is driven into the theatre at ceiling level. Its size is 45 ft. 4 ins. by 36 ft. 6 ins. by 12 ft. high. The cubic capacity is 19,861 cubic feet, and the ventilation changes eleven per hour. Sterilisers and all other equipment are outside the theatre.

TABLE 2.

OPERATING THEATRES.

	THEATRE	DATE AND TIME	TOTAL AMOUNT AIR SAMPLED CU. FT.	AVERAGE NUMBER OF COLONIES PER CU. FT. OF AIR	GENERAL CONDITIONS
WINTER CONDITIONS	A	23/1/56 14.45	6.00	112.33	Cleaning in progress, blanket shaken.
	A	18/4/57 15.10	12.00	53.41	Operations in progress, much activity.
	A	26/4/57 11.45	12.00	46.41	Operations in progress, much activity.
	B	19/3/56 11.30	8.50	66.35	Operations in progress, much activity, *staph. pyogenes* isolated.
	B	24/3/56 11.30	9.00	18.23	Quiet, cleaning in progress.
	C	23/2/56 14.50	10.00	17.2	Dental operations in progress, quiet.
SUMMER CONDITIONS	A	30/7/56 11.53	12.50	28.32	Operations in progress, much activity.
	A	1/8/56 12.20	6.00	21.0	Quiet, cleaning in progress.
	A	3/8/56 12.20	12.00	31.58	Operations in progress, quiet.
	A	4/8/56 11.50	6.00	69.5	Preparation for operation, much activity, drainage of empyema before sampling began.
	B	16/8/56 14.30	12.00	31.16	Operations in progress, moderate activity.
	D	13/4/56 12.30	10.00	5.6	Operations in progress, quiet; theatre has independent positive pressure ventilation.

Results of air sampling of operating theatres under winter and summer conditions without the use of U.V. light.

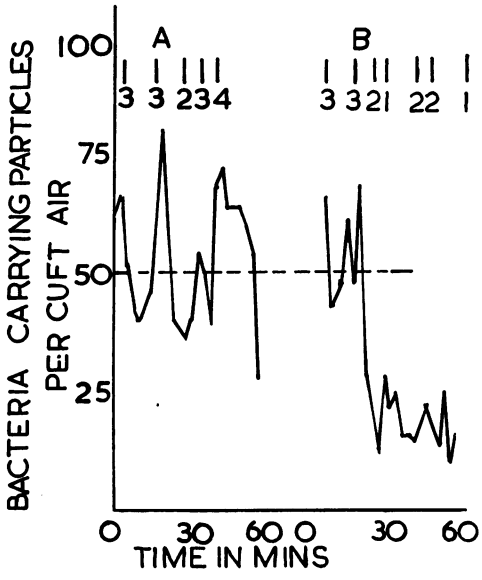

Fig. 2.— Illustrates the findings during air sampling in operating theatre A under winter conditions (curve A), and summer conditions (curve B).

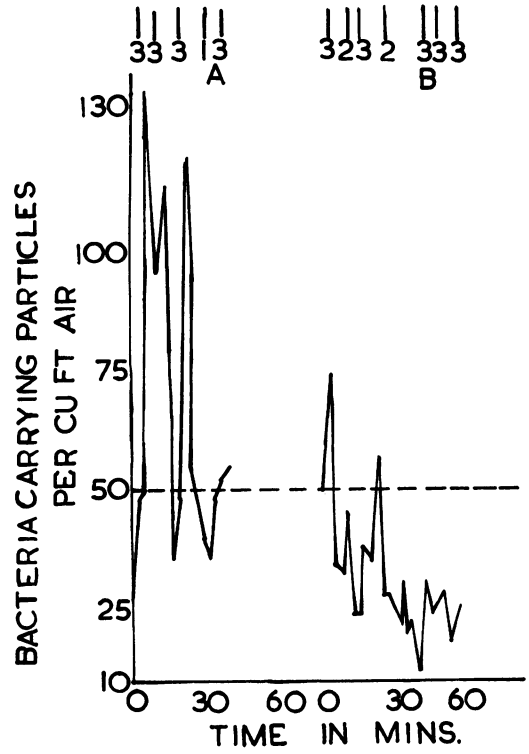

Fig. 3.—Illustrates the findings during air sampling in operating theatre B under winter conditions (curve A), and summer conditions (curve B).

The results of sampling in theatres A, B and C under winter conditions and of theatres A, B and D under summer conditions are summarised in table 2. Notes on the conditions prevailing during the period of investigation are included in the tables.

Frequency curves were also made from the results obtained in each sampling session and curves selected from them to illustrate the findings in "winter" and in "summer conditions" are shown in figs. 2, 3 and 4. Degrees of activity are indicated by the numerals 1 to 4.

Six sampling sessions were carried out under "winter conditions." The three sessions in theatre A and one of the two in theatre B produced high average counts and in each case the degree of activity prevailing during the sessions was high. The values of 18.33 in theatre B and 17.20 in theatre C were obtained when conditions were quiet, in B during cleaning, and in C during a very quiet operating session.

Six sessions were carried out during "summer conditions." Of these, four were in theatre A, one in theatre B and one in theatre D. During three of the sessions in theatre A the values found show a definite drop as compared with those found

under "winter conditions." The fourth produced the high count of 69.50. This was found during a session of thirty minutes sampling, which was preceded by an operation for drainage of an empyema. The lowest count (5.60) obtained during any session was in theatre D where the conditions were better than those in any of the other theatres sampled.

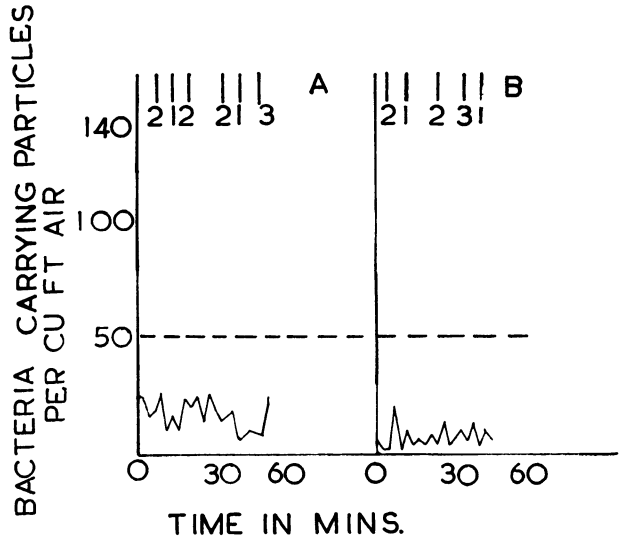

Fig. 4.— Illustrates the findings during air sampling in operating theatre C (curve A) during winter conditions, and in theatre D (curve B), which has a special system of controlled ventilation.

During the course of these investigations in operating theatres the total number of plates examined was 325. Counts of 10 per cubic foot air and under, were found on 38 of them, and 17 of these were obtained from the air of theatre D during one period of sampling.

Wards. *Ultra-Violet Light.*

The lethal effect of the recirculation of air over U.V. light upon suspended bacteria was investigated and for this a special mobile unit was available.

The prototype model used was designed by Hanovia Ltd. of Slough in association with Messrs. R. B. Stirling of Glasgow, who were responsible for its manufacture and to whom we are indebted for the loan of first one model and later a second. It consisted of a rectangular metal box 42″ high by 13″ wide by 13″ deep. An air intake fan is situated close to the bottom of one of the panels and it draws air in through three filters made of viscous coated glass fibre situated in the sides of the machine close to the top. The filtered air drawn in passes over two fifteen-watt low pressure M.V. discharge lamps in quartz, fitted with ozone eliminating liquid filter jackets and it is discharged by the fan at the lower end of the model. The air

flow over the U.V. tubes can be regulated by means of a switch to rates varying from 200 to 264 cubic feet per minute.

The idea behind the design of this mobile unit for air disinfection was that by placing it between beds in surgical wards the numbers of organisms in the air would be so reduced that the possibility of pathogenic bacteria passing from one

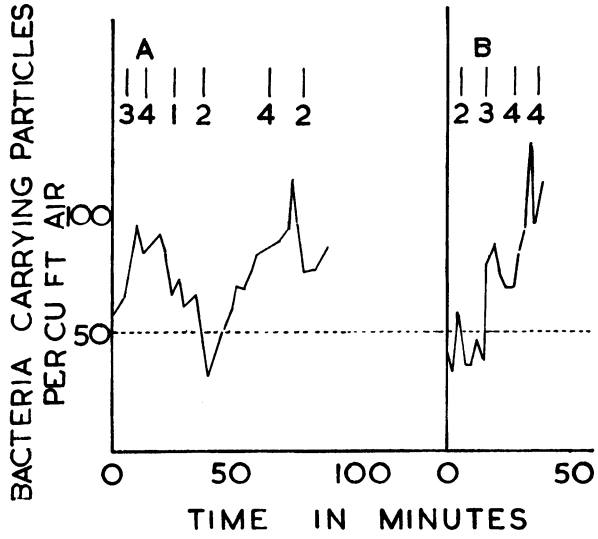

Fig. 5.—Illustrates the findings during air sampling in a male surgical ward when the air in the neighbourhood of the slit sampler was being re-circulated over U.V. light. Curve A shows the results when the rate of re-circulation was 222 cubic feet per minute, and curve B when it was 444 cubic feet per minute.

bed to another would be very slight. Its designers thought that its use would be specially advantageous during surgical dressings.

The mobile unit was used in the wards and small clinical room, and was tested only under "winter conditions." In the wards it was placed beside the slit sampler and a patient's bed.

Results are summarised in table 3. In fig. 5 the two frequency curves shown illustrate the findings obtained during periods of sampling in a male surgical ward when either one or both mobile U.V. units were being used.

In fig. 6 the frequency curves illustrate the results obtained in the small clinical room with and without the use of the U.V. mobile unit.

As in the results obtained from sampling without U.V. light there is a marked variation in the average number of bacteria per cubic foot of air in different sessions, the lowest average being 12.14 and the highest 185.75. High counts were found when blankets were shaken or activity marked. Counts in the wards obtained during comparable conditions of activity do not differ appreciably from those found under normal conditions. Counts in the clinical room were lowered by the

use of one mobile unit to an average of 31.55 bacteria carrying particles per cubic foot of air and to an average of 12.14 by the use of two units, which were circulating air each at the rate of 222 cubic feet per minute for a period of two and a half hours before testing and while samples were being taken.

Operating Theatres.

The lethal effects of direct and indirect U.V. light was assessed in theatre A during both "winter" and "summer conditions." Results of using indirect U.V. light are summarised in table 4 and shown in the frequency curves exemplified in fig. 7.

TABLE 3.

WARDS.

WINTER CONDITIONS

WARD	DATE AND TIME	TOTAL AMOUNT AIR SAMPLED CU. FT.	AVERAGE NUMBER OF COLONIES PER CU. FT. OF AIR	GENERAL CONDITIONS
12 Male Surgical	17/5/56 16.30	8.5	68.35	Bed-making, curtains, moderate activity, two U.V. machines in use.
12 Male Surgical	26/1/56 11.40	10.0	126.4	Bed-making, curtains, floor polishing, much activity, one U.V. machine in use.
12 Male Surgical	2/2/56 11.30	4.5	44.4	Dressing being done, curtains, moderate activity, one U.V. machine in use.
12 Male Surgical	8/2/56 11.25	26.0	41.76	Patient vomiting, another getting out of bed, dressing being done, curtains, moderate activity, one U.V. machine in use.
12 Side Ward	10/1/56 14.30	10.0	33.7	Quiet, visitors in, one U.V. machine in use.
12 Side Ward	12/1/56 12.15	8.0	185.75	Activity in corridor outside open door, blankets and clothes shaken, one U.V. machine in use.
Clinical Room	24/2/56 15.10	4.5	31.55	Quiet, then cloak shaken, one U.V. machine in use.
Clinical Room	18/5/56 15.15	7.0	12.14	Two U.V. machines in use for two hours before test began, moderate activity.

Results of air sampling in large and small wards under winter conditions with the re-circulation of air over U.V. light.

Under "winter conditions," both when blankets were shaken and under conditions of moderate activity, the levels found were lower when the U.V. lamps were being used than when they were not, but, as is shown in the discussion which follows, they did not reach satisfactory limits in any test. Under "summer conditions," the average values obtained in two sampling sessions were 23.66 and 23.41 bacteria carrying particles per cubic foot of air respectively—the lowest result found in this theatre, but in three other sessions during very hot and humid conditions, the bacterial counts were about the same as those found in winter without U.V. light.

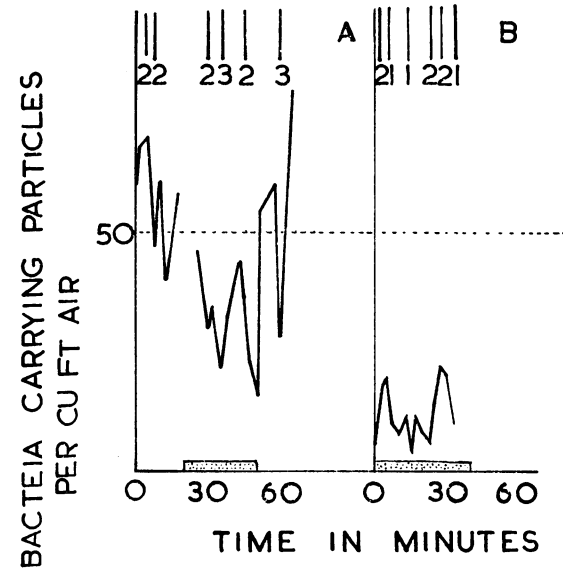

Fig. 6—Illustrates the findings during air sampling in the small clinical room (curve A) when one machine was in use (re-circulation of air 222 cubic feet per minute) and (curve B) when two machines were in use (re-circulation of air 444 cubic feet per minute). The hatched areas indicate the periods when the U.V. machines were running.

The effect of direct U.V. light in a closed theatre was investigated. After a period of fifty-three minutes exposure the bacterial count of the air was reduced to an average of two bacteria carrying particles per cubic foot, which is slightly less than the average value found from the air which comes into the theatre from the ventilating shaft (2.27).

The rise to this mean level was the result of the entry of two persons and the slit sampler. After ten minutes a blanket was shaken and the number of bacteria carrying particles rose immediately to 156 per cubic foot of air. The record shows that quiet conditions continued and the numbers fell to 50, ten minutes after the blanket was shaken, to 24 at twenty minutes, to 20 at twenty-five minutes, and to 6 at twenty-eight minutes after.

From this experiment one might assume that provided conditions in the theatre were quiet, exposure to direct U.V. light for half an hour, combined with the low ventilation rate of 2.9 c.p.h. would be enough to bring the level of bacteria carrying particles to levels safe for surgery, provided that movement was reduced to a minimum and the measures suggested later were put into effect.

TABLE 4.

OPERATING THEATRE A.

	DATE AND TIME	TOTAL AMOUNT AIR SAMPLED CU. FT.	AVERAGE NUMBER OF COLONIES PER CU. FT. OF AIR	GENERAL CONDITIONS
WINTER CONDITIONS	12/3/56 14.30	6.0	66.3	Theatre closed and exposed to direct U.V. light for one hour before sampling began. During sampling a blanket was shaken.
	18/1/56 12 noon	6.0	70.83	Quiet, except that a blanket was shaken during sampling.
	30/4/57 15.30	12.0	37.58	Operations in progress, moderate activity.
SUMMER CONDITIONS	31/7/56 12 noon	12.0	23.66	Operations in progress, moderate activity.
	2/8/56 11.40	12.0	23.41	Operations in progress, moderate activity.
	13/6/57 15.30	6.0	38.83	Operations in progress, moderate activity, very hot and humid.
	18/6/57 15.40	4.5	58.22	Operations in progress, much activity, very hot and humid.
	25/6/57 12.15	5.0	63.2	Operations in progress, moderate activity, very hot and humid.

Results of air sampling in operating theatre A while indirect U.V. light was being used, under winter and summer conditions.

DISCUSSION.

For the purpose of this investigation it has been assumed that the standards proposed by Bourdillon, Lidwell and Thomas (1948) for the bacterial content of the air of occupied rooms, operating theatres and rooms used for surgical dressings are reasonable, especially as no other values or standards have yet been suggested. Bourdillon and Colebrook (1946), as the result of extensive work in operating theatres and dressing rooms, stated that in their opinion the number of bacteria carrying particles in the air should not exceed 20 per cubic foot, where minor

operations and dressings are done; for major operations the level should not exceed 10, and for brain surgery or operations on patients with a very low tissue resistance the numbers should be not more than 2-0.1. These standards were confirmed by Bourdillon *et al.* (1948) as the result of many observations in operating theatres. In addition, following upon extensive field trials, they suggest that it is not unreasonable to take fifty bacteria carrying particles per cubic foot of

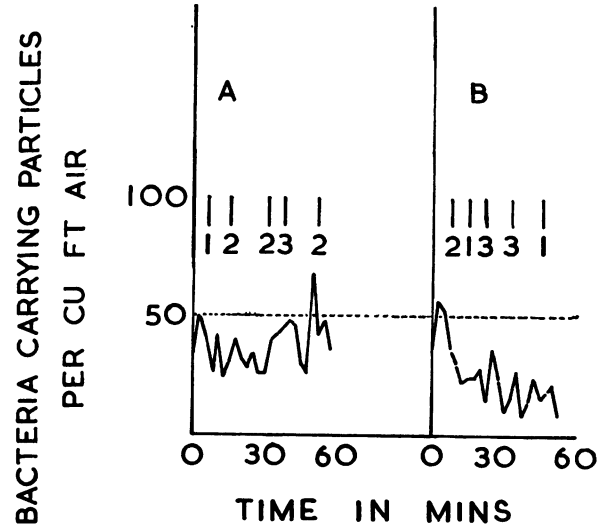

Fig. 7.—Illustrates the findings during air sampling in theatre A while it was under the influence of indirect U.V. light. Curve A was obtained under winter conditions, and curve B under summer conditions.

air as an upper limit to be considered satisfactory in any ordinary occupied space. Bourdillon and Colebrook (1946) have also shown that the estimation of the level of the general bacterial flora of the air is of value in surgical dressing rooms and operating theatres. In fact by its use they showed that a bacteria-free atmosphere was an essential factor in the prevention of the septic infection of burns.

Reid, Lidwell and Williams (1956) have discussed the question of using total bacterial counts as an index of air hygiene. Their results show that counts of the general bacterial flora of the air in schools do not bear any relationship to the incidence of cross infection in respiratory diseases, but that there is a significant relationship between the numbers of *streptococcus salivarius* in the air and the risk of classroom transfer of measles. On this account and because most of the bacteria isolated are non-pathogenic cocci, they state that estimations of the general bacterial flora of the air are not likely to be a reliable indication of the general state of air hygiene, at least so far as respiratory diseases are concerned. On the other hand, it has been shown by Wright, Cruickshank and Gunn (1944) that during an outbreak of streptococcal infections of the middle ear and mastoid cells complicating measles, the mean bacterial count in the air of a ward treated by

oiling clothes and bedclothes fell by 92 per cent., and at the same time the count of hæmolytic streptococci fell by 99 per cent., as compared with the results obtained in the control ward in which no special preventive measures were taken. In addition, the rate of complications in the test ward fell to 18.6 per cent., as compared with a rate of 73.3 per cent. in the control ward. This would seem to indicate some correspondence between the mean bacterial count per cubic foot of the air in the measles ward and the incidence of complications due to hæmolytic streptococci.

Whether the general bacterial count of the air in the wards or theatres bears a relationship to the incidence of wound infection has yet to be shown. It is probable that more information could be obtained by a search for the occurrence or incidence of pathogens such as *staphylococcus pyogenes* as has been suggested by Shooter, Griffiths, Cook and Williams (1957), or potential pathogens such as *pseudomonas aeruginosa* or *escherichia coli,* since these organisms are from time to time associated with outbreaks of wound infection in hospital wards.

In the present study the findings show that in both wards and theatres the numbers of bacteria carrying particles per cubic foot of air are high.

Wards.

In the wards the tables and frequency curves show that high counts are associated with increased activity and counts below fifty are found only in quiet periods, which is a finding similar to that reported by Bourdillon *et al.* (1948). Since the wards are seldom quiet during the day, it follows that the number of bacteria in the air is maintained at a level of over fifty for long periods, a level which would be considered unsatisfactory in an ordinary occupied space according to the standards of Bourdillon *et al.* (1948).

The mean values compare, as a whole, not unfavourably with those given by Bourdillon *et al.* (1948) for hospital wards in London during the winter of 1943-44, when the highest mean value obtained was 667 and the lowest 92; though these high figures may be accounted for by the difficulties of ventilating overcrowded wards during the black-out. Colebrook and Cawston (1948) emphasised the importance of adequate ventilation. In a ward ventilated by several open windows on each side, they obtained mean values as low as 6 to 13 bacteria carrying particles per cubic foot of air when the ward was quiet, even though dressings were in progress. During bed-making, with the windows open, the mean count was 77. With nearly all the windows closed one count found during a dressing in the same ward reached the high level of 619.

Since ventilation rates were constant in the present series of experiments and the number of bacteria in the incoming air had the low average value of 2.27 per cubic foot, the effect of various kinds of activity of the bacterial count could be assessed.

As a result of making observations at intervals of two and a half minutes or oftener, and co-relating these observations with the bacterial counts, the ability of the slit sampler to detect frequent and sudden changes in the bacterial content of the air was confirmed.

When frequency curves are examined in conjunction with the notes kept during sampling it is evident that any movement, even very slight, of fabrics, curtains, clothing and bed-clothes, scatters a shower of organisms into the air. The greater the movement or disturbance of clothing the higher are the counts, and bed-making or the shaking of blankets produces the highest counts of all. A count of 516 was once obtained during bed-making, and the shaking of a blanket in a small ward produced a count of 799 bacteria carrying particles per cubic foot of air.

These results confirm those found by many workers; namely, that clothing, bedclothes and blankets are heavily loaded with bacteria and that the bacteria are cast into the air by any movement of the fabrics. Indeed it has been shown repeatedly that blankets are one of the chief sources of bacteria in a ward, if not the main reservoir. Thomas and van den Ende (1941) discussed the question of blankets as a bacterial reservoir as long ago as 1941 and estimated that a single blanket might harbour up to one million organisms. Bourdillon and Colebrook (1946) showed that blankets taken directly from wards and shaken in a sterile dressing room liberated up to 471 bacteria per cubic foot of air. Frisby (1957), by homogenising a square inch of blanket in a measured amount of broth and making our plate cultures, estimated that a whole blanket could harbour from forty to eighty million bacteria.

It has been shown by Bourdillon and Colebrook (1946) and Barnard (1952) that the ordinary process of laundering blankets does not render them free from bacteria, and Barnard found that most freshly-laundered blankets contained *staphylococcus aureus*.

Efforts to deal with the difficult problem of ridding blankets of bacteria have been made from time to time since 1941 (van den Ende, Edward and Lush, 1941; Thomas and van den Ende, 1941, and van den Ende and Thomas, 1941). Briefly stated these methods included the treatment after washing, by oil emulsions or liquid paraffin, and the use of detergents such as fixanol (Rountree, 1946), and cetyl trimethylaminobromide (Blowers and Wallace, 1955) in the laundering process. The latter method, known as the "lissapol-cirrasol" technique, has been used in an extensive investigation on the cleaning of blankets by Frisby (1957). He states that "provided that blankets are washed frequently—for example after every patient—this technique is adequate to keep ordinary woollen blankets clean."

It has been suggested that blankets might be made of cotton or terylene fabrics instead of wool, because such materials may be boiled without being damaged. Blowers has boiled a set of terylene blankets fifty times without causing them an appreciable amount of damage, and Frisby states that terylene blankets used in his investigation were boiled fourteen times without being damaged. Osborne, Littlewood and Atkinson (1957) sterilised terylene blankets by autoclaving after washing, and found that they remained soft, white and fluffy after six such treatments. Terylene blankets are light and warm and would seem to be ideal for hospital use, but they have the disadvantages of being expensive and liable to build up a high static electrical charge which would preclude their use in operating theatres.

Frisby's observations about the need for the frequent washing of woollen blankets apply equally forcibly to those made of terylene, for though a blanket may be clean and sterile when placed on a patient's bed, it soon acquires a fresh load of bacteria, and if the patient has a septic, discharging wound there will be large numbers of pathogens in the bedclothes and blankets. If the numbers of pathogens in the hospital environment are to be kept within reasonable limits, then the blankets, as well as the other bedclothes should be efficiently washed upon the discharge of every patient from hospital.

Some attention should also be given to the clothing of the persons who work in the wards. Duguid and Wallace (1948) have shown that large numbers of bacteria carrying particles were liberated from clothing, even during a period of very slight activity, and that 10 per cent. of these remained airborne for half an hour. They also showed that nasal carriers of *staphylococcus aureus* infected the air to a greater degree by liberation of dust from clothing than by sneezing, and that *staphylococcus aureus* was present in about 0.1 per cent. of the bacteria carrying particles which were shed into the air from the clothing of carriers.

The results of the present investigation show that the level of twenty bacteria carrying particles recommended by Bourdillon and Colebrook (1948) as the highest mean value to be permitted in the air of a room used for surgical dressings, is very far from being attained in the wards of this hospital where it is the usual practice to do surgical dressings as well as minor surgical procedures, such as lumbar punctures. In this connection it should be borne in mind that the dressing of wounds discharging pus in an open ward inevitably sheds the infecting organisms on to the bedclothes and so into the air and environment.

Howie (1956) suggests that bacteria should be attacked while they are still in the hospital environment and not only after they have invaded patients' tissues. We have already available a good deal of information about the sources and ways of spread of pathogenic bacteria in hospitals, but more investigation on this problem needs to be done. Much improvement could be obtained by making better use of the knowledge already available. Measures to control dust and carriers may be very thorough and barrier nursing performed to perfection, but so long as we allow dirty blankets to remain indefinitely on hospital beds and close our eyes to the fact that our woollen garments are heavily loaded with bacteria, we are failing to control the spread of potential pathogens.

Measures of control already in use are "barrier nursing" in selected cases, and covering the floors with a film of sticky polish to keep down dust, but it is evident from the results of the present investigation that these methods are not sufficient to keep the numbers of bacteria in the air below reasonably safe limits during normal ward activity.

The re-circulation of air over U.V. light in the large wards was not effective in reducing the numbers of bacteria carrying particles under ordinary conditions. In small rooms the reduction effected by the use of one machine did not bring the bacterial counts to levels safe for dressings, but the use of two machines under conditions of normal activity in a small room of 1,221 cubic feet capacity brought the

bacteria count to 12.14 per cubic foot of air, which would make it more suitable for use as a surgical dressing-room than the wards are at present.

If the numbers of bacteria in the air are to be reduced significantly, measures which should be adopted as well as those mentioned above are first, the provision of clean blankets for each patient and the frequent washing of hospital blankets by a technique such as the "lissapol cirrasol" method. The possibility of the future use of terylene blankets should be borne in mind, as they might well prove less expensive in the long run than special laundering methods.

All members of staff who work in wards should wear clothing which can be frequently changed and easily laundered. The nursing profession has always been conscious of the necessity of wearing such clothing. Other members of staff have compromised by wearing a white cotton coat over ordinary woollen outdoor clothing, but medical students are allowed in the wards in the tweed coats and flannel trousers which they have worn daily for months. They should at least be required to wear a white coat or gown which covers them, for it would cut down the numbers of bacteria they scatter by fifty per cent. (Duguid and Wallace, 1948).

Where at all possible, vacuum cleaning should be adopted in all hospital departments, and indeed, when new hospitals are being designed, built-in suction should be included for this purpose.

If it were at all possible a special room should be equipped and kept for the sole purpose of doing surgical dressings and no wound should ever be uncovered in a general ward.

Operating Theatres.

When the results shown in tables 2 and 4 are considered together, it is apparent that the average numbers of bacteria carrying particles per cubic foot of air found are almost all much higher than the level suggested by Bourdillon and Colebrook (1946) as a reasonable standard for theatres where major operations are performed. In only three sampling sessions out of a total of twenty, was the average bacterial count per cubic foot of air below fifty, which is the standard suggested as reasonable for an ordinary occupied room. The counts found in each of the four theatres reflect the general conditions in them. Conditions in theatre A are the least satisfactory, and those in theatre B leave much to be desired. There are three other theatres similar to A in use in the hospital. The comparatively good result obtained in theatre C was probably mainly due to the quiet conditions prevailing during sampling, but the fact that it is a larger room, is less crowded with apparatus, has better arrangements for sterilisation and for preparation and induction of anæsthesia, may have contributed to this result. The counts obtained in theatre D are the only ones which conform to Bourdillon and Colebrook's standards for major surgery. In this theatre the ventilation rate (eleven changes per hour) is not greater than that found in the other theatres during summer, but this theatre is much larger than the others and is quite devoid of equipment apart from the operating table, the surgeon's table and the anæsthetist's trolley. The theatre is one of a suite, and all sterilisation and other preparations are done outside. All the staff, both medical and nursing, change from outdoor clothing into fresh theatre suits before scrubbing-up, and enter the theatre completely prepared for the

operation. Movement is not great, is unimpeded, and is seen in table 2 and fig. 4, the counts during quiet periods are low.

As in the wards, any increase in activity in the theatres is associated with a rise in the numbers of bacteria in the air. This is illustrated both in tables 2 and 4, and in figs. 2, 3, 4 and 7.

Apart from the usual activity at the beginning and end of each operation, it was noted that the actions which caused a rise in the bacterial count were; movements of the operating table up and down, of the overhead lamps and of the anæsthetist; rinsing of the surgeon's hands in sterile lotion, mopping of the surgeon's forehead, opening of the doors of store cupboards, moving the curtain over the doorway, the passage of persons in the corridor outside, and the entry of visitors from time to time. The visitor may have prepared for his entry by donning a sterile mask, or a sterile mask plus a sterile gown, or a sterile mask, cap and gown, but this sterile clothing is put on over the wearer's ordinary clothes.

Duguid and Wallace (1948) have shown that this practice, which they describe as "surgical gowning," does not prevent the dissemination of bacteria from the clothing of the wearer, though it does effect a reduction of fifty per cent. when compared with the numbers shed into the air from a person wearing ordinary clothing and no gown. That surgical gowning is not effective has been confirmed during the present study by the observation made during an operating session, when a technician who was wearing sterile gown, mask and cap over his ordinary clothes, moved the gown and put his hand into his trouser pocket. This action was immediately followed by a rise in the bacterial count.

But during the present series of observations in operating theatres it has been noted that though the surgeon and one assistant will have changed into operating suits, quite often a second assistant and the anæsthetist will be content with "surgical gowning." Except for the staff working in theatre D, this was not an uncommon practice, and it must have contributed to the high level of bacteria generally found in the air of the operating theatres. One might also add that the sterile caps worn by the surgical and nursing staff to cover the hair often did not fulfil their purpose and masks were occasionally seen situated below the nose.

The operating theatres in the hospital were designed over fifty years ago almost at the beginning of the "surgical era," to cope with a volume of work which was very much less than that which exists at present. As they are now, they have to serve not only as operating theatres but as preparation room, sterilising room, scrubbing-up room, dressing room, and for the storage of equipment and other materials. When not being used as operating rooms they are often used as examination rooms for out-patients. In fact, the theatre fulfils the entire function of a modern operating suite, and according to modern standards they are not proper places even for the dressing of wounds.

In spite of the difficulties, something might be done to bring the bacterial counts down to safer levels, and it might be worth while to consider what is possible under the present circumstances. The following measures are suggested :—

The doors between the corridors and theatres should be kept shut; contaminated air from the corridors has been shown to enter the theatres during the present series of tests. Admission of any person to the theatre after an operation has begun should not be permitted except under exceptional circumstances. All of the staff, including the anæsthetist and the nurses, should change into fresh cotton clothes before actual preparation for the operation begins; this would perhaps not be possible under the present conditions, as accommodation for changing is very limited (and is only available to the surgical staff). If surgical suits are worn outside the theatre for an appreciable length of time, then they should be taken off and fresh suits put on before beginning another operating session.

Some thought should be given to redesigning masks, caps and gowns. After a mask is put on, it should never be handled and it should be so designed that it could not be pushed up and down under the chin each time the wearer feels uncomfortable. Many of the caps worn, even if put on so as to cover the head, after a time ride up and leave large areas of hair uncovered. If a surgeon is one of those people who is likely to sweat freely from the head or forehead, it would be advisable for him to apply a little vaseline to the roots of the hair and to the eyebrows.

Gowns are so cut that they often do not meet at the back of the neck and the top button has to be left undone so a space is left uncovered.

People should not come into the theatre in ordinary shoes and socks; cotton socks could be put on at the same time as surgical suits and special laundered over-boots which should be worn outside the theatre as little as possible.

The patient should be dressed in clean cotton garments with cotton operation stockings instead of wool which cannot be sterilised. Every patient, whether male or female, bald or hirsute, should have the head completely covered by a clean cotton cap. It might be a good thing if the patient's jacket had short sleeves so as to make for less disturbance of clothing when the anæsthetist is giving intravenous injections. Movement of every person in the theatre should be restricted to those essential and should not be sudden or vigorous.

Obviously "clean" cases should be dealt with first. The use of direct U.V. light after a "dirty" case for a certain period (about half an hour is suggested) in combination with the controlled ventilation will kill the bacteria in the air and on such surfaces as the rays fall upon.

The use of indirect U.V. light proved disappointing. Any reduction in numbers following its use was more than compensated for by the rise due to the general conditions which prevailed in the theatre. In other words, the amount of activity which existed kept the bacterial level too high for the U.V. light to have an appreciable killing effect.

Summary.

A survey of the numbers of bacteria carrying particles in the air of the wards and operating theatres of a hospital ventilated by the Plenum system has been done.

The results obtained in the wards show that the ventilation rates, even in summer, are not sufficient to keep the bacterial levels below fifty during normal working conditions. When conditions are quiet during the day the levels are lower than

fifty, but they never reach a level which could be regarded as satisfactory for surgical dressings.

In the operating theatres the results of air sampling revealed the fact that the number of bacteria carrying particles in all except one, were maintained at a level which must be regarded as thoroughly unsatisfactory. *Staphylococcus pyogenes* (*aureus*) colonies were recovered from the air of one theatre during an operation for the amputation of a leg.

The value of indirect U.V. light in the theatres and wards was assessed. Under present conditions its use did not seem to produce effective results.

The re-circulation of air over U.V. light in a special prototype machine was of no advantage in the large wards under normal working conditions, even when the machine was running beside the slit sampler and a patient's bed. More bacteria were being added to the air than were being killed by the U.V. light.

Results obtained in the small clinical room were more encouraging. If the machine were able to deal with large enough quantities of air, then the balance between bacteria being added and bacteria being killed might be nearly equal.

The main factors in keeping the bacteria in the air at a high level are movements of bedclothes, clothing, curtains, persons and furniture.

Measures have been suggested which, in combination with those already in use, should bring down the numbers of bacteria in the air of the theatres to safer levels.

My thanks are due to Professor G. W. A. Dick for help and encouragement in the preparation of this paper; to the surgical, nursing and engineering staff of the Royal Victoria Hospital, Belfast, for their willing and helpful co-operation; and to Messrs. R. B. Stirling of Glasgow for the loan of the machine used for the re-circulation of air over U.V. light. The technical assistance was partly paid for by a grant to this department from the Medical Research Council, and this I wish to acknowledge.

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An Evaluation of Mitral Valvotomy

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MITRAL VALVOTOMY is now a standard procedure and in recent years many series of cases have been reported. The results of 121 cases from this hospital have been recorded (Pantridge et al., 1953). 454 patients with mitral stenosis, all of whom were assessed by one of us (J. F. P.), have now had mitral valvotomy. The results of the initial 400 operations have been subjected to critical analysis are presented here. The operations were performed by Mr. T. B. Smiley, Mr. J. A. W. Bingham and Mr. H. M. Stevenson.

Of the patients 305 (78.2 per cent.) were female and 85 (21.8 per cent.) male. (Table 1). A few patients had more than one operation. The figures relate to all operations and include those where no effective commissurotomy was possible.

TABLE 1.

AGE AND SEX DISTRIBUTION.

AGE	FEMALE	MALE
10-19	10	4
20-29	73	23
30-39	127	30
40-49	84	23
50-59	11	5
TOTALS	305	85

The average age at operation was 35.4 years. The oldest patient was aged 58 and the youngest 13. Only 40 per cent. of patients referred by their practitioners or by other specialists for consideration of mitral valvotomy proved suitable for operation.

ASSESSMENT OF DISABILITY.

In the clinical history special attention was paid to the following:—history of rheumatic activity; exercise tolerance; orthopnœa; hæmoptysis; "winter bronchitis"; arrhythmias; embolic episodes; history of congestive failure; the effect of pregnancies.

For the purpose of this study the patients were graded according to the severity of their symptoms:—grade 0, no disability; grades 1, 2 and 3, slight, moderate and severe disability; grade 4, complete incapacity from congestive

heart failure or intractable pulmonary congestion and œdema. Such a classification, based mainly on subjective complaints, has its limitations. Patients vary widely in their reaction to cardiac disease; in some grave disability is borne with stoicism, while in others the symptoms are disproportionately great due to a superadded neurosis. Where our assessment of disability, based on objective clinical, laboratory and operative findings and on an appraisal of the patient's attitude to his disease, conflicted with the severity of subjective complaints, we did not hesitate to alter pre-operative or post-operative grading accordingly.

Difficulties existed in grading patients whose presenting symptoms were partly caused by chronic respiratory disease, or whose limitation of activity was partly due to the residual effects of embolic episodes, and also in grading those patients who developed rapid though reversible deterioration, e.g., pulmonary œdema during pregnancy and cardiac failure from the onset of atrial fibrillation. In the latter instance the patient was graded according to his status following control of the arrhythmia.

In addition to physical examination, full laboratory investigation was performed in all cases, including electrocardiography, fluoroscopy, a P.A. chest film, E.S.R., and leukocyte count. In the early stages cardiac catheterisation was frequently required, and was performed in 71.3 per cent. of cases from 1950 to 1953. Increasing experience has lead to a substantial decrease in the number of cases requiring catheter studies and since 1954 the figure is 24.7 per cent. Cardiac catheterisation is still necessary for the assessment of those patients whose symptoms appear disproportionate to the clinical and laboratory signs of severity and in evaluating the importance of associated respiratory disease (asthma, emphysema, pulmonary fibrosis) in the production of dyspnœa.

The majority of cases in this series were pre-operatively grade III or IV. None were better than grade II. There was no deliberate selection of good risk cases. When the stenosis was thought to be tight, valvotomy was advocated despite the risk involved. Indeed in a few cases the patient was virtually moribund at the time of operation.

Those patients with signs of pure mitral stenosis but without sufficient incapacity to warrant valvotomy have been reviewed at regular intervals in an endeavour to select the optimum time for surgery. There is much to be gained by adopting conservative measures in such cases. In some, especially in the older age groups, the disease is slowly progressive or static and it may be possible to postpone operating indefinitely. Further, as experience increases, the technique of mitral valvotomy is improving and the mortality, already at a low level, declining.

Initial Results of Valvotomy.

Criteria have been used similar to those of Baker, Brock and Campbell (1955). An improvement of 3 grades or more was regarded as excellent; 2 grades, good; 1 grade, improved. The remainder either were not improved (0 grade), some being worse, or died at operation or in the early post-operative period (– 1 grade). It is difficult to exclude psychological factors in determining the amount of benefit from operation. Attention was therefore also paid to objective changes, including

alterations in electrocardiographic and radiographic appearances, and to improvement in pulmonary vascular pressures determined by post-operative cardiac catheterisation. In some cases the occurrence of persistent post-operative fibrillation or of post-operative embolism unfavourably influenced the grading.

The initial assessment was made 6 months after operation (Table 2).

TABLE 2.

INITIAL ASSESSMENT OF RESULTS.

(390 patients).

Grade of improvement		Number of patients		Percentage of total	
(3) Excellent		110	...	28.2	
(2) Good		128	...	32.8	
(1) Improved		75	...	19.2	
(0) No Improvement		67	...	17.2	
(−1) Died (a) at operation		3	...	0.8	
(b) immediate post-operative phase		7	...	1.8	
		10	...		2.6

Average grade of improvement for entire group = 1.67.

It is seen that at this time the result was good or excellent in 61 per cent. and some improvement was obtained in 80 per cent. The average improvement was by 1.67 grades. Since criteria for selection of cases and for assessing improvement vary in different centres, and since the period after operation at which the results are analysed also varies widely, no direct comparison can be made with other series. However, our figures are very similar to those of other large series, e.g., Janton, Glover and O'Neill (1952)—78 per cent. improved; Wood (1954)—85 per cent. improved; Kirklin and Ellis (1955)—78 per cent. improved.

The operative mortality has been low. Five deaths occurred at the first 50 operations. Since then there have been 5 deaths at 350 operations (1.4 per cent.). Between June 1952 and August 1954, 155 operations were performed without a death. The mortality for the entire series was 2.5 per cent. of 400 operations or 2.6 per cent. of 390 patients. The 10 deaths were due to, cerebral embolism (3); cardiac arrest at operation (2); severe hæmorrhage at operation (2); post-operative hypotension, bilateral adrenal hæmorrhage (2); hæmorrhage following post-operative iliac embolectomy (1).

The more important factors influencing the initial results were the technical success of the valvotomy, calcification of the mitral valve, and associated mitral incompetence. Other factors included embolism, cardiac arrhythmias, pre-operative congestive heart failure, complicating tricuspid lesions, pregnancy, and the age of the patient.

Technical Success of the Valvotomy.

The surgeon's estimate of technical success at valvotomy is a reliable guide to the patient's subsequent clinical state. This is clear from Table 3, relating to

234 operations, in which the degree of splitting of the commissures is related to the patient's grade of improvement. Good or excellent results were obtained in 91 per cent. of cases when full splitting of both commissures was possible, but in only 1 of 33 cases where little or no split was achieved.

TABLE 3.

INITIAL RESULTS IN RELATION TO THE EXTENT OF VALVOTOMY.

Grade of improvement	Extent of Valvotomy				
	Poor or none	Fair	Good	Full	Total
Excellent	0	4	19	47	70
Good	1	24	26	22	73
Improved	6	22	7	5	40
No Improvement	26	18	5	2	51
TOTAL	33	68	57	76	234

Calcification of the Mitral Valve.

Moderate or gross calcification was noted at operation in 68 patients (17.4 per cent). In about the same number minor degrees of calcification were detected, insufficient to cause any additional functional disturbance or operative hazard; these cases are not considered here. The site of the deposit varied. In some cases there was diffuse calcification of one or both cusps; in others a mass of calcium occupied one or both commissures; occasionally calcification extended to involve the posterior wall of the left atrium. Twenty-nine patients with calcified valves had loud mitral systolic murmurs, and incompetence was found at operation in 16 (53.1 per cent.). In contrast, only 2 of 14 (14.3 per cent.) with soft localised systolic murmurs, and 2 of 25 (8.0 per cent.) with no systolic murmur, had significant incompetence. The high overall incidence of incompetence (29.4 per cent.) appears to be due to the calcified valve's lack of mobility. An opening snap was heard in only 31.3 per cent. of patients with calcified valves, compared with 70 per cent. in the entire series. The average age of men with calcified valves was 38.7 and of women 33.3 years. Calcification was twice as common in men as in women.

In 8 cases with extensive calcification in both commissures no valvotomy was possible; forcible splitting was avoided owing to the dangers of causing mitral incompetence and releasing calcific emboli. A limited valvotomy was performed in 33 cases in most of which calcification involved one commissure only, and a more complete operation was possible in the remaining 27. The results, assessed six months after valvotomy were, excellent, 14 (20.5 per cent.); good, 16 (23.5 per cent.); improved, 20 (29.5 per cent.); no improvement, 16 (23.5 per cent.); deaths, 2 (3.0 per cent.). The average grade of improvement was 1.35. Neither of the 2 deaths was directly attributable to the presence of calcium. Post-operative embolism occurred in 2 patients; in one of these, a young man with sinus rhythm and an auricle free from clot, calcium embolism was suspected.

While the presence of gross calcification is usually an unfavourable sign, the following case indicates that it is not invariably so.

A man aged 38 suffered from increasing dyspnœa for fifteen years. He had had several episodes of complete heart block. On admission he was totally incapacitated from pulmonary congestion. Electrocardiography showed second degree A.V. block and fluoroscopy showed gross calcification of the mitral valve. Mitral valvotomy was performed by Mr. Bingham in January, 1955, a good split being obtained despite massive calcium deposits in both cusps of the valve. No mitral reflux was detected following splitting of the commissures. During operation numerous rhythm disturbances occurred including complete heart block. Transient right ventricular defeat occurred after operation. However, the patient is now asymptomatic and A.V. conduction is normal.

Mitral Incompetence.

This was suspected when the following signs were present; a loud mitral systolic murmur conducted to the axilla, a soft first sound, the third heart sound of rapid ventricular filling, and an enlarged left ventricle. Localised systolic murmurs of grade 1 or 2 intensity were probably as common in patents with pure stenosis as in those with minor degrees of incompetence. In individual cases, it may be difficult to decide whether significant incompetence is present, and every large series contains some cases where at operation an unsuspected degree was found.

In the present series a regurgitant jet was found by the surgeon in 49 cases; 20 of these (40.8 per cent.) had associated calcification. The incompetence was minimal in 30; it was increased by the valvotomy in only 3 of these, and the average grade of improvement (1.47) was only slightly inferior to that of the whole series. Moderate incompetence was found in 13; there were 2 operative deaths, in several cases the incompetence was increased, and only 5 patients were improved. Unexpected gross incompetence was found in 6 (1.5 per cent.) and none of these were improved.

The effects of incompetence produced at operation are discussed later.

Embolism.

The incidence of post-operative pulmonary embolism is difficult to determine since other common pulmonary complications such as pneumonia, small effusions and post-operative collapse may have similar clinical and radiographic features. In our experience, however, pulmonary infarcts, whether due to embolism or venous thrombosis were much more common in patients with fibrillation. The remainder of this section relates to systemic embolism, regarding which more precise details are available.

There was a clear-cut history of pre-operative systemic embolism in 20 patients (5.1 per cent. of the series). The site was cerebral in 16, iliofemoral in 6, and abdominal in 3, several of the patients having had multiple episodes. Embolism was more frequent in patients with fibrillation (7.8 per cent.) than with those in sinus rhythm (3.7 per cent.).

Systemic emboli were less common at operation and immediately afterwards than in some other reported series, occurring in only 17 patients (4.4 per cent.). It is of interest that none of the 20 patients with definite pre-operative emboli had a recurrence at or following operation. This may be partly due to the great care with which the atrium was flushed free of clot before splitting of the valve was undertaken. Our experience in this respect parallels that of Goodwin et al. (1955), who concluded that "there is certainly no reason to think that the risk of embolism during valvotomy is increased if the patient has previously suffered from embolic phenomena." On the other hand, Bailey and Bolton (1956) noted post-operative emboli in 6 of 37 patients with a history of both cerebral and peripheral emboli and state that a patient with a history of arterial emboli prior to surgery is a somewhat greater surgical risk than one with no such history. The post-operative emboli were more liable to occur in patients with fibrillation (10 cases) than in those with sinus rhythm (7 cases); in 2 of the former the embolism was related in time to the onset of paroxysmal fibrillation. Cerebral embolism occurred 10 times, with 3 deaths, iliofemoral 5 times and abdominal twice. Iliofemoral embolectomy was performed on 4 occasions with 3 successes and 1 death (retroperitoneal hæmorrhage from the suture line); the fifth case died from a simultaneous cerebral embolus.

Cardiac Arrhythmia.

Ninety-nine patients (25 per cent.) showed pre-operative atrial fibrillation. The incidence of pre-operative arrhythmia was higher in the older age groups (Table 4). It was also noted that the larger the left atrium the higher the incidence of atrial fibrillation (Table 5).

Valvotomy caused auricular fibrillation in 50 patients previously in sinus rhythm. Nine of these 50 patients spontaneously reverted to sinus rhythm within a few hours or days. Reversion with quinidine was obtained in 26. Thus 15 patients

TABLE 4.

INCIDENCE OF FIBRILLATION IN THE AGE GROUPS.

AGE GROUP		PER CENT. WITH FIBRILLATION
10-19	...	14.3
20-29	...	10.5
30-39	...	21.5
40-49	...	44.0
50-59	...	81.3

TABLE 5.

RELATIONSHIP OF LEFT ATRIAL SIZE TO THE INCIDENCE OF FIBRILLATION.

L.A. SIZE		PER CENT. WITH FIBRILLATION
+	...	9.5
+ +	...	15.5
+ + +	...	41.5
+ + + +	...	85.5

developed permanent fibrillation as a result of mitral valvotomy. No patient with established atrial fibrillation regained sinus rhythm after valvotomy, and no attempt was made to achieve this.

Congestive Heart Failure.

Forty-two patients had an indubitable history of one or more episodes of congestive heart failure in the past, or were actually in congestive failure when admitted for operation. The dominant rhythm was fibrillation in thirty-nine. The occasional spectacular result, exemplified by the following case indicates that operation may be worthwhile, even in patients with intractable congestive cardiac failure.

A woman aged 43 years became increasingly breathless over a period of two years; for six months she had been totally incapacitated with congestive heart failure. On admission to hospital she was dyspnœic and cyanosed, the jugular venous pressure raised 10 cm., the liver tender and enlarged, the ankles swollen, and the lung fields moist. The signs of failure were unaffected by a rigid medical regime. Catheterisation showed a mean pulmonary artery pressure of 65 mm. Hg. At operation the mitral orifice was extremely small and slit-like, with some calcification; a satisfactory finger fracture valvotomy was achieved. All signs of cardiac failure disappeared after operation. The mean pulmonary artery pressure fell to 27 mm. Hg. Five years later she works in a shop, does all her housework, and has no dyspnœa on ordinary exertion.

Complicating Tricuspid Lesions.

Tricuspid insufficiency was detected by Bailey and Bolton (1956) in 17 per cent. of cases during routine exploration of the tricuspid valve at mitral valvotomy. In many cases the condition is in part functional incompetence and improvement can be anticipated following mitral valvotomy. Tricuspid stenosis is a more important lesion, since it is amenable to surgical correction. The diagnosis may be missed since some of the signs are masked by those of the invariably associated mitral lesion. Tricuspid stenosis was found as a complication in three cases (Pantridge and Marshall, 1957) and two have had tricuspid valvotomy with considerable benefit.

Pregnancy.

It has been stated that the risk of mitral valvotomy is greater during pregnancy (Burwell and Metcalfe, 1954). However, eighteen cases in this series were operated on during pregnancy (Marshall and Pantridge, 1957). In each case the operation was performed either as an emegency measure or following failure of strict medical therapy. There was no maternal death and only one fœtus was lost from premature labour two days after valvotomy.

The age of the patient.

Operation was delayed when possible in patients under 20 years of age because of the likelihood of subsequent attacks of rheumatic activity with possible re-stenosis of the mitral valve. However, operation has been performed in fourteen such patients because of severe pulmonary congestion. The youngest patient was

aged 13. Although there was evidence of florid rheumatic activity in seven of twelve biopsies, rheumatic manifestations occurred post-operatively in only one case. The initial results in this group have been very gratifying, immediate improvement being excellent or good in all. One patient, however, deteriorated nine months after operation and died two years later; at autopsy there was active rheumatic carditis and re-stenosis of the mitral valve. The long-term outlook in the remaining cases is uncertain, since seven of the operations were performed in the last year and the longest follow-up is $2\frac{1}{2}$ years; however, the improvement has been maintained to date in all thirteen.

It has often been stated that valvotomy is rarely, if ever, indicated in elderly patients. The reasons given are that the anatomical lesions are of longer standing and more complex than in younger patients, the operative risk is greater, valvotomy is more likely to be inadequate, and that the elderly can tolerate a considerable reduction in their activities. Nevertheless recent published experience favours operation for otherwise suitable cases, irrespective of age. d'Allaines, Dubost and Blondeau (1955) operated on 14 cases over 50 years, with 2 deaths, and concluded that neither the morbidity nor the mortality was high enough to constitute an argument against valvotomy. In our series 16 patients were aged between 50 and 58. The results were good or excellent in 8, 4 were improved, 3 showed no improvement, and 1 died from cerebral embolism, the average grade of improvement was 1.38. Although the results are less good than those of the whole series they are satisfactory enough to indicate that valvotomy may be considered in patients who have reached the sixth decade.

Long Term Results of Mitral Valvotomy.

Mitral valvotomy is still a relatively new procedure. Thus, although the immediate results of operation are well documented, little is known of the long-term effects. Of 131 of our patients operated on three or more years ago, 11 have been lost from follow-up, in most cases because of emigration. The post-operative assessment at six months, one year, two years, and three years for the remaining 120 patients is shown in Table 6.

TABLE 6.

Three-year Follow-up of 120 Cases.

Grade	Number and Per Cent. of Cases in Each Grade			
	6 months	1 year	2 years	3 years
	No. %	No. %	No. %	No. %
Excellent	37 (31)	37 (31)	36 (30)	35 (29)
Good (+2)	31 (26)	29 (24)	25 (21)	24 (20)
Improved (+1)	23 (19)	22 (18)	17 (14)	14 (12)
No improvement (0)	22 (18)	23 (19)	30 (25)	35 (29)
Dead (−1)	7* (6)	9 (8)	12 (10)	12 (10)
Average grade of improvement	1.58	1.52	1.36	1.29

*Five were operative deaths; the others died two and four months after operation.

The average grade of improvement of these 120 at the initial assessment (1.58) was slightly inferior to the figure for the whole series; the difference is explained by the higher incidence of operative deaths (5) among the early cases. The remaining cases of the group can therefore be regarded as a representative sample of the whole series.

Between six and twelve months after operation one patient with a good result died suddenly from cerebral embolism and another who was not improved by operation died in congestive heart failure. One patient with a good result and one regarded as improved reverted to their pre-operative state. At the end of one year the average grade of improvement was 1.52.

The table indicates that a significant number of patients deteriorated during the second and third years after operation. Study of individual cases has shown that several factors are responsible for such deterioration. In our experience the more important of these are the development of free aortic incompetence, the production of traumatic incompetence at valvotomy, and myocardial failure. Other factors which may influence the long term as well as the immediate results include active infection and re-stenosis of the mitral valve, change of rhythm, systemic embolism and associated medical conditions.

Aortic Incompetence.

Advanced degrees of aortic incompetence contraindicate mitral valvotomy. Minor degrees of this lesion are difficult to detect in the presence of tight mitral stenosis with high pulmonary vascular resistance, since the early diastolic murmur may be confused with the Graham-Steel murmur of pulmonary incompetence. If mitral stenosis is mandatory on other grounds, a degree of aortic valvular involvement insufficient to alter the pulse pressure is not usually regarded as a contraindication to operation.

Successful mitral valvotomy leads to improved left ventricular filling and therefore to increase in left ventricular stroke volume. An aortic lesion considered insignificant before operation may therefore become highly significant following mitral commissurotomy.

In this series no case complicated by more than minimal aortic incompetence was submitted to mitral valvotomy. Twenty-one patients, however, had basal murmurs indicative of mild aortic valve involvement; in three there was a relatively localised systolic murmur, in six a blowing early diastolic murmur audible in the aortic area and conducted down the left border of the sternum, and in twelve a double aortic murmur. After mitral valvotomy the murmurs were more conspicuous and a double murmur was heard where previously it had been confined either to systole or to diastole. In addition, aortic diastolic murmurs were detected in a further eight patients in whom no basal murmur was heard pre-operatvely, making a total of twenty-nine patients with complicating aortic valvular involvement. The results in this group at the first assessment were comparable with those of the whole series. Fifty-two per cent. were good or excellent, a further thirty-four per cent. improved, and fourteen per cent. unaltered; there were no deaths. The average grade of improvement was 1.55.

A most important finding, however, is that patients with complicating aortic lesions who have been followed up for two or more years have in many cases lost much of their initial symptomatic improvement. In some there have been enlargement of the left ventricle and development of more obvious peripheral signs of free aortic incompetence. In Table 7 the initial results are compared with those two to six years (average 3.5 years) after operation in a group of sixteen patients.

TABLE 7.

INITIAL AND LONG TERM RESULTS IN CASES WITH COMPLICATING AORTIC INCOMPETENCE.

	Excellent	Good	Improved	Not improved	Dead
Initial result	4	5	5	2	0
Result after 2-6 years	2	3	6	4	1

It will be seen that during this period the average grade of improvement fell from 1.81 to 1.06, a much greater rate of deterioration than in the series as a whole. It is, of course, possible that in some of the patients other factors, difficult to evaluate, such as rheumatic myocardial damage, may have played a contributory part in the deterioration.

Traumatic Mitral Incompetence.

The development of undoubted traumatic incompetence at valvotomy was noted by the surgeon in eleven patients who previously had no regurgitant jet. The initial result in this small group was only fair (average improvement 1.18 grades). Six of these patients have been observed for three years or more after valvotomy. Of the four who initially benefited from operation three subsequently deteriorated. Two of the five patients followed up for less than three years have also fallen by one grade each.

We therefore regard incompetence produced at operation as a very unfavourable prognostic sign. Our experience is in marked contast with that of Belcher (1956) who states that the creation of incompetence at operation has little influence on the results of valvotomy.

Active Infection and Re-stenosis of the Mitral Valve.

Although bacterial endocarditis and florid rheumatic activity are easily recognised and demand postponement of mitral valvotomy, it is difficult to exclude the

TABLE 8.

RELATIONSHIP BETWEEN THE E.S.R. AND THE PRESENCE OF ACTIVE RHEUMATIC LESIONS IN THE LEFT AURICULAR BIOPSY.

E.S.R. (Westergran)	No of Patients	Rheumatic Activity Present	Absent
0-14	190	23%	77%
15-29	20	35%	65%
30+	10	30%	70%
TOTAL	220	24.3%	75.7%

presence of low-grade rheumatism. The E.S.R. is a poor index of rheumatic activity as judged by the left auricular biopsy (Table 8) and the leukocyte count, anti-streptolysin titre and electrocardiogram are no more helpful.

The proportion of patients with rheumatic activity in the biopsy falls gradually with increasing age, but in this series differences are relatively slight (Table 9).

TABLE 9.

RELATIONSHIP BETWEEN AGE AND THE PRESENCE OF ACTIVE RHEUMATIC LESIONS IN THE LEFT AURICULAR BIOPSY.

Age	No. of Patients	Rheumatic Activity	
		Present	Absent
10-29	62	37%	63%
30-39	93	26%	74%
40-59	65	23%	77%

This contrasts with the findings of McNeely, Ellis and Harken (1953); 89 per cent. with activity at 20 to 25 years, and 14 per cent. at 45 to 50 years. Histological evidence of rheumatic activity is, however, much less common in cases with fibrillation (8 per cent.) than with those in sinus rhythm (34 per cent.).

McKeown (1953) who studied ninety-two cases of rheumatic heart disease coming to autopsy, found that all cases with active lesions in the auricle had also rheumatic activity in the left ventricle. It is therefore surprising that the presence of such smouldering activity does not appear to influence the results of mitral valvotomy. Post-operative febrile reactions with arthralgia and myalgia ("post-commissurotomy syndrome") were no more common than in patients with normal biopsies. Further, analysis of the patients who deteriorated between the first and third years after valvotomy does not suggest that this deterioration is more likely to occur in those with histological evidence of rheumatic activity (Table 10). Of the group of 120 patients, followed for 3 years, 91 were graded as excellent, good or improved at the end of 6 months (Table 6). Left auricular biopsies were available for 60 of these. Of the 15 patients who deteriorated only 4 (26.7 per cent.) had histological evidence of rheumatic activity. On the other hand 13 of 45 patients (28.9 per cent.) with fully maintained improvement had rheumatic activity. These figures show that the auricular biopsy is of little value as a prognostic index.

TABLE 10.

RELATION BETWEEN LONG-TERM IMPROVEMENT AND THE PRESENCE OF RHEUMATIC ACTIVITY.

	Rheumatic Activity in Biopsy	
	Present	Absent
Maintained initial improvement	13	32
Deteriorated	4	11

Re-stenosis has occurred in at least three patients in the series, at periods between one and four years after operation. It is of interest that in all three the auricular biopsy taken at the first operation showed no evidence of rheumatic activity.

Associated Medical Disorders.

Several patients have deteriorated despite technically satisfactory operations, due to progressive chronic respiratory disorders. Others have gained weight excessively and developed restriction of activity from obesity.

An attempt was made (Table 11) to evaluate the relative importance of the factors which may lead to deterioration after initial success in the group of patients followed up for three years. In some patients two or more factors were responsible. It is of interest that only two patients regarded initially as excellent results deteriorated during the three year follow-up period.

TABLE 11.

FACTORS CONTRIBUTING TO THE DETERIORATION OF 18 PATIENTS BETWEEN 1 AND 3 YEARS AFTER MITRAL VALVOTOMY.

Factor	No. of Cases
Aortic incompetence	6
Mitral incompetence (traumatic)	3
Re-stenosis of mitral valve (confirmed at operation)	3
Onset of atrial fibrillation	3
Congestive failure (probably myocardial origin)	3 (1 death)
Bronchitis and emphysema	2
Obesity	1
Cerebral embolism	1 death
Unknown	1 death

SUBSEQUENT FOLLOW-UP.

Thirty-nine patients have been followed up for a fourth year. Of these, 12 of 13 remained in the excellent grade and 1 fell to good, 3 of 10 good results fell to improved, and 1 of 4 improved patients reverted to the condition present before operation. There were no deaths.

During the fifth year, 2 patients dropped one grade each, the remaining 14 maintained their status (5 excellent, 2 good, 2 improved and 5 with no improvement).

From our experience it is clear that some guidance as to prognosis may be obtained from the initial post-operative results. When the operation is technically successful and the patient's condition restored to normal or approaching normal, deterioration is unlikely to occur for at least 5 years. Thus 87 per cent. of these patients classified as good or excellent 6 months after operation retained these grades at the end of 3 years. When, however, the result at 6 months was improved, only 42 per cent. were still improved 3 years later.

Summary and Conclusion.

The results of four hundred operations for mitral stenosis have been reviewed. Particular attention has been directed to factors influencing the result.

As might be expected the immediate and late results were greatly influenced by the technical success of the operation. When the immediate result was regarded as good or excellent few cases subsequently deteriorated. Deterioration was, however, frequent in those cases classified as "improved" at the initial post-operative assessment.

Associated aortic valvular lesions and mitral incompetence, particularly traumatic mitral incompetence were important factors resulting n failure to maintain initial benefit. Evidence of rheumatic activity in the auricular biopsy did not significantly affect either the immediate or long-term result.

We are indebted to Dr. R. J. Weir for his help in the post-operative care and post-operative assessment of many of the earlier cases.

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The Influence of Environmental Temperature on the Incidence of Bleeding Peptic Ulcer

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WHILE working as house physician in the Royal Victoria Hospital, Belfast, I was impressed by the large number of cases of hæmatemesis and/or melæna admitted to the wards during the month of November, 1955. This investigation was therefore undertaken, in the first place to determine whether the incidence of bleeding peptic ulcer varies at different times during the year. For this purpose, cases of bleeding peptic ulcer admitted to the wards of the Royal Victoria Hospital during the period 1946-1952 were collected from the records. Only those patients with a history of pain suggestive of ulceration, or with radiological or other evidence of an ulcer, were included. Cases of hæmatemesis or melæna associated with carcinoma of the stomach, cirrhosis, or other disease, and those with no evidence of peptic ulceration were not included. During this seven-year period, 548 cases of bleeding peptic ulcer were admitted to hospital. Of these, 292 were patients under 50 years of age, the other 256 being 50 or older. The date on which bleeding first occurred was noted in each case.

It is thought that these cases represent an unselected sample of all the cases of bleeding peptic ulcer in Belfast over this period, so far as the variables considered in this paper (time of year and environmental temperature), are concerned. Gastrointestinal bleeding is generally regarded as an emergency requiring admission to hospital, and the great majority of such patients in this area are admitted either to the Royal Victoria Hospital or to the City Hospital, Belfast, without selection.

RESULTS.

Seasonal Distribution. The numbers of cases occurring in each season of the year over the seven-year period were compared, the results being shown in Table I. In this table, and in Tables 2 and 3, χ^2 was obtained on the basis of a null hypothesis; the expected number of cases in each age group was calculated by dividing the total number by 4, 12, and 7 respectively, in Tables 1, 2, and 3.

Monthly Distribution. The numbers of cases occurring in each month over the seven-year period are shown in Table 2 and in Fig. 1.

Daily Distribution. The total numbers of cases occurring on each day of the week were next calculated, as shown in Table 3.

As expected, the largest number of cases of bleeding peptic ulcer occurred in the winter months (December-February). The number of cases occurring in the summer months (June-August), was only slightly less: 141 as against 157, while considerably fewer cases (118) occurred between March and May. Considering

the incidence in the older age group alone, there is still less variation from one season to another. The differences are not statistically significant at the 5% level. Furthermore, there was no single month in which a strikingly larger total number of cases occurred than in any other month. However, there is a significant difference in monthly incidence of bleeding in the older age group (Table 2), the incidence falling in the summer months, rising suddenly in November, and remaining high during the winter (Fig. 1).

TABLE 1

SEASONAL DISTRIBUTION OF ADMISSIONS.

SEASON	AGE GROUP IN YEARS		
	Total	Under 50	50 and over
December-February	157	85	72
March-May	118	56	62
June-August	141	82	59
September-November	132	69	63
TOTAL	548	292	256
χ^2	5.9	7.3	1.5
D.F.	3	3	3
Probability	$P > 0.1$	$0.1 > P > 0.05$	$P > 0.1$

TABLE 2

MONTHLY DISTRIBUTION OF ADMISSIONS.

MONTH	AGE GROUP IN YEARS		
	Total	Under 50	50 and over
January	48	22	26
February	53	32	21
March	55	23	32
April	34	14	20
May	29	19	10
June	51	27	24
July	41	24	17
August	49	31	18
September	39	20	19
October	39	26	13
November	54	23	31
December	56	31	25
TOTAL	548	292	256
χ^2	18.95	13.2	22.8
D.F.	11	11	11
Probability	$0.1 > P > 0.05$	$P > 0.1$	$0.01 < P < 0.02$

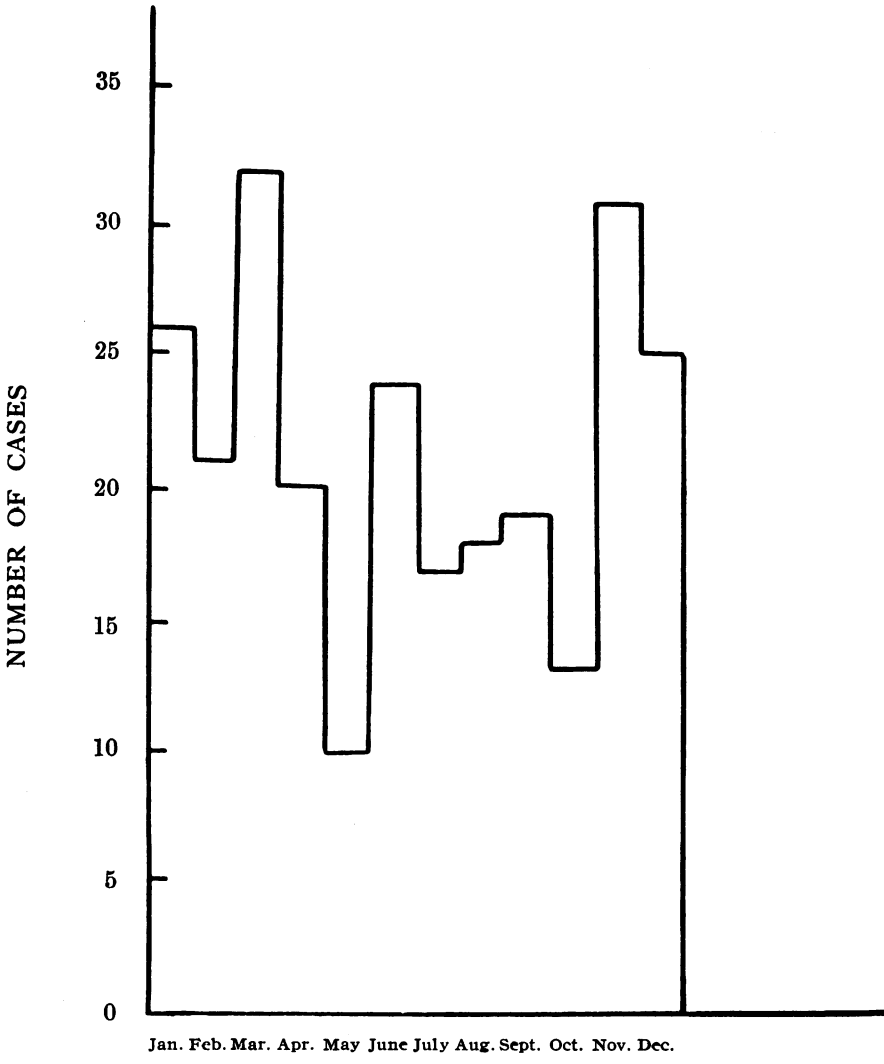

Fig. 1

Monthly Distribution of Bleeding Peptic Ulcer in subjects over 50 years of age.

TABLE 3

DAILY DISTRIBUTION OF ADMISSIONS.

DAY	Total	AGE GROUP IN YEARS: Under 50	50 and over
Monday	77	42	35
Tuesday	73	46	27
Wednesday	85	44	41
Thursday	87	40	47
Friday	86	48	38
Saturday	73	40	33
Sunday	67	32	35
TOTAL	548	292	256
χ^2	4.7	3.9	6.5
D.F.	6	6	6
Probability	$P > 0.1$	$P > 0.1$	$P > 0.1$

Among the possible factors responsible for this significant variation, the influence of environmental temperature seemed important, and this was next studied. From records kept at the meteorological station of Queen's University, Belfast, the maximum and minimum daily temperatures for each day of the period 1946-1952 were obtained. The temperatures and temperature ranges existing at approximately the time that each case of bleeding occurred were compared with the incidence of this complication in order to determine whether any of them correlated significantly.

The following temperatures were studied:—

(a) The maximum temperature on the day of bleeding.

(b) The 24-hour temperature range over the day of bleeding (i.e., the difference between maximum and minimum temperatures on that day).

(c) The minimum temperature on the day of bleeding.

(d) The maximum temperature on the day before bleeding occurred.

(e) The temperature range on the day before bleeding occurred.

(f) The difference between the maximum temperature on the day when bleeding occurred and the maximum temperature of the preceding day.

(g) The difference between the lowest and highest temperatures of each two-day period, the day on which bleeding occurred being the second of the two days.

In all these analyses, the procedure was similar, in that the temperatures or temperature differences were arranged in groups, each covering a range of 5 degrees Fahrenheit. The number of days in which the relevant temperatures lay within each 5 degree group was counted, each day of the 7-year period being allotted to its appropriate group. The relevant temperatures on each day on which a case of bleeding occurred was noted, and also the temperature on the day

preceding each case. Thus the number of cases falling within each temperature group was counted.

These results are shown in Table 4. In this and the subsequent tables, the expected values were derived on the basis of a null hypothesis, assuming that the total number of cases and the total number of days were divided between the temperature groups in the same ratio. For example, in a group comprising 100 days, the expected number of cases would be

$$\frac{100 \times \text{Total number of cases.}}{7 \times 365}$$

TABLE 4

COMPARISON OF OBSERVED WITH EXPECTED DISTRIBUTIONS, ACCORDING TO VARIOUS TEMPERATURES.

TEMPERATURE	AGE GROUP IN YEARS: Under 50 χ^2	D.F.	Probability	50 and over χ^2	D.F.	Probability
Maximum temperature on day of bleeding	12.35	7	$0.1 > P > 0.05$	16.95	7	$0.01 > P > 0.02$
Temperature range on day of bleeding	3.6	4	$P > 0.1$	9.8	4	$0.02 > P > 0.05$
Minimum temperature on day of bleeding	1.0	6	$P > 0.1$	8.9	6	$P > 0.1$
Maximum temperature on preceding day	12.6	7	$0.1 > P > 0.05$	13.1	7	$0.1 > P > 0.05$
Temperature range on preceding day	3.0	4	$P > 0.1$	5.9	4	$P > 0.1$
Difference in maximum temperature between day of bleeding and preceding day	0.5	3	$P > 0.1$	2.4	3	$P > 0.1$
Difference between maximum and minimum temperature of two-day period	3.0	4	$P > 0.1$	7.9	4	$0.1 > P > 0.05$

Table 4 shows that of all the temperatures studied, only two correlated significantly with the incidence of bleeding: the maximum temperature and the temperature range on the day when bleeding occurred. These relationships are shown in detail in Tables 5 and 6, and in Figs. 2 and 3.

DISCUSSION.

A significant difference has been shown in monthly incidence of bleeding peptic ulcer in subjects over 50 years of age. There is an irregular incidence from

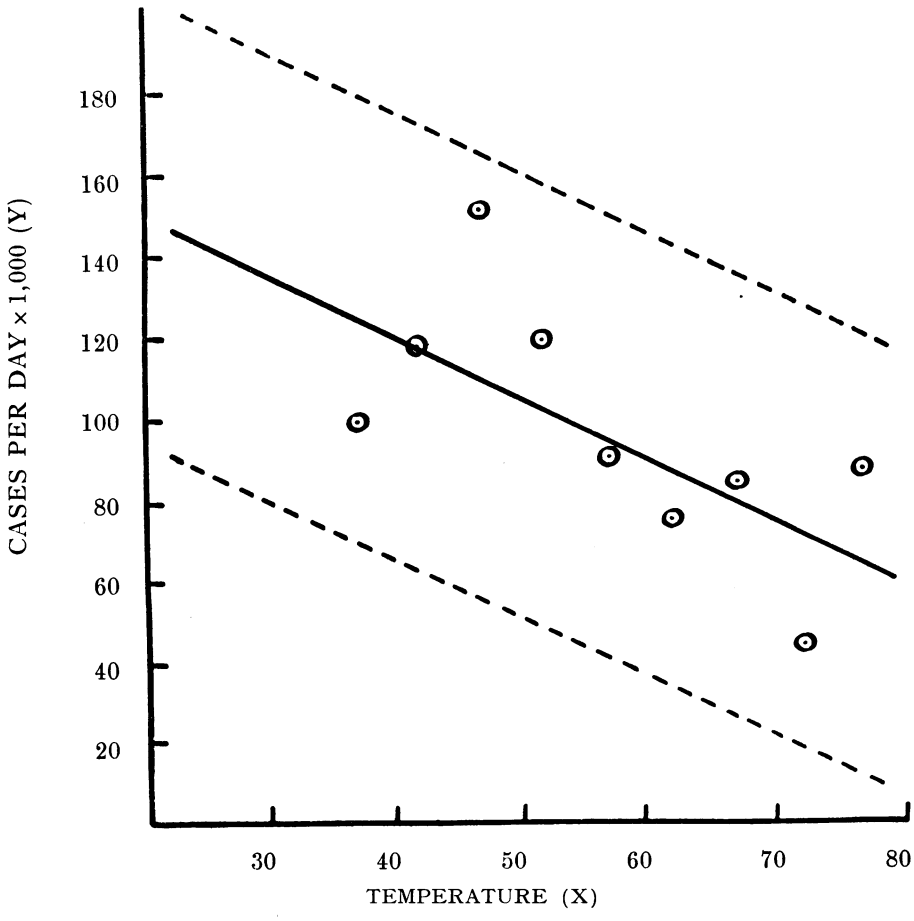

Fig. 2

Regression of number of cases of bleeding in subjects over 50 years of age on maximum daily temperature. The solid line represents the regression line, and the dotted lines $\pm$ 2 S.D. from regression.

$Y = 180.5 - 1.5\ X.$ S.E. of regression coefficient = 0.6.
S.D. from regression = 23.4. $0.02 < P < 0.05$.

January to June, a sudden fall in July, which persists until October, and a sudden rise in November and December (Fig. 1). These findings are similar to, although not identical with, those of Lewison (1950), who showed in patients admitted to Johns Hopkins Hospital between 1928 and 1946, the incidence of bleeding peptic ulcer was lowest in June and July, and highest in October. Duggan (1956), analysing admissions to the Royal Newcastle Hospital, New South Wales, from 1949 to 1954, showed a low incidence in the midyear, and a peak in December and January.

It is of interest to compare the findings of Illingworth (1953), with regard to perforated peptic ulcer. The incidence of this complication is roughly constant each month from January to July, then falls abruptly with the holdiay period till November, and rises to a high peak in December. In none of these other series was a differentiation made between age groups, and in the present series the significant variation is seen to affect the group over 50 years alone, and not the younger group.

The incidence of bleeding does not vary with the day of the week. As a complication of peptic ulcer, therefore, hæmorrhage differs from perforation in that the incidence of the latter is least on Sunday and Monday, intermediate during the midweek, and reaches a high peak on Friday and Saturday (Illingworth, 1953). Illingworth also investigated the variation in incidence of perforation with the hour of the day, and found 4-6 p.m. to be the time of greatest incidence. A comparable study of bleeding peptic ulcer could not be made here, as the exact times of hæmorrhage were not regularly entered in the case records.

Table 4 shows the effect of maximum daily temperature on the incidence of bleeding. It is seen that this temperature is a significant factor in the older age group (50 and over), in that a low maximum temperature favours a high incidence of bleeding from an ulcer. Fig. 2 shows the high degree of correlation between maximum temperature and incidence of bleeding in this group. In the group under 50 this relationship is not evident. This finding is consistent with the variation in monthly distribution of hæmorrhage in the older age group, which

TABLE 5

COMPARISON OF OBSERVED WITH EXPECTED DISTRIBUTION, ACCORDING TO MAXIMUM TEMPERATURE.

MAXIMUM TEMPERATURE (°F.)	AGE GROUP IN YEARS: Under 50		50 and over	
	Observed	Expected	Observed	Expected
30-34	–	1.15	2	1.0
35-39	8	11.5	10	10.1
40-44	35	30.2	31	26.4
45-49	46	36.6	48	32.0
50-54	45	56.2	56	49.2
55-59	41	47.1	37	41.1
60-64	69	56.7	37	49.6
65-69	38	35.4	26	30.9
70-74	5	13.05	5	11.4
75-79	5	4.0	3	3.5
80-84	–	0.6	1	0.5
χ^2	12.35		16.95	
D.F.	7		7	
Probability	$0.1 > P > 0.05$		$0.01 < P < 0.02$	

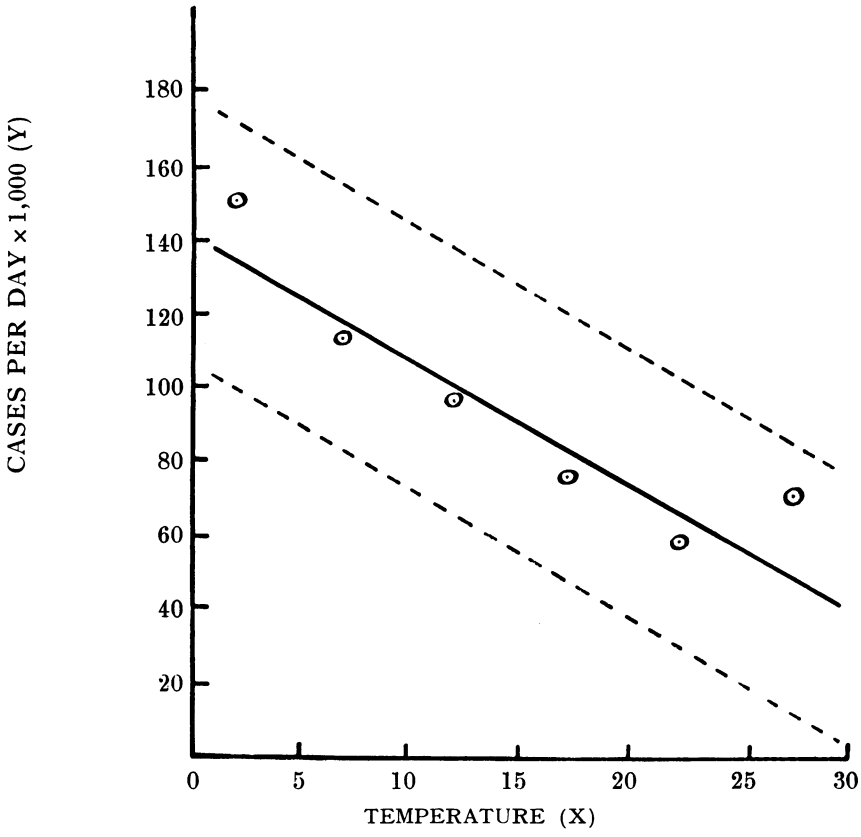

Fig. 3

Regression of number of cases of bleeding in subjects over 50 years of age on the 24-hour temperature range. The solid line represents the regression line, and the dotted line ± 2 S.D. from regression.

$Y = 144 - 3.4\ X.$ S.E. of regression coefficient = 0.6.
S.D. from regression = 12.75. $P < 0.01$.

was found to be least in the summer months and high in November and December. Now the maximum temperature on a given day probably reflects the mean temperature of the part of the day during which an individual would be exposed to outdoor conditions. This assumption is based on the fact that the maximum temperature usually occurs about the middle of the day or in the early afternoon, when people are working, whereas the minimum temperature often occurs at night when people are indoors. Therefore a cold day appears to predispose to bleeding from a peptic ulcer in a subject over 50 years of age.

Table 5 and Fig. 3 show that a correlation also exists between the daily temperature range and the incidence of bleeding in the older age group. A small

range in temperature is associated with a significantly higher incidence of bleeding than a large range. This is consistent with the fact that on days with a low maximum temperature there is likely to be a smaller range in temperature during that day than on days when the maximum temperature is high.

Table 6 shows that the minimum temperature, the mean temperature of the preceding day, and the change in temperature from one day to the next, do not affect the incidence of bleeding peptic ulcer in either age group. The significant feature of these results, then, is that in a subject with peptic ulcer over 50 years of age, bleeding is more likely to occur on a cold day than on a warm one. Exposure to cold may therefore be a precipitating factor in the etiology of bleeding peptic ulcer. In subjects under 50 years of age with peptic ulcer, cold does not affect the incidence of bleeding significantly.

TABLE 6

COMPARISON OF OBSERVED WITH EXPECTED DISTRIBUTION, ACCORDING TO 24-HOUR TEMPERATURE RANGE.

24-HOUR RANGE (°F.)	AGE GROUP IN YEARS: Under 50		50 and over	
	Observed	Expected	Observed	Expected
0-4	15	14.8	20	13.2
5-9	89	86.5	88	77.1
10-14	105	97.9	85	87.3
15-19	49	51.3	35	45.7
20-24	7	13.3	7	11.9
25-29	1	1.6	1	1.4
30-34	–	0.1	–	0.1
χ^2	3.6		9.8	
D.F.	4		4	
Probability	$P > 0.1$		$0.02 < P < 0.05$	

The precipitation by cold of bleeding from a peptic ulcer may be an effect of the stress resulting from exposure. While the mechanism of the effects of stress is unknown, increased liberation of hydrocortisone by the adrenal glands may be an important factor. It is well known that peptic ulcers may bleed or perforate during treatment with cortisone or corticotrophin, although Sandweiss (1954) suggests that such ulcers are usually acute and may occur whether the patient had a past history of ulcer or not.

Crohn and Shwartzman (1937), noted the frequency of gastro-intestinal bleeding following respiratory tract infection, and suggested that this was a manifestation of the Shwartzman phenomenon. The ulcer crater becomes secondarily invaded by bacteria, which induce a lasting state of reactivity in the surrounding tissues. During a subsequent infection, circulating products of bacteria cause necrosis and hæmorrhage in the reactive ulcer site. Thus the higher incidence of bleeding

peptic ulcer during the winter months might, in part, be explained by the prevalence of respiratory tract infection at this time.

It is possible that there is a physiological cold pressor response of the gastric and duodenal blood vessels, which results in vasoconstriction. Atheromatous vessels would not be able to constrict to the same extent as normal vessels, so that the vasoconstriction produced by exposure to cold might protect a young subject with peptic ulcer and normal blood vessels from bleeding, but would not take place in an older subject with atheromatous vessels.

Beaumont (1833), in his famous observations on a subject with a gastric fistula, found that while a humid atmosphere was associated with a slightly lower temperature inside the stomach than a dry one, there was no correlation between the environmental temperature over a wide range and the temperature inside the stomach. Nor did he mention any change in appearance of the interior of the stomach with either intragastric or environmental temperature variation.

Another factor which may be significant is that more hot food and hot drinks are consumed on cold days, resulting in trauma to the stomach mucosa and increased blood supply to its walls.

The consumption of aspirin is another possible factor, although there is no definite evidence to show whether this is really greater on cold days. Waterson (1955), has shown aspirin to be a cause of hæmorrhage due to acute gastric erosion, and it is known to increase the discomfort of many patients suffering from peptic ulcer. Whether aspirin has a more destructive effect on gastric mucosa of subjects over 50 years of age than under is unknown, but older people suffer more from cold, and may consume a greater quantity of aspirin to alleviate their sufferings from "rheumatics" and other complaints which seem to be aggravated by cold weather.

Summary.

The maximum daily environmental temperature has been shown to be significantly correlated with the incidence of hæmorrhage from peptic ulcer in subjects over 50 years of age. A low maximum temperature is associated with a higher incidence of hæmorrhage on the same day. The maximum day temperature probably reflects the mean temperature during which an individual is exposed to outdoor conditions. In subjects over 50 years of age the 24-hour temperature range is also a significant factor, a small range being associated with a high incidence of bleeding. There is also a significant variation in monthly incidence of this complication in older subjects, not unlike that observed with perforated peptic ulcer, although less striking. Possible reasons for these findings are discussed.

The minimum 24-hour temperature and the variations in temperature during the day preceding the onset of hæmorrhage do not significantly influence the incidence of this complication.

I wish to thank Professor G. M. Bull for his constant advice and encouragement, Dr. E. A. Cheeseman for statistical advice, and Mrs. J. McCabe and Mr. J. D. Merrett for help in compiling the tables.

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PERNICIOUS ANÆMIA SURVEY.

THE College of General Practitioners is mapping the incidence of pernicious anæmia in the United Kingdom. Members and Associates of the College have already been notified, and other doctors have also provided data. The work is based on information supplied by doctors about the incidence of pernicious anæmia in their own practices. Much more information will be required before all areas are satisfactorily covered.

This notice is an appeal to all doctors in general practice in the United Kingdom to contribute data, so that the survey may be a success. The information required is simple and covers only four particulars:

(1) Number of patients of all ages in the practice.
(2) Number of cases of pernicious anæmia at present under treatment in the practice.
(3) Was the diagnosis made locally or elsewhere?
(4) Nature of practice—whether urban, semi-urban or rural.

Partnerships should be treated as a single practice. In a practice where there are many visitors, only data about permanent residents is required. Nil returns are especially important, to prevent an over-estimate of the incidence of the disease. Comments and enquiries are welcome. Professor L. J. Witts, M.D., F.R.C.P., has kindly consented to act as consultant adviser for this investigation.

It is emphasised that all details about practices will be regarded as strictly confidential. Information under the four headings mentioned above should be sent to **Dr. E. Scott, Suomi, Westwell, Ashford, Kent,** who is acting as Recorder for the College in this investigation. No further information is required from those who have already written.

The local officers of the College of General Practitioners have asked the Journal to publish the above notice, and they invite all practitioners to co-operate in this important survey.

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Fœtal Loss in Hæmolytic Disease of the Newborn

By W. A. B. CAMPBELL, M.D., F.R.C.P.E.
Royal Maternity Hospital, Belfast

Based on a paper read to the Ulster Obstetric and Gynæcological Society, May, 1957

HÆMOLYTIC disease of the newborn is one of the best examples of a condition in the common ground where the spheres of the obstetrician and pædiatrician overlap.

The general principles of the inheritance of the Rhesus blood groups, and of the pathogenesis of the condition are now well known. There is also general agreement on the superiority of replacement transfusion over simple transfusion as a method of treatment (Mollison and Walker, 1952).

This paper describes our experience in the Royal Maternity Hospital from 1948, when exchange transfusion was introduced as the standard method of treatment, until 1956.

TABLE I.

Cases admitted as Hæmolytic Disease, Royal Maternity Hospital.

	1948	49	50	51	52	53	54	55	56	Total
Rhesus Negative (Unaffected)	5	2	4	4	2	8	6	13	14	58
Stillborn -	4	3	4	5	7	5	11	11	14	64
Neonatal Deaths	–	3	–	1	3	6	5	6	6	30
Survived - (Affected)	3	4	7	14	12	34	42	37	58	211
TOTAL	12	12	15	24	24	53	64	67	92	363

Table I shows the number of infants dealt with in each year, and the outcome. It has been our policy to encourage centralisation of these cases in Belfast, as it is impossible for a centre dealing with only a few cases annually, to provide the necessary team for prompt diagnosis, assessment of severity, and adequate treatment. As a rule, therfore, if a woman is found to have antibodies during any pregnancy, she is referred by the obstetrician in the regional hospital to the City Hospital or the Royal Maternity Hospital for confinement, and she is generally admitted about a month before term, so as to permit of induction of premature labour if this is considered advisable. (Since the appointment of a pædiatrician to Londonderry, about two years ago, some of the cases are dealt with there.)

The table shows the steady increase in the number of infants treated each year; it should be stated that 44 affected and 2 rhesus negative infants are included which were admitted after delivery elsewhere, either because the mother came into premature labour before the day fixed for her admission, or in a few cases because antibodies had not been looked for antenatally.

As a rough indication of the degree to which centralised care has been achieved, the annual number of births in Northern Ireland in the last few years has been about 29,000. On the usual assumption that the incidence of hæmolytic disease is 1/200,

TABLE II.

Distribution of 363 Total Cases.

Gestation		Up to 37 weeks			38 weeks and over			Total		
Previous Stillborn	Delivery	N.A.	Aff.	Total	N.A.	Aff.	Total	N.A.	Aff.	Total
Nil	Induced	1	34	35	25	90	115	26	124	150
	Spont.	1	37	38	21	64	85	22	101	123
1	Induced	2	13	15	2	17	19	4	30	34
	Spont.	-	5	5	–	11	11	–	16	16
2+	Induced	1	16	17	2	8	10	3	24	27
	Spont.	–	7	7	2	4	6	2	11	13
TOTAL	Induced	4	63	67	29	115	144	33	178	211
	Spont.	1	49	50	23	79	102	24	128	152

N.A. = Not affected, i.e., Rhesus negative. Aff. = Affected

there should be about 150 cases annually; in 1956, 63 cases were born in the Royal Maternity Hospital and 32 in the City Hospital; 15 were admitted to the Royal Maternity Hospital and 6 to the City Hospital for treatment after delivery, so that roughly three-quarters of the cases in the country were treated in Belfast.

The counties of origin of the cases treated in the Royal Maternity Hospital were: Belfast 119, Antrim 44, Armagh 42, Down 77, Fermanagh 19, Londonderry 30, Tyrone 31.

LABORATORY SERVICE.

The Blood Grouping and detection of antibodies is done for all hospitals and for general practitioners by the Northern Ireland Blood Transfusion Service, who also provide a constant supply of Rhesus-Negative Group O blood for transfusion.

As was to be expected, the great majority of all our cases of hæmolytic disease were due to "Anti-D," the original rhesus antibody. Only one case each of Anti-C, Anti-$\bar{c}$ and Anti-A were found in the series. This is almost certainly an underestimate of the incidence of such rarer antibodies, but this can be expected, since a Rhesus-positive woman's blood would not normally be examined for antibodies unless a child was born with hæmolytic disease. The number of cases with such uncommon antibodies is, however likely to increase as time goes on, with more awareness of their existence. In 1957 we have already had two cases of Anti-E and one of Anti-Lewis.

Distribution of Cases.

Table II shows the general distribution of the 363 total cases. There are so many independently variable factors in this disease which may affect mortality, that exact statistical analysis of the mortality is almost impossible. In this table, therefore, a deliberate over-simplification has been made, and only three of the possible factors considered :—

1. The number of previous stillbirths due to hæmolytic disease (including a few cases of hydrops fœtalis which lived for a few minutes).
2. The maturity of the infant at delivery, taking an arbitrary division at 37 weeks' gestation.
3. Whether delivery was spontaneous or followed induction of labour (or planned Cæsarean Section).

In each compartment of the table, Rhesus-negative infants are shown as "Not Affected." In all the subsequent comparisons of mortality, these are omitted, for the sake of simplifying the calculations; in point of fact there were very few deaths in this group, and such death could not be due to hæmolytic disease.

TABLE III.

Fœtal Loss : Percentage of Affected Cases.

Previous Stillborn	0				1		
Gestation	< 37	38 +	Total		< 37	38 +	Total
Induced	35.3	12.2	18.5	...	53.8	17.6	33.3
Spontaneous	56.8	15.6	30.6	...	80.0	27.2	43.7
Previous Stillborn	2 +				Total		
Gestation	< 37	38 +	Total		< 37	38 +	Total
Induced	75.0	37.4	62.5	...	44.2	15.4	26.9
Spontaneous	85.8	50.0	72.6	...	63.2	19.0	35.9

Fœtal Loss.

Table III shows the fœtal loss expressed as a percentage of the cases shown in the previous table in each section.

The overall fœtal loss is higher than may perhaps be generally realised, 24 per cent. where there has been no previous stillbirth, 37 per cent. where there has been one previous stillbirth, 65 per cent. after two or more previous stillbirths. As one would expect, the loss is higher in each section where delivery was before the end of the 37th week.

From Table III it would appear that induction of labour reduces the fœtal loss, and these figures correspond roughly with those reported by Dr. Fisher from this hospital earlier this year (Fisher, 1957). There is, however, one obvious fallacy in considering such uncorrected figures as they stand; a number of women are included in the series whose fœtus died early in pregnancy, and in the great majority of these cases no attempt was made to induce labour; this has the result

TABLE IV.

Fœtal Loss : Excluding Intrauterine Death before end of 34th Week.

Previous Stillborn	0				1		
Gestation	< 37	38 +	Total		< 37	38 +	Total
Induced	29.0	12.8	17.0	...	25.0	16.6	19.2
Spontaneous	27.8	14.9	17.6	...	50.0	30.0	33.3

Previous Stillborn	2 +				Total		
Gestation	< 37	38 +	Total		< 37	38 +	Total
Induced	66.6	37.5	55.0	...	37.2	15.2	22.1
Spontaneous	50.0	33.3	40.0	...	31.7	17.5	30.6

of adding a number of stillbirths to the "spontaneous" group, and thus increasing the mortality. In Table IV, therefore, I have shown the mortality after leaving out all cases where the fœtus was known to be dead by the end of the 34th week. I have selected this stage of pregnancy because, in fact, only 3 out of 35 infants delivered before the end of that week survived, and induction of labour at any such early stage is very unlikely to save many infants.

The number of cases concerned, especially in the groups with previous stillbirths, are too small to be considered as significant, but it can at least be seen that there is no likelihood of effecting a very large saving of fœtal life by routine induction of labour.

This does not mean, of course, that induction of labour is never indicated, and there must be some women with a history of previous stillbirth and a homozygous husband, in whom termination of pregnancy 3-4 weeks before term will produce a living child, not too premature to have a reasonable chance of survival. Such women should be admitted at about the 35th week, and a very careful watch kept for any sign of fœtal distress. A rising indirect Coombs titre of the order of 1/750-1/1000, or the presence of "Bevis-type" pigments in the amniotic fluid might give additional evidence of a severely affected child. In such a case, labour should be induced, and if delivery does not occur promptly, Cæserean Section should be considered. In any event, pregnancy should not be allowed to continue beyond the expected date of delivery.

TABLE V.

Outcome by Parity of Mother.

Parity	Born	S.B.	S.B. Rate %	Live Born	N.N.D.	N.N.D. Rate %
1–2	39	8	20.25	31	3	9.5
3–4	107	24	22.4	83	9	10.8
5–6	80	20	25.0	60	5	8.3
7–8	35	6	17.1	29	7	24.1
9 +	37	6	16.2	31	4	13.0
TOTAL	298	64	21.4	234	28	11.9

N.N.D. = Neo-natal Deaths.

TABLE VI.

Blood Group of Mother (Affected only).

Group	Mothers	Births	S.B.	Rate %	Live Births	N.N.D.	Rate %
A	96	110	24	21.8	86	14	16.3
O	140	145	32	22.0	113	11	9.7
B, AB	38	43	8	18.5	35	3	8.6

INFLUENCE OF MATERNITY PARITY.

Table V shows the effect of the parity of the mother upon the stillbirth and neonatal death rates. There is no consistent increase in mortality as the parity increases; this probably indicates the interaction of several factors; the higher parity groups probably include an increased number with heterozygous husbands, in whom the first affected child does not occur until relatively late in the birth order; there is a known variability in the ease with which women become sensitised to the rhesus factor; many of those with homozygous husbands and early occurrence of severely affected infants do not choose to have further children, thus increasing the mortality in the early groups only, as a counterbalance to the general tendency for the severity of the disease to increase in successive pregnancies.

ABO BLOOD GROUP.

It will be seen from Table VI that while there is no apparent difference in the stillbirth rate for the various blood groups, there is a considerable increase in the neonatal death rate of the infants born to mothers of Group A. This may be a chance finding, as it is not significant by the ordinary probability test (X^2) even without considering other variables. The blood group of the father does not seem to have had any influence on the mortality of the fœtus.

TABLE VII.

Distribution of Blood Groups (Percentage).

Group	A	B	AB	O
10,000 Donors	33.7	9.8	2.7	53.8
500 RMH -	34.8	10.0	3.8	51.4
Mothers -	35.0	11.3	2.6	51.0
Fathers -	21.4	5.6	2.0	71.0

In Table VII I have compared the blood group distribution in :

(a) 10,000 donors registered in 1956 with the Northern Ireland Blood Transfusion Service.

(b) 500 consecutive multiparæ without Rhesus antibodies, from the Royal Maternity Hospital.

(c) The mothers in the present series.

(d) The fathers in the present series.

It will be seen that the first three samples compare very closely, but that there is a considerable increase in the incidence of Group O among the fathers. This is

statistically "highly significant." The probable explanation is that where the blood of the fœtus is compatible as regards ABO groups with the mother's blood, sensitisation to the rhesus factor can easily occur, whereas if the fœtus and mother are incompatible, the fœtal cells which enter the maternal circulation are likely to be destroyed rapidly by the more powerful ABO antibodies before Rhesus sensitisation can occur.

Influence of Treatment.

In Table VIII I have attempted to subdivide the neonatal deaths to see how the loss might be reduced.

Eleven babies born in the Royal Maternity Hospital, and 4 admitted, died after "incorrect" treatment. Four babies born in the hospital did not receive exchange transfusion; in 2 of these a false negative Coombs test, including 1 rhesus positive mother with Anti-C, confused the issue; the other 2 had hæmoglobin levels above 110 per cent. and bilirubin below 3 mgm. per cent., which at that time was

TABLE VIII.

	Born in R.M.H.	Admitted
Incorrect Treatment		
No Exchange	4	4
Unsuccessful Exchange	4	–
Inadequate Exchange	3	–
"Correct" Treatment	11	3
Unrelated	1	–
Total	23	7
Rate/100 Live Births	11.6	16.0

considered to signify such a mild degree of hæmolysis as to make treatment unnecessary; all 4 died of kernicterus. Of the 4 babies admitted who did not receive exchange transfusion, 2 were "in extremis" and died before transfusion could be attempted, the other 2 were over 36 hours old, and at that time this was considered to rule out exchange transfusion.

In 4 babies it was impossible to effect an exchange transfusion owing to technical difficulty. Three of these were very severely affected and died in a few hours, the fourth died on the fourth day with kernicterus. Three babies received one successful exchange, but later died of kernicterus; these occurred before the need for repeated exchange transfusions, if the bilbirubin rose above a critical level (20-30 mgm. per cent. according to the method used) was realised.

It should have been possible to avoid 10 of these 15 deaths if our present experience and criteria had been available, but it will be seen that 14 infants died in spite of "correct" treatment. Five of these had hæmoglobin levels below 60 per cent. in the cord blood, and it is appreciated that the mortality in this group is inevitably high, especially since 4 of the 5 weighed less than 5½ lbs.

The remaining 9, however, were not severely affected, and only 3 of them weighed less than 5½ lbs. They all died during or immediately after transfusion. One was

during a third exchange, 2 during the second exchange, and the rest during the first exchange. The cause of death in these infants in obscure, but hyperkalaemia may have been responsible in some cases (Campbell, 1955).

Place of Confinement.

The number of admitted babies in the present series is admittedly small, but the increased neonatal mortality shown in Table VIII strengthens the strong clinical impression that such infants present a greater problem than those born in the hospital.

The infants born elsewhere, and not even admitted for treatment, would appear to be at even greater risk. Table IX is an attempt to calculate this risk, using calculations based on the Registrar General's returns.

Even allowing for the obvious fallacies of this type of calculation, there would seem to be a definite advantage for the infant born and treated in a hospital with a

TABLE IX.

Neonatal Deaths in and out of Hospital, 1955 and 1956.

	Born Affected	Neonatal Deaths	"Rate"
Northern Ireland - (Calculated)	300 ...	50 ...	16.6
Royal Maternity Hospital (Observed)	108 ...	8 ...	7.4
Northern Ireland, less Royal Maternity Hospital	192 ...	42 ...	21.8

properly equipped team of medical, nursing and laboratory staff. (If infants born and treated in the Belfast City Hospital, the other large centre in the Province, were excluded from the table, the mortality for the remainder would be even higher).

Walker and Mollison (1957) have published figures obtained in a similar, but more accurate manner, showing the same trend in England and Wales, and also stressing the need for treatment to be concentrated in a few hospitals with a large annual experience of the disease.

Summary.

In the Royal Maternity Hospital from 1948 to 1956 inclusive, 305 infants were seen suffering from hæmolytic disease of the newborn, 96 (31 per cent.) were lost, from stillbirth or neonatal death. It is unlikely that routine induction of labour will significantly reduce this loss.

Fœtal loss is increased by a history of previous hydrops fœtalis, inadequate exchange transfusion, or delivery outside a properly equipped hospital.

The treatment of these cases has been a matter of teamwork, and I should like to thank my obstetric and pædiatric colleagues who have co-operated in this work over the years.

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A Case of Malignant Carcinoid of the Cæcum

By S. D. NELSON, M.B., B.Ch.
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GREAT interest has been taken during recent years in a syndrome associated with malignant carcinoid of the small intestine. This syndrome was first described by Biörck, Axen and Thorson in 1952, and later reviewed by Thorson et al., in 1954. They state the syndrome as follows:

1. Malignant carcinoid of the *small* intestine.
2. Metastasis to the liver.
3. Valvular disease of the right side of the heart (usually pulmonary stenosis, often with tricuspid incompetence and without septal defect).
4. Sudden flushing of the skin.
5. An unusual type of patchily distributed, changing cyanosis.
6. Frequent watery stools.
7. Finally, œdema and ascites.

A case showing most of the features of the Biörck-Thorson syndrome was investigated in Banbridge Hospital and is described.

CLINICAL HISTORY.

The patient, a single lady aged 62, was admitted to hospital on 14th May, 1957. She had been quite well till five weeks before admission, when she developed a cough, and a feeling of weakness, associated with anorexia. One month prior to admission she had a prolapse of the rectum which was easily reduced. Since then she had been suffering from slight diarrhœa. Three weeks prior to admission she developed ankle œdema and found difficulty in walking due to the weight of her legs and to a feeling of "pins and needles" in them when she walked. During this time she had also been having periodic "flushes" and breathless attacks when she tried to walk.

On examination she was thin and showed cyanosis of face and lips. There was marked pitting œdema of both legs and of abdomen to the level of the costal margin, and an eczematous rash on the anterior aspects of both legs, the abdomen and on the hands. There was one large rubbery gland palpable in the left axilla.

Cardio-Vascular System.—Pulse 80/min., regular. B.P. 160/180 mm. Hg. No jugular venous pulsation. Marked enlargement of the heart. Systolic and diastolic murmurs were audible in mitral and tricuspid areas, and a systolic murmur was present at base of heart.

Respiratory System.—Some dullness at right base. Otherwise no positive findings.

Alimentary System.—Abdominal wall so œdematous as to make accurate palpation impossible. Liver thought to be about four finger breadths enlarged. Hard fixed lump palpable high up on P.R.

C.N.S.—No findings of significance.

Urine.—S.G. 1015. Albumin and Sugar—nil.

Course and Investigations.

16-5-57.—**C.S.U.**—Occasional pus cell. Coliform organisms.

Fæces.—Occult blood negative.

Blood Picture.—Hb. 92% (13.3 gm/100m.). W.C.C. 3,300/cmm. Neutrophils 69%. Lymphocytes 29%. Monocytes 2%. Erythrocyte Sedimentation Rate 11 mm. in 1 hour.

Blood Urea.—24 mgm%.

Plasma Proteins.—Total 5.1 gm%. Albumin 3.0 gm%. Globulin 2.1 gm%.

Thymol Turbidity.—1 unit.

W.R. and Khan.—Negative.

The patient was confined strictly to bed and treated as for congestive cardiac failure. In addition she was given Vitamin B Complex 1 ampoule I.M. alternate days, Vitamin C 100 mg. t.i.d. and Penicillin 500,000 units bd.

24-5-57.—The œdema had subsided slightly. Chest X-ray report, "There is a little fluid at each costo phrenic angle. The heart is markedly enlarged."

E.G.C.—A low voltage tracing showing no definite abnormality.

3-6-57.—The œdema had now subsided sufficiently for a hard fixed mass to be palpable in the R.I.F. The liver was now definitely four finger breadths enlarged and very hard.

11-6-57.—**Barium Meal.**—nothing abnormal in œsophagus, stomach or duodenal cap.

24-6-57.—The patient had been allowed up, but she now became very dyspnœic and had a bluish flushing of the face and neck.

26-6-57.—**Barium Enema.**—"The enema passed into the ascending colon, but not the cæcum. The appearance suggests a neoplasm."

27-6-57.—Laparotomy (Mr. Gallagher and Mr. K. G. Orr).

Findings. — 1. Huge mass in root of mesentery with ascending colon stretched over it and perhaps invaded.
2. Liver grossly enlarged and nodular with secondaries. Two stones in gall bladder.
3. Appendix and spleen normal.

Procedure.— 1. Ileo transverse colostomy.
2. Nodule removed from liver for histology.

4-7-57.—**Report on nodule from liver.**—"Secondary carcinoid."

Report on 24-hour specimen urine.—"The patient is excreting grossly abnormal quantities of 5 hydroxyindole acetic acid—the most probable cause of which is an argentaffinoma. There is in addition excretion of serotonin, 5 hydroxy-tyrptophane, indole lactic acid, indole acetic acid and 5 hydroxy acetic acid sulphate. The presence of these latter compounds suggests the presence of renal metastases from a carcinoid."

Following operation the patient's condition did not improve and on 10-7-57 she started to become incontinent of urine and fæces.

13-7-57.—Œdema of legs now very marked. Patient drowsy and confused. Incontinent of urine and fæces.

She showed gradual deterioration and died on 31-7-57.

Post-Mortem (Dr. J. Lowry).

Gross Findings.

Cardiovascular System.—The heart was moderately enlarged, with dilatation of the right ventricle. The left ventricle was markedly hypertrophied. The tricuspid valve was thicker and more opaque than normal but there was no definite tricuspid stenosis. The pulmonary, mitral, and aortic valves were normal. The coronary arteries were grossly atheromatous.

Abdomen.—A mass $3\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2\frac{1}{2}''$ was present in the angle between the ileum and cæcum, both of which were densely adherent to it. This mass superiorly extended up to and was adherent to the pancreas; it was yellow in colour and showed areas of hæmorrhage and necrosis. On section, apart from the large tumour mass a smaller round one $\frac{1}{2}''$ in diameter was present in the submucosa of the cæcum.

Liver.—Enlarged with secondary deposits visible under the capsule. On section, the right lobe was almost entirely replaced by tumour deposit.

Kidneys.—Both appeared to be normal .

Histology.

Heart.—Some patchy increase of fibrous tissue throughout the myocardium suggestive of ischæmic fibrosis. On the tricuspid valve there is a fairly uniform laying down on the surface of new fibrous tissue which is fairly well collagenised and there is little active fibroblastic proliferation. Towards its surface there are some thin walled, poorly formed capillary channels. This new fibrous tissue extends down and envelopes the chordæ tendinæ.

Lungs.—No thickening of intima or media of pulmonary arteries or arterioles.

Tumour Tissue.—Typical carcinoid argentaffinoma growth.

Lymph glands.—Those from the mesentery and para-aortic region show extensive replacement by tumour tissue.

Kidneys.—These show (a) anteriosclerotic changes and (b) an area resembling cortical necrosis, but no tumour tissue.

Discussion.

Carcinoids arise from the argentaffin (Kulschitsky) cells of the crypts of Lieberkühn, so that they may be found anywhere along the intestine. Many are discovered as a chance finding on histological examination of specimens from appendicectomies, but these are mainly of the benign variety. Only about 20% of carcinoids show malignant changes (Ogilvie, 1951), and these appear to arise mainly in the terminal ileum or cæcum, and occasionally in the appendix.

Malignant carcinoids metastasise to the liver and to mesenteric and para-aortic lymph glands. In many cases the right lobe of the liver is grossly infiltrated, whereas the left lobe may be almost clear.

Many features of the Biörck-Thorson syndrome are thought to be due to the presence in the blood of excessive amounts of 5 hydroxy tryptamine (serotonin). This substance is present normally in the body in small amounts approximately five-sixths being bound to the platelets, and the remainder present in the serum. It is secreted by the Kulschitsky cells and has the following actions (Branwood and Bain, 1954).

1. It increases peristalsis.
2. It causes bronchoconstriction.
3. It causes an increase in pulmonary arterial pressure.
4. Injected intradermally it causes local congestion and venous spasm.
5. It may play a part in nervous function.

Serotonin is produced in large amounts by both the primary carcinoid and its secondaries. It is inactivated in the pulmonary vascular bed by an enzyme mono-amine oxidase (Globe, May and Sandler, 1955), which converts it to 5 hydroxy indole acetic acid (5 H.I.A.A.) and this is excreted by the kidneys. The excretion of 5 H.I.A.A. over twenty-four hours is so grossly abnormal that estimation of urinary 5 H.I.A.A. is the diagnostic test. It is noteworthy that in patients suffering from cancer of the pyriform fossa, larynx or bronchus, excretion of 5 H.I.A.A. is also markedly increased after administration of 2 grammes of l-tryptophan although not to such a marked degree as in carcinoid (Boyland, Gasson and Williams, 1956).

Although the increased amount of serotonin present is carried mainly on the platelets, in vitro studies have not revealed any abnormality of them, such as increased adhesiveness (Globe et al.). It has been suggested that a high level of serotonin may cause endothelial damage to the right side of the heart leading to deposition of platelets (*Lancet*, 1955).

The cardiac lesions have been accurately described by Smith and Campbell (1956). The end result is usually pulmonary stenosis, often with tricuspid incompetence. The disease process appears to be a gradual thickening of the valve cusps due to deposition of platelets, with subsequent organisation. Platelets may also be deposited in the pulmonary arteries. This is not a thrombotic process, such as occurs in subacute bacterial endocarditis. It has been suggested that the pulmonary vascular lesions are merely a hypertrophic phenomenon following a prolonged vaso-constriction (Jenkins and Butcher, 1955).

The cardiac lesions are not related to the cyanosis which is often a feature of early cases. Selzer et al. (1949) has stated that cyanosis only occurs in pulmonary stenosis without septal defect, after the onset of cardiac defeat. Possibly cyanosis may be due to a local action of serotonin 5 H.I.A.A. or to another (as yet unidentified) product from the tumour.

The flushing attacks which are so prominent in this syndrome seem almost certainly to be related to a sudden release of serotonin from the tumour. Flushes have been described as being precipitated by alcohol (Snow et al., 1955), or by large amounts of food, or by exertion. The flush is a peculiar bluish purple colour, appearing in patches and altering quickly. It is most marked over the head and neck, and upper part of the thorax. Flushing attacks may be associated with bronchial spasm, and marked cyanosis, or with severe prostration and collapse, and very often with diarrhœa and abdominal pain.

Diarrhœa which occurs at some stage in every case is intermittent in nature, the patient having a normal bowel habit for several days or weeks, then an attack of diarrhœa lasting some 1-3 days during which 5-6 watery stools per day are passed. These attacks may become more frequent but always maintain their intermittent nature. There are often severe cramps. An important feature is that occult blood is only very rarely present in the stools.

Œdema and ascites occur usually as a terminal feature in the Biörck-Thorson syndrome. A variety of factors, congestive heart failure, compression of inferior vena cava, hepatic failure, vitamin deficiency (consequent on chronic diarrhœa) and capillary damage due to toxic products from the tumour, has been suggested and may contribute.

The patient described had an eczematous rash on the legs and abdomen. This was thought at the time to be due to gross œdema, and as the œdema subsided the rash disappeared. However in a series of twenty cases reviewed by Duncan, Garven and Gibbons (1955), four (20 per cent.) had an eczematous rash on the legs and abdomen, and sometimes on the hands.

During her stay in hospital, it was noted that the patient became confused at night and later during the day also. In the series reviewed by Duncan, Garven

and Gibbons (1955), three (15 per cent.) had nervous symptoms of this type. This may be due to a disturbance of brain metabolism by high levels of serotonin. Woolley and Shaw (1954) believe that certain psychoses such as schizophrenia may be related to abnormal levels of serotonin.

Treatment has, so far, been disappointing in that it must be only symptomatic. Many of these cases progress only very slowly and various forms of specific treatment appear only to accelerate the course of the disease. Deep X-ray therapy (Shaw and Smith, 1956) and intravenous injection of radioactive gold (Au^{198}) (Goble et al.) have been tried, in both cases with the object of destroying hepatic secondaries (Au^{198} is concentrated in the liver). Serotonin antagonists (hysergic acid, and "B.O.L. 148") have also been tested, unfortunately a dose of these compounds sufficient to produce any noticeable effect produces convulsions and delirium. Surgical removal of the primary tumour and lymphatic secondaries has led to a temporary symptomatic improvement, but in all cases so far recorded, liver metastases were present, and these could not be extirpated.

Summary.

The Biörck-Thorson syndrome associated with malignant carcinoid of the small intestine is described and illustrated by a case occurring in a 62-year-old woman. Her primary complaints were marked swelling of the legs, breathlessness, and diarrhœa. As abdominal œdema subsided a mass became palpaple in the right iliac fossa. The primary growth was found to be in the cæcum, and there were massive secondaries in the mesenteric and para aortic lymph glands, and in the liver. The tricuspid valve showed thickening by fibrous tissue. Large quantities of 5 hydroxy-tryptamine were present in the urine. Treatment was unsuccessful and the patient died after an illness lasting almost four months. Features of the syndrome and their pathogenesis are discussed.

I wish to thank Mr. H. W. Gallagher, F.R.C.S., Dr. J. H. Bruce, M.D., M.R.C.P., and Dr. J. Lowry, M.D., M.R.C.P.I., for permission to publish this case. I would also thank Dr. J. E. Morison, M.D., D.SC., for his help.

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Hydrocortisone in Minor Orthopædic Conditions

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DISILLUSIONMENT and disappointment frequently follow the initial enthusiasm for using a new therapeutic substance. Only prolonged and careful study by many workers reveals the true value and the limitations of a new drug. When Hench and his associates at the Mayo Clinic introduced cortisone for the systemic treatment of rheumatoid arthritis (Hench et. al., 1949) hopes ran high at first, but gradually it was realised that cortisone was no more effective than the humble aspirin tablet in the treatment of this chronic disease (Medical Research Council Report, 1955). Likewise, the local injection of cortisone and hydrocortisone was, at first, reported to produce beneficial results in many arthritic and soft tissue lesions (Hollander et al., 1951; Robecchi and Capra, 1953; Murley, 1954). Later reports, however, suggested that these injections were no more effective than injections of local anæsthetic agents or inert substances (Freeland and Gribble, 1954; Brockley, 1956). In order to help determine whether hydrocortisone was of any real value in orthopædic practice an investigation was carried out to study the effects of this hormone on a wide variety of minor orthopædic conditions.

TABLE I

CONDITIONS TREATED WITH LOCAL INJECTIONS OF HYDROCORTISONE.

CONDITION	NUMBER OF PATIENTS
"Frozen shoulder"	54
Supraspinatus tendinitis	33
Chondromalacia patellæ	26
Plantar fasciitis	15
"Tennis elbow"	14
Osteoarthritis of knee	13
Patello-femoral arthritis	10
Miscellaneous	35

TOTAL—200 consecutive patients.

MATERIAL AND METHODS.

During a period of two and a half years, two hundred patients, suffering from various non-rheumatoid lesions, were treated with local injections of cortisone or hydrocortisone (Roussell). The main conditions treated are shown in Table I. The miscellaneous group included arthritis of small joints, post-traumatic and post-operative stiffness of joints, and painful areas in the low back. Only thirty-four patients were given cortisone, all the rest receiving hydrocortisone.

Aseptic technique was employed when giving the injections. If only soft tissues were being injected, 1,000 units of hyalase were mixed with the 1-2 ml. of xylocaine (Duncan Flockhart) used to anæthetise the skin and deeper tissues. Before any injection was given an attempt was made by palpation and movement to localise

the painful area accurately. The preliminary injection of xylocaine often aided this localisation.

At the shoulder, the conditions treated were the acute (supraspinatus tendinitis) and the chronic ("frozen shoulder") phases of degenerative periarthritis. When manipulation of the shoulder was not employed, the injection was made in radial fashion from the lateral, subacromial aspect of the joint. The joint capsule, supraspinatus tendon and subacromial bursa were infiltrated with 50 mg. hydrocortisone. Four such injections were given at weekly intervals. If the patient originally had pain in the region of the long head of biceps, that area too was injected. If, however, a stiff shoulder was being manipulated under a general anæsthetic, one injection of 25-50 mg. hydrocortisone was made into the main joint cavity at the conclusion of the manipulation.

Three weekly intra-articular injections, each of 50 mg., were usually given for conditions affecting the knee joint. Painful heels (plantar fasciitis) received two injections of 25 mg. hydrocortisone, infiltrating the affected tissues on the plantar aspect of the calcaneum from the medial side. A single injection of 12.5-25 mg. into the painful area usually sufficed for so-called "tennis elbow."

Each patient was warned that he might experience some discomfort at the site of injection for 24-36 hours. The majority of patients were followed up for at least a month after the last injection had been given; those with chronic lesions were seen at intervals for up to one year.

TABLE II

Condition	Number Treated	Result		
		Good	Failed	Recurred
"Tennis elbow"	14	13	1	2
Plantar fasciitis	15	14	1	2
Chondromalacia patellæ	26	22	4	5
Supraspinatus tendinitis	33	31	2	3

Results—Good.

TABLE III

Condition	Number Treated	Result		
"Frozen shoulder"		Good	Fair	Failed
(a) without manipulation	29	1	19	9
(b) with manipulation	25	1	15	9
Osteoarthritis of knee	13	0	4	9
Patello-femoral arthritis	10	2	5	3

Results—Poor.

Results.

The principal findings are set out in Tables II and III. Many of the conditions treated are notorious for the variability of their clinical courses and consequently the assessment of results was extremely difficult. The main criterion of success employed when recording results was whether or not the patient obtained rapid relief from the symptoms of which he complained. A response to treatment described as "Fair" (Table III) means that one sympton, usually pain, had been

relieved, but that another symptom, mostly stiffness, was still present to a troublesome extent.

Good results were obtained in "tennis elbow," painful heel (plantar fasciitis), chondromalacia patellæ, and supraspinatus tendinitis. All the recurrences responded to further injections of hydrocortisone. Nearly one-fifth of the cases of chondromalacia patellæ recurred in from one to eight months. In this group the failures were either in very advanced cases or in those treated with cortisone. Many of the painful heels had failed to respond to conservative measures. The presence of a large spur on X-ray did not adversely affect the response to injection, but all such patients were provided with a cut-out rubber heel pad.

In those conditions in which hydrocortisone did not produce a good result (Table III), transient or permanent relief from pain was occasionally obtained, but stiffness was much more resistant to treatment. Although the number of patients which received cortisone was too small to draw any definite conclusions, the results appeared to be inferior to those obtained with hydrocortisone. The age or sex of the patient did not affect their response to treatment. No ill effects attributable to the hydrocortisone injections were observed.

Discussion.

The fact that only four conditions were rapidly relieved by hydrocortisone clearly indicates that this hormone is not a "cure-all" for vague orthopædic complaints. "Tennis elbow" and painful heel are well recognised conditions, and both responded rapidly to hydrocortisone when other methods of treatment had failed. It is unreasonable, however, to expect one or two injections to have any effect on gross bony abnormalities, such as calcaneal spurs. When a spur was present, the use of a cut-out rubber pad was continued in order to diminish repetitive trauma to the soft tissues on the plantar surface of the spur.

Less frequently recognised is the condition known as chondromalacia patellæ, in which the articular cartilage of the patella undergoes degenerative changes. Clinically the patient is usually a young girl who complains of intermittent pain, stiffness, and "catching" in the knee; sometimes momentary locking may have occurred. There is pain on pressing on and moving the patella over the femoral condyles. X-ray examination is seldom helpful, except in the occasional case which has progressed to the stage of patello-femoral arthritis. The majority of cases sooner, or later, undergo a spontaneous remission or cure, but there is a strong tendency for the complaint to recur. There were five recurrences among twenty-six patients treated with hydrocortisone; all, however, obtained permanent relief, following a further course of injections.

Local hydrocortisone often brought dramatic relief to patients suffering from the acute phase (supraspinatus tendinitis) of periarthritis of the shoulder, a full range of painless movement frequently being restored within 24-48 hours. Diagnosis and localization of the affected tissues, however, must be accurate (Cyriax and Troisier, 1953). Injection of unaffected tissues will bring neither relief to the patient nor credit to the surgeon. At the shoulder, the degenerative changes and secondary inflammation are present in the capsule, bursæ and tendinous cuff around the joint, and most of the hydrocortisone should be widely

distributed throughout these structures rather than injected into the joint cavity.

There is still no effective treatment for the "frozen shoulder." In the past, the ability of hydrocortisone to hasten the disappearance of established fibrous tissue has probably been over-emphasized. Once the chronic, fibrotic phase of shoulder periarthritis has become established, hydrocortisone ceases to have any worthwhile effect on the condition. As with early osteo-arthritis of joints (Leveaux and Quin, 1956) the drug may produce some slight, transient alleviation of pain, but the disease process is unaffected and pursues its usual unpredictable course.

In an investigation such as this, the statistical analysis of the results is surrounded by difficulties. The natural history of many of the conditions is very uncertain, and most of those lesions which responded to hydrocortisone are known to resolve spontaneously after a variable period of time. Unless very large numbers of patients are available for study, statistical analysis will produce false negative results, and this fact may not be apparent to those who are not acquainted with the limitations of the statistical methods employed.

The absence of any marked local reaction at the site of injection was reassuring. A small series of patients (not included in the present investigation) was treated with long-acting hydrocortisone—T.B.A. (Merck), but this compound, while satisfactory when used in joint cavities, frequently caused a severe painful reaction when injected into soft tissues. In consequence, its use has been abandoned in favour of ordinary hydrocortisone, which is now regarded as the treatment of choice in "tennis elbow," painful heel, chondromalacia patellæ, and supraspinatus tendinitis.

Summary.

1. The effects of local injections of cortisone and hydrocortisone in two hundred patients suffering from various minor orthopædic conditions were investigated.
2. The treatment produced excellent results in "tennis elbow," painful heel, chondromalacia patellæ, and supraspinatue tendinitis.
3. It was of no real value in osteoarthritis and "frozen shoulder."

We wish to express our thanks to the surgeons of the Orthopædic Department, and especially to Mr. R. J. W. Withers, for their interest in this investigation, and for permission to publish the results. Without the willing co-operation of our nursing staff the work would not have been possible.

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Upper Lobe Bronchiectasis as a Chest Clinic Problem: Three Cases Discussed

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BRONCHIECTASIS is one of the commonest conditions encountered at a chest clinic. Five years ago Whitewell (1952) believed that bronchiectasis was almost as common as tuberculosis. Heller (1946), in Hounslow Chest Clinic, found it ranking only after pulmonary tuberculosis and chronic bronchitis as a cause of hæmoptysis. Minarik (1956) discovered 51 cases of bronchiectasis admitted as tuberculosis to his sanatorium between 1952 and 1955.

When bronchiectasis involves the upper lobe bronchus, differential diagnosis from active pulmonary tuberculosis may at first sight be difficult and require observation in hospital. The purpose of this communication is to give some indication of the frequency with which upper lobe bronchiectasis may occur, and how it may be differentiated from active pulmonary tuberculosis.

Although bronchiectasis, except for rare congenital types, is recognised as being a secondary condition, it has been arbitrarily named primary bronchiectasis to distinguish it from types secondary to such disease as bronchial carcinoma, inhaled foreign body and post-primary pulmonary tuberculosis (Wynne-Williams, 1957).

Since tuberculous bronchiectasis is usually apical, so upper lobe bronchiectasis is most often tuberculous. Tuberculous bronchiectasis is very common, being found in 27.6 per cent. of 134 thoracoplasty cases of pulmonary tuberculosis coming to post-mortem (Pagel, Simmonds and McDonald, 1953) and in 42 per cent. of 602 resected lung specimens (Olsen, Jones and Angevine, 1953). Juhl, Alt and Wasserburger (1956) reported the results of both tomography and bronchography in 100 randomly selected tuberculous patients with apical disease. Bronchiectasis was found in no less than 74 per cent. of the total, being present in all 5 thoracoplasty cases, in 22 of 24 far advanced and 43 of 53 moderately advanced cases, but in not more than 4 of 18 minimal cases. X-rays reproduced show that minor degrees of ectasis were included in these results. The post-mortem and laboratory figures quoted probably reflect better the proportion of significant bronchiectasis to be expected in tuberculosis. Tuberculous bronchiectasis is not a major clinical problem. It is almost always of the upper lobe or apex of the lower lobe bronchus, and retention of sputum does not often occur. On the other hand, non-tuberculous bronchiectasis of the upper lobe bronchus is less frequent and is stated by many authors to be rare, e.g., Ritvo (1956) and Coope (1948).

The rarity of non-tuberculous bronchiectasis involving the upper lobe bronchus may be over estimated. In Whitwell's report (Whitwell, 1952) 200 specimens, resected because of bronchiectasis, included 6 of the right and 5 of the left upper

lobe bronchus or a total of 5.5 per cent. Mann (1949) found more than this on bronchography of 16 unilateral cases, of whom 2 (12.5 per cent.) involved the right upper lobe. At Enniskillen Chest Clinic, Co. Fermanagh, 22 cases of primary bronchiectasis confirmed by bronchography since January, 1956, included 3 (13.6 per cent.) of upper lobe bronchiectasis, of which 1 (4.6 per cent. of the total) was non-tuberculous. The difference between these and Whitwell's figures is explained by the comparative clinical "silence" of upper lobe bronchiectasis (Simon, 1956), fewer requiring resection than cases involving the dependent bronchi.

While upper lobe bronchiectasis may not be associated with sputum retention, major hæmoptyses and secondary infection are found, as shown below in the three cases described. Probably from 5 per cent. to 13 per cent. of cases of bronchiectasis referred to a chest clinic will involve the upper lobe.

Differential diagnosis between active pulmonary tuberculosis and upper lobe bronchiectasis is aided by the rapid resolution in bronchiectasis of any surrounding pneumonitis following admission to hospital. A staright film can at this stage resemble active pulmonary tuberculosis. The history and bacteriological findings aid diagnosis.

Criteria for differentiating tuberculous from non-tuberculous bronchiectasis in the absence of tuberculous activity are given by Gordon and Pratt (1953) :—

A.—*Bronchography.*

1. Segmental lobar location is basal and posterior in non-tuberculous bronchiectasis, apical and posterior in tuberculous.
2. Bronchographic pattern shows extension of estasia to the periphery in non-tuberculous disease, but limitation to the medial two-thirds in tuberculous bronchiectasis.
3. Bronchial caliber shows increase on inspiration during bronchography in tuberculous bronchiectasis, none in the non-tuberculous variety.

B.—*Laboratory Findings.*

In resected lung specimens the pulmonary artery on injection fills normally in non-tuberculous bronchiectasis; tuberculous bronchiectasis shows characteristic obliteration of the pulmonary artery due to the associated parenchymal disease. Histopathology reveals extensive bronchial damage in non-tuberculous disease, in contrast to predominantly parenchymal involvement in tuberculous bronchiectasis.

Bronchiectasis due to primary tuberculosis in childhood is invariably regarded as "primary" bronchiectasis and is indistinguishable from non-tuberculous varieties, in which the ætiology is often unknown.

Method of Bronchography.

Bronchography by the use of the trans-nasal route with the tongue pulled forward was used for both local anæsthetic and opaque medium. An ordinary syringe for each completes the equipment necessary. Two inches of fine rubber catheter attached to the nozzle aids introduction. Safety is provided by the use of 4 per cent. Xylocaine for local anæsthesia, followed by Dionosil as the contrast medium (Domm et al., 1956). Filling of the upper lobe bronchus is achieved after Dionosil had been introduced by getting the seated patient to lean far to one side

until the hand or elbow rests on the floor (Huizinga and Smelt, 1949). Forward rotation in this position permits filling of the anterior branch, and extreme backward rotation the posterior. Filling of the remaining lobar and segmental bronchi is carried out with the patient seated, in accordance with their anatomical situations. The right side is first filled and photographed in the postero-anterior and lateral positions. The left follows with postero-anterior and left posterior-oblique views, a lateral view being now impossible and usually unnecessary. Several coughs clear the bronchi sufficiently for the patient to go home on foot or by public transport, after being warned to avoid hot food for three hours. The whole procedure requires 1 to 1½ hours. A preliminary "tranquillizer" in full dosage is useful, e.g., methylpentynol ("Oblivion") 250 mgms. 2 to 3 capsules, or benactyzine hydrochloride ("Suavitil") 1 mgm. 2 to 3 tablets.

Case Reports.

Three cases of upper lobe bronchiectasis are described :—

Case 1.—C. J. M., male, aged 41, complains of bronchial colds since an attack of severe "bronchitis" in infancy. Had first hæmoptysis with right sided pleuritic pain in February, 1945, following which he was admitted to the Richmond Hospital, Dublin. X-ray here showed infiltration and cavitation right apex, and in view of the cavitation his right phrenic nerve was crushed. Sputum was consistently negative. He was discharged in May, 1946. A year later he was admitted to Rostrevor Sanatorium and transferred from here to Armagh Chest Hospital, leaving in August, 1948. He continued to have cough, sputum and occasional hæmoptysis, and attended Enniskillen Chest Clinic. Asthma began to be complained of and obstruction of the right nostril was noted. Sputum continued negative on both direct examination and culture on numerous occasions. Bronchograms in 1956 showed marked cylindrical bronchiectasis of the right upper lobe bronchus, affecting principally the apical branch. His symptoms since 1948 at least, apart from the asthma, are due to upper lobe bronchiectasis, the tuberculous ætiology of which although probable has not been proved.

Case 2.—E. H., a well preserved and intelligent grandmother of 75 years, who has had six children of her own. She states that one of her brothers had pulmonary tuberculosis. When aged 16 years she had her first hæmoptysis, not repeated until aged 47, when in 1929 bleeding followed influenza. As her children were young and she could not rest at home, she was admitted to Peamount Sanatorium in November, 1929, spending four months there on rest treatment only. Sputum has been found negative repeatedly on culture since she was first examined by me in November, 1949. There is no record of a positive sputum at Peamount Sanatorium. Mantoux test was strongly positive to 0.1 mgm. (1/1000) old tuberculin in 1956. She has been several times in Dungannon and Killadeas Chest Hospitals following hæmoptysis, of as much as "a pint," and attacks of bronchitis. Bronchograms done on 14th March, 1957, show saccular bronchiectasis of the postero-lateral branch of the right upper lobe bronchus. Her symptoms since she was first seen by me in 1949 are due to upper lobe bronchiectasis. The gross bronchial deformity and the irregularity of the saccules point to a tuberculous ætiology, also the fact that these fail to reach the preiphery in the P.A. view. Tomograms taken 27th July, 1957, show multiple thin walled cavities at the right apex, not penetrated by the opaque medium at bronchography, and which are typical of "healed" tuberculous excavation.

Case 3.—Miss K. A. K., aged 67 years, is a tall strongly-built lady. She states that two paternal uncles died of pulmonary tuberculosis in America, and that her father, who lived to 84 years of age, always had bronchitis. Her first hæmoptysis, which she attributed to a slap on the back one week previously, occurred 30 years ago. She appears to have had no further attacks until five years ago, since when she has brought up a mouthful of blood twice or thrice annually. These hæmoptyses occurr apart from colds or constitutional

upset and do not interrupt her house and farm work. Following a severe hæmoptysis with bronchitis in January, 1957, she was admitted to Killadeas Hospital. X-ray taken on 10th January, 1957, shows infra-clavicular infiltration, which quickly cleared in two to three weeks. Bronchograms performed on 14th March, 1957, show typical saccular bronchiectasis of the right upper lobe bronchus and the right dorsal lobe bronchus. Sputum was found negative to tubercle bacilli on direct examination on six occasions, and culture of the first specimen was also negative. Primary bronchiectasis of the right upper and dorsal lobe bronchi was diagnosed.

Discussion.

Three cases of apical bronchiectasis are described. In each differential diagnosis from active pulmonary tuberculosis was made by sputum examination for tubercle bacilli, by rate or response to chemotherapy, and by the typical appearance of bronchograms and straight X-rays. In one case tomography was very helpful in showing the tuberculous ætiology of the bronchiectasis.

Case 1 is probably tuberculous in origin, case 2 tuberculous, and case 3 non-tuberculous.

In all three cases finger clubbing is absent and in cases 2 and 3 sputum is only occasional. All have good respiratory function apart from asthmatic attacks in case 1. The advanced age of cases 2 and 3 is noteworthy. Cases 1 and 2 are fit for work, and only age partially incapacitates case 3. All three illustrate the ease with which cases of bronchiectasis without active tuberculosis can find their way into a chest hospital.

Summary.

1. The place of upper lobe bronchiectasis in chest clinic work is indicated. It has been found to account for from 5 per cent. to 13 per cent. of cases of bronchiectasis.
2. Bronchography by the trans-nasal route is described as being suitable for use on out-patients.
3. Three cases are described.

I wish to acknowledge the advice and help of my colleagues, Dr. E. F. James, M.D., M.R.C.P.I., and Mr. T. B. Smiley, M.C., F.R.C.S., in this study, and of Dr. R. F. Stronge, M.D., who demonstrated the method of bronchography used. My thanks are due to Miss S. E. Elliott, clinic secretary, for the typing of this paper.

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REVIEWS

SIR GEORGE BUCKSTON BROWNE. By Jessie Dobson, B.A., M.Sc., and Sir Cecil Wakeley, Bt., K.B.E., C.B., LL.D., D.Sc., F.R.C.S. (Pp. viii + 143; figs. 28. 25s.) Edinburgh and London: E. & S. Livingstone, 1957.

AFTER reading this delightful book one must, I think, concede the authors' claim that it has been for both of them indeed a labour of love. Their aim has obviously been to make it worthy of the man for whom they had an intense and undying admiration. In this they have attained considerable success.

They have spared no pains to give a very complete picture of their idol. They begin by detailing fully his family history from the Sir Thomas Browne of the fifteenth century to Sir George Buckston Browne of the twentieth. They have followed his career through his early schooldays in Manchester, where he was bullied, to his medical student days at University College, where he gained many prizes and found that patients were not merely cases. They give an account of his valuable period as assistant to Sir Henry Thompson, then perhaps the best publicised surgeon in London. In 1888 he took up practice on his own account in Wimpole Street and they show him making a name for himself by sheer merit against the competition of the ablest surgeons of the day with the inestimable advantage of attachment to one or other of the great London teaching hospitals, often defeating them by his dexterous use of urethral instruments, gaining by this means the confidence of a wide public and ultimately dying a rich man.

From the impersonal point of view the story is one of universal interest, for it covers the period which, following the discoveries of Lister, saw the birth of modern surgery as we know it today. Moreover, it depicts a surgeon who, without a hospital appointment, successfully practised the science and art of surgery. In this respect he will probably remain unique to the end of time.

The book may be regarded as an autobiography, written as much of it is in Buckston Browne's own words and taken from his own records. Whilst its main interest will be for the surgeon, it is a very human story of a man as he developed from the earnest and industrious medical student, as he was described by his teacher, Sir John Erichsen, at University College, to the perfect craftsman when he reaches the top of the tree in the speciality of his choice.

For the general reader it is hardly less attractive and fascinating, for with Browne the patient was always the most important actor in the drama, and if it brought in the end great monetary rewards to the surgeon one cannot but be struck with the gratitude so often expressed by the patients. For less distinguished members of the medical profession this acquisition is hardly less valued than the material recompense. The book is also interesting for the number of personal sketches of such well-known characters as Leander Star Jamieson, Wilkie Collins, Spurgeon the preacher, Horatio Bottomley, and Robert Louis Stevenson, to mention only a few of the well-known people who were Browne's patients.

From the professional point of view, Browne's dexterity with urethral instruments must have been phenomenal, and it will probably remain so till the end of time, for Browne saw the termination of an era when retention of urine due to enlargement of the prostate was treated by catheterisation. Freyer's enucleation of the gland at the turn of the century and its many succeeding variations since then have provided a radical cure and a normal life for many sufferers from prostatic enlargement. These operations have replaced the catheter life to which many elderly men had previously been condemned.

Browne must also have seen the crude method of dealing with stone in the bladder by lithotrity which left the patient to pass per vias naturales the fragments of crushed stone, through litholapaxy when the fragments were washed out through a wide bore catheter, to removal of the stone by means of a suprapubic cystotomy.

Browne's gift to humanity did not end when he retired from the practice of urology. His activities in his later years (he died at the age of 94) were devoted mainly to the Royal

College of Surgeons, to which he gave much time and many princely donations. In a way he was unlike a great many others, for his generosity was recognized and his name will ever be remembered with that of John Hunter as the two greatest benefactors of the College. As proof of this may be mentioned the Honorary Fellowship which he received, and the congratulatory banquet which was held at the College on his ninetieth birthday.

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It is just twenty-nine years since the discovery of penicillin and sixteen years since it was first used as a therapeutic substance. Penicillin, the first antibiotic, was the forerunner of some thousands of antibiotic substances, only a small fraction of which have proved to be of therapeutic value. One of the main reasons for this was the toxicity of many of the substances and their tendency to produce serious side-effects when administered in therapeutically effective doses.

Experience has shown that most of the antibiotics, currently in use and invaluable in treatment, are also associated with undesirable side-effects, and Dr. Schindel's book presents a review of the literature dealing with the side-effects of thirteen antibiotics widely used in U.S.A. Only two of these, fumagillin and cycloserine, are not as yet in general use in this country. A chapter is devoted to each of the antibiotics, except the tetracyclines which are grouped together in one chapter. The side-effects of each antibiotic are discussed under the headings of (1) allergic and hypersensitivity reactions, including changes in skin and mucous membranes, urticaria, contact dermatitis and local irritation at site of injection; (2) systemic reactions, such as anaphylactic shock, serum sickness-like reactions; (3) specific organ reactions, including blood changes, damage to liver, kidney, bowel, and nervous system, and (4) sequelæ such as acute enteritis, fungus infections, especially with *C. albicans*, and associated deficiencies of vitamin K and the vitamin B complex.

The author has described with bibliographical references every known side-effect associated with the administration of antibiotics. As he points out, the literature about antibiotics issued by commercial firms usually contains the sentence: "This product is practically free from undesirable side-effects." This book, therefore, serves a useful purpose in collating evidence to counter this over-optimistic view, and should be of value to clinicians by making it clear that none of the antibiotics is blameless from the point of view of causing side-effects, varying from local irritation at the site of injection to severe or fatal gastro-enteritis, aplastic anæmia, or moniliasis. It is a pity there are so many errors in spelling, e.g., "bacteriæ," "penicillase," "urobilinurea," "hæmophilus influenza" (not italicized). The construction of some of the sentences would suggest a literal translation from German and in a few places the meaning is unintelligible.

Despite these defects which should be corrected in a future edition, this small volume should be read by those who wish to recognize at the earliest stage of treatment the undesirable reactions associated with the use of the common antibiotic. V. D. A.

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Next year is the centenary of the Medical Act which initiated the General Medical Council, and it is interesting to read of the various attempts to establish some form of control over the training of a doctor which have failed prior to this date. One gets the impression that the author feels that this Act was unnecessary, but the history of medical education in the United States shows the advantage which it conferred on British medicine.

Whilst this book is interesting and raises many important problems for the profession, it suffers from the defect of being provincial. It is entitled, "Medical Education in the Nineteenth Century," and yet it is devoted almost entirely to the changes in English medicine. Not only so, but it is chiefly concerned with the London teaching schools, a little about Oxford and Cambridge, and not at all about the majority of the university medical schools in the provinces, in Scotland or in Ireland. The doctor whom the author wishes to see produced is more likely to come from the provincial university than from the hospital medical school. Yet for the factual presentation and for the problems which it poses this book is well worth reading. J. H. B.

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This sixth edition has done much more than uphold the prestige of the earlier ones—it has greatly enhanced it. Every contribution has been carefully thought out and beautifully illustrated, and it would be invidious to single out any one for special mention, but amongst many it is impossible not to be struck by the clarity of illustration and text of the chapter on gynæcological operations. Amongst those on obstetric subjects, the chapters on injuries to the mother and to the baby rank very highly. The editor has rendered a great service in presenting so much information in such an attractive form, and in this task he has been very ably assisted by his publishers; the whole work is produced in that superb style long associated with them.

For the value of the book the price seems moderate indeed, and there is no doubt that it will more than hold its own in competition with American, continental, and other British textbooks of greater size. No information is missing that any enquirer could reasonably hope for, and the quality of illustration, both in choice and presentation, will remain a matter for envy. G. B-L.

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EXTENSILE EXPOSURE. By Arnold K. Henry, M.B.(Dubl.), M.Ch.(Hon.), T.C.D. in Cairo, F.R.C.S.I. Second Edition. (Pp. xii + 320; figs. 198. 45s.) Edinburgh and London: E. & S. Livingstone, 1957.

It is always stimulating, and sometimes very enlightening, to look at an old subject in a new way; and when a person has the gift of making others do so he is indeed a teacher. Professor Henry has this gift, to which is added a command over our language, and an evident love of it which almost defeats its own ends.

There is a great temptation when reading this book to appreciate the English of each phrase and to enjoy the little "nicknames" given so abundantly to nerve-muscle-artery relationships, and to miss the real kernel which is the wealth of accurate observation.

The method used in reviewing the book was to take it to the anatomy department, and, ignoring the beauty of the English composition, to carry out many of the dissections as described in its pages. As these dissections unfolded it became more and more evident that the book is a great one and by a great teacher who might prove, even to an anatomist, that so-called "gross" anatomy is not finished.

Each dissection contains some tricks; each trick works like a charm, and the book succeeds completely in its professed purpose, which is to show us how to make incisions and dissections which will give us adequate exposure of those parts of the body on which we need to work. For this reason it can be recommended to all general surgeons as well as to orthopædic surgeons, who have always appreciated the first edition. It should be an excellent book for revision purposes for those who are working for examinations in anatomy, particularly the "primary" F.R.C.S.

The first edition was called "Extensile Exposure applied to Limb Surgery." This new (second) edition adds the neck, parts of the chest and the pelvis. The new areas are spotlighted in the same original manner. When some of the exposures are carried to their limits they are very extensive. They start in the correct position to be made extensive as required by dividing certain unimportant structures. This does not mean that they start extensive—merely extensile. The author states that he would like to think this unnecessary advice, but it is really very necessary, as one sometimes sees enormous incisions where a smaller one would do quite well.

The whole spirit of the book may be summed up in the statement that there are enough difficulties in surgery without adding inadequate—or overadequate—exposure. S. V.

SURGEON'S JOURNAL. The Autobiography of J. Johnston Abraham. (Pp. viii + 441. 25s.) London: Heinemann, 1957.

Dr. Abraham was born in Coleraine in 1876, and this is a fascinating record of a full and interesting life. The author, well known for an early book, "The Surgeon's Log," and perhaps to some better known under the pseudonym of James Harpole, is an accomplished and experienced writer. He vividly recreates his early life around Coleraine and his student days at Trinity. At Trinity the medical course allowed him time to study English literature under Dowden, and he hesitated between medicine and becoming a writer.

London before World War 1, war service in Serbia and in Egypt, the Sinai Desert and Palestine, where he showed great skill as an administrator and rose to the rank of colonel, and the years of settling down and building up a consultant practice in London are described with a fine appreciation of how to tell a story. His account is never tedious and many dramatic incidents are skilfully recounted, and many charming anecdotes of the great figures of his time and of ordinary folk are cleverly interspersed.

Many will find the final third of the book is of great interest. It covers the thirties and life during World War 2, and is well garnished with many stories of great contemporary figures, but it lacks something of the incident and continuity of the earlier chapters.

Few medical autobiographies or biographies can match this work for interest to those outside the profession, and both doctors and their patients will find it of absorbing interest.

J. E. M.

EXTENSILE EXPOSURE. By Arnold K. Henry, M.B.(Dubl.), M.Ch.(Hon.), T.C.D. in Cairo, F.R.C.S.I. Second Edition. (Pp. xii + 320; figs. 198. 45s.) Edinburgh and London: E. & S. Livingstone, 1957.

It is always stimulating, and sometimes very enlightening, to look at an old subject in a new way; and when a person has the gift of making others do so he is indeed a teacher. Professor Henry has this gift, to which is added a command over our language, and an evident love of it which almost defeats its own ends.

There is a great temptation when reading this book to appreciate the English of each phrase and to enjoy the little "nicknames" given so abundantly to nerve-muscle-artery relationships, and to miss the real kernel which is the wealth of accurate observation.

The method used in reviewing the book was to take it to the anatomy department, and, ignoring the beauty of the English composition, to carry out many of the dissections as described in its pages. As these dissections unfolded it became more and more evident that the book is a great one and by a great teacher who might prove, even to an anatomist, that so-called "gross" anatomy is not finished.

Each dissection contains some tricks; each trick works like a charm, and the book succeeds completely in its professed purpose, which is to show us how to make incisions and dissections which will give us adequate exposure of those parts of the body on which we need to work. For this reason it can be recommended to all general surgeons as well as to orthopædic surgeons, who have always appreciated the first edition. It should be an excellent book for revision purposes for those who are working for examinations in anatomy, particularly the "primary" F.R.C.S.

The first edition was called "Extensile Exposure applied to Limb Surgery." This new (second) edition adds the neck, parts of the chest and the pelvis. The new areas are spotlighted in the same original manner. When some of the exposures are carried to their limits they are very extensive. They start in the correct position to be made extensive as required by dividing certain unimportant structures. This does not mean that they start extensive—merely extensile. The author states that he would like to think this unnecessary advice, but it is really very necessary, as one sometimes sees enormous incisions where a smaller one would do quite well.

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J. E. M.

AN ATLAS OF MUSCLE PATHOLOGY IN NEUROMUSCULAR DISEASES. By J. Godwin Greenfield, M.D., G. Milton Shy, M.D., Ellsworth C. Alvord, jun., M.D., and Leonard Berg, M.D. (Pp. ix + 104; figs. 87. 45s.) Edinburgh and London: E. & S. Livingstone, 1957.

THIS is an important and useful attempt to clarify one of the most unsatisfactory and difficult aspects of morphological pathology. Of great value to the pathologist, it will also inform neurologists and physicians of the place and limitations of biopsy diagnosis.

As the authors point out, much difficulty is caused by the use of terms, such as necrosis, degeneration, and inflammation, which, when applied to muscle, have no clear or generally accepted meaning. The first ten chapters are therefore devoted to a purely objective description of the histopathological changes seen with ordinary techniques in muscle. These are illustrated by photo-micrographs in both colour and monochrome, which, with very few exceptions, do really advance the descriptions.

In the second part the authors attempt to describe with what clinical entities the reactions are associated. Avoiding such terms as myopathy, myositis, and muscular dystrophy, which have variable definitions, they recognize distal muscular syndromes of definite and possible neurogenic basis, myotonic syndromes, including dystrophia myotonica, myotonia congenita, and para-myotonica congenita, proximal muscle syndromes which include many cases now designated myositis and muscular dystrophy, and finally myasthenia gravis. They are forced to conclude that no single change has been found specific for any disease, and even combinations of changes are no more than highly suggestive.

It is evident that nothing useful will result from muscle biopsies unless both physicians and pathologists appreciate the limitations and the need for correlation of clinical and histological observations. In all such studies this book will be a useful guide. J. E. M.

THE LIVER: SOME PHYSIOLOGICAL AND CLINICAL ASPECTS. Volume 13, No. 2, of British Medical Bulletin. (Pp. 75-152; illustrated. 20s.) London: The British Council, 1957.

THIS will probably prove to be one of the most popular numbers of this bulletin. It supports the contention of Sir Harold Himsworth in the introduction that neither study of the normal nor study of the abnormal can alone supply the full information required for the comprehension of either.

The survey is admittedly limited to some aspects only, but develops logically from papers on biochemistry, the circulation in the liver, and response to injury by both toxic agents and nutritional deficiency to clinical papers on infective hepatitis, hæmochromatosis, hepatolenticular degeneration, and aspects of liver failure. Several large volumes have recently been published on this subject, but within a reasonable compass this number succeeds in presenting the more actively advancing aspects of the subject in a manner acceptable to non-specialist readers.

CUNNINGHAM'S MANUAL OF PRACTICAL ANATOMY. Volume I. Revised by J. C. Brash, M.C., M.A., M.D., D.Sc., LL.D., F.R.C.S.(Ed.), F.R.S.E. Twelfth Edition. (Pp. xii + 394; figs. 196. 25s.) London: Oxford University Press, 1957.

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if the distal segments were examined early in the course of a rapid survey of the limbs. The traditional more detailed consideration of the parts should then be more readily comprehended by the student.

The English equivalent of the Paris Nomenclature of 1955 has been largely used throughout, although some of the more familiar terms of the Birmingham Revision have been retained alongside the newer terms; the index containing cross-references of the more important structures thus treated. New X-rays in "negative" form have been substituted for the "positives" of earlier editions, and some old text-illustrations have been replaced. The binding is now in a waterproof material which should be useful in a manual of this nature. This volume maintains the high standards of its predecessors, and can be recommended as a complete guide to the dissection of the limbs. W. R. M. M.

AIDS TO PSYCHIATRIC NURSING. By A. Altschul, B.A.(Lond.), S.R.N., R.M.N. (Pp. xii + 281. 8s. 6d.) London: Baillière, Tindall & Cox, 1957.

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There is a need for literature that will assist the nurse towards a deeper understanding of her rôle, and a fuller appreciation of the needs of the patient, without encouraging her to become a pseudo-psychiatrist. This book, in my opinion, goes a long way towards helping the nurse in her search for a clearer knowledge of what is expected of her in an exacting career, and of how she can adopt herself to changing circumstances.

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(We are indebted to Miss McGuinness, Matron of Purdysburn Hospital, for this review.)

A STUDENT'S HISTOLOGY. By H. S. D. Garven, B.Sc., M.D., F.R.S.E., F.R.F.P.S.G. (Pp. xii + 650; illustrated. 55s.) Edinburgh and London: E. & S. Livingstone, 1957.

The author of this new text on normal histology is an experienced teacher and, despite the size and the extensive and detailed descriptions, the volume does make a real attempt to guide the student to a useful understanding of one of the most difficult subjects of his curriculum. Any real appreciation of this subject requires more time than the curriculum can usually afford. To many, both students and practising physicians and surgeons, the subject seems devoid of value, and few students retain the unrelated facts which are provided in the older textbooks. By careful exposition and by line drawings, as well as by half-tone and colour illustrations, a very complete and lucid exposition of the fine structure of the body is presented. At times the descriptions are wearisome. The details of the glands of the skin, the layers of the bowel wall, the different tubules of the kidney, etc., are important and valuable to a complete understanding, but one feels that something more might have been done by different sizes of print, and perhaps by tabular summaries, to help the student who has little time and who, despite the clarity of the exposition, may still be in danger of failing to grasp the broad principles.

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A PRACTICAL HANDBOOK OF MIDWIFERY AND GYNÆCOLOGY. By W. F. T. Haultain, O.B.E., M.C., B.A., M.B., F.R.C.P.Edin., F.R.C.S.Edin., F.R.C.O.G., and Clifford Kennedy, M.B., Ch.B., F.R.C.S.Edin., F.R.C.O.G. Fifth Edition. (Pp. x + 410; figs. 48. 30s.) Edinburgh and London: E. & S. Livingstone, 1957.

THIS textbook by two well-known Scottish obstetricians now enters its fifth edition. The format remains the same, but Professor Henderson's chapter on the infant considerably enhances the value of the whole work. In essence it remains a revision handbook for the final-year student, and in the opinion of the reviewer, a Scottish student at that. For others, there are sufficient divergencies of opinion and practice to reduce its value and make it essential that it be used in conjunction with systematic lecture notes. It is doubtful if it has much to offer not found in many smaller books.

If it seems churlish to criticise, even slightly, a work by such eminent authors now in its fifth edition, perhaps the reviewer may plead a bias against all books listing "causes" and "treatments" in sequence, with little or no explanation. Many of the illustrations, especially in the section on gynæcology, add little to the value of the text and would probably have gained much by being reduced to simple line drawings.

Within these limitations the book still remains a ready source of information in fully condensed form. G. B-L.

THE CARE OF THE ELDERLY SICK IN GENERAL PRACTICE. By W. Ferguson Anderson, M.D., F.R.F.P.S., M.R.C.P. (Pp. 27. 3s. 6d.) Edinburgh: Royal College of Physicians, 1957.

IN this John Matheson Shaw Lecture for 1956 Dr. Anderson discusses the finer points of diagnosis and management of illness in old people. G. F. A.

THE CLOSED TREATMENT OF COMMON FRACTURES. By John Charnley, B.Sc., M.B., F.R.C.S. Second Edition. (Pp. xii + 260; figs. 199. 50s.) Edinburgh and London: E. & S. Livingstone, 1957.

IN these days of excessive, and I believe misplaced, enthusiasm for operative treatment of fractures it is indeed important that surgeons should not forget that non-operative methods are still, in the majority of bone injuries, the methods of choice.

In his book Mr. Charnley has clearly shown that, far from being a crude and miss or hit affair, the art of manipulative treatment of fractures can nowadays become something of a science if the fracture surgeon takes the trouble to master the technique.

Whilst the entire book is beautifully written and the points which the author wishes to make stand out against a general background of logic and common sense, three chapters are worthy of special mention. Those on the repair of fractures, plaster of paris technique, and the proper use and application of the Thomas splint should be carefully studied by all who work in fracture services.

Mr. Charnley is far too modest when he says that the book is written primarily for the resident casualty surgeon—it is indeed a book to make the experienced orthopædic surgeon re-examine his own methods and possibly discard some of his most cherished "pets."

R. J. W. W.

AIDS TO PATHOLOGY. By John O. Oliver, M.B., B.S.(Lond.), M.R.C.S.(Eng.), L.R.C.P. (Lond.). Eleventh Edition. (Pp. viii + 347; figs. 13. 10s. 6d.) London: Baillière, Tindall & Cox, 1957.

THIS book reflects the older and almost purely morphological approach to pathology. As the author states, the subject matter is limited to morbid anatomy, with some mention of histology. A considerable amount of information is provided, but there is little or no discussion of disturbed function or of ætiology, and pathology is not correlated with clinical medicine or with the basic sciences. Increasingly, this restricted approach must fail to meet the requirements of the modern curriculum. J. E. M.

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AUTONOMIC NERVOUS SYSTEM. British Medical Bulletin, Volume 13, No. I. (Pp. 153-230. 20s.) London: Medical Department of the British Council, 1957.

EDITED by Dr. W. S. Feldberg, this symposium consists of a number of articles contributed by distinguished British anatomists, physiologists, and pharmacologists, including Burn, Boyd, Lovatt Evans, Garry, Perry, Edith Bulbring, and Marthe Vogt, and there is an introduction by Sir Henry Dale. Many of the contributors have not limited themselves strictly to the structure and function of the autonomic nervous system but have taken the opportunity to discuss related problems which go somewhat beyond the bounds of the symposium's title. For example, functional vasodilatation in the salivary glands is examined by Hilton and Lewis and apocrine sweating in the horse by Lovatt Evans, and evidence is presented that these phenomena are not primarily associated with autonomic nervous activity. Other papers deal with the metabolism and distribution of substances long recognized as autonomic chemical transmitters. Some papers, such as Professor Boyd's on "Intermediate Sympathetic Ganglia" and that by Drs. Murray and Thompson on "Collateral Sprouting in Response to Injury in the Autonomic Nervous System and Its Consequences," are of great importance, and throw new light on the anomalous persistence or recovery of sympathetic activity after sympathectomy. Though the gaps in knowledge are still immense, the symposium gives a clear and concise account of the nature of the work and techniques currently being used in Britain in this fascinating field of research. I. C. R.

TEXTBOOK OF MEDICINE. By Sir John Conybeare, K.B.E., M.C., D.M.(Oxon), F.R.C.P., and W. N. Mann, M.D.(Lond.), F.R.C.P. (Pp. xv + 859; plates 32. 42s.) London and Edinburgh: E. & S. Livingstone, 1957.

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CORTISONE THERAPY. By J. H. Glyn, M.D., M.R.C.P., D.Phys.Med. (Pp. x + 162. 21s.) London: Heinemann Medical Books, 1957.

THIS is a useful book, in which the place of cortisone and other steroid drugs in the treatment of the rheumatic diseases is reviewed. The book falls naturally into two parts. The first section consists of five chapters, and is concerned with the use of cortisone in rheumatoid arthritis. The second section consists of two chapters, the first of which decribes the general use of cortisone in diseases other than rheumatoid arthritis, while the second discusses miscellaneous topics related to cortisone therapy such as the problems of drug production, therapeutic trials, mode of action of steroid drugs, and prospects for the future. Finally, there are several appendices, in one of which Dr. J. G. Bearn, of the Anatomy Department of the Middlesex Hospital, London, describes the anatomy and technique of intra-articular, and soft tissue injections of cortisone.

The best section is undoubtedly the first part, where Dr. Glyn describes the value, methods, indications, and limitations of cortisone therapy in rheumatoid arthritis. It is now ten years since Hench first employed cortisone in this condition, but there is as yet no unanimity among those best qualified to speak about its merits or demerits. Nevertheless, Dr. Glyn has tackled the problem bravely and with success, and has provided a helpful guide for those inexperienced in this new treatment. Much too of what he has to say is of value to the expert, and few will fail to profit from the balanced and comprehensive survey of this difficult field of modern therapeutics. Adequate stress has been laid on the dangers of indiscriminate use of cortisone in rheumatoid arthritis and the complications of treatment are fully discussed. The section describing the pre-treatment "briefing" of the patient is most practical, for all patients on cortisone must know something of the problems to be faced, and this knowledge helps to prevent undue disappointments later if success is not achieved.

The second section is less comprehensive than the first because of condensation, but it provides a good summary of the use of cortisone in a wide variety of diseases, including such collagen disorders as systemic lupus erythematosis, polyarteritis nodosa and dermatomyositis, and the allergic states.

This book will be of value to all physicians and surgeons anxious to bring themselves up to date with cortisone therapy. D. A. D. M.

REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1955-1956. (Pp. vii + 270. 9s.) London: Her Majesty's Stationery Office, 1957.

MOST of this report is of necessity occupied by somewhat formal and factual details of the various research units, groups, and individuals supported by the Council. However, pages 10 to 56, entitled, "Some Aspects of Medical Research," present a review of current researches and trends in research, and will be of very general interest. Causative factors in cancer of the lung, poliomyelitis and whooping-cough vaccination, radiation and immunity and radiation and leukæmia, growth and renal function, abnormal hæmoglobins and microbial genetics are among subjects discussed, and indicate some fields where workers of the Council in this country have contributed to notable advances. In tropical areas filariasis and protein deficiency have been studied with support from the Council.

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CORTISONE THERAPY. By J. H. Glyn, M.D., M.R.C.P., D.Phys.Med. (Pp. x + 162. 21s.) London: Heinemann Medical Books, 1957.

THIS is a useful book, in which the place of cortisone and other steroid drugs in the treatment of the rheumatic diseases is reviewed. The book falls naturally into two parts. The first section consists of five chapters, and is concerned with the use of cortisone in rheumatoid arthritis. The second section consists of two chapters, the first of which decribes the general use of cortisone in diseases other than rheumatoid arthritis, while the second discusses miscellaneous topics related to cortisone therapy such as the problems of drug production, therapeutic trials, mode of action of steroid drugs, and prospects for the future. Finally, there are several appendices, in one of which Dr. J. G. Bearn, of the Anatomy Department of the Middlesex Hospital, London, describes the anatomy and technique of intra-articular, and soft tissue injections of cortisone.

The best section is undoubtedly the first part, where Dr. Glyn describes the value, methods, indications, and limitations of cortisone therapy in rheumatoid arthritis. It is now ten years since Hench first employed cortisone in this condition, but there is as yet no unanimity among those best qualified to speak about its merits or demerits. Nevertheless, Dr. Glyn has tackled the problem bravely and with success, and has provided a helpful guide for those inexperienced in this new treatment. Much too of what he has to say is of value to the expert, and few will fail to profit from the balanced and comprehensive survey of this difficult field of modern therapeutics. Adequate stress has been laid on the dangers of indiscriminate use of cortisone in rheumatoid arthritis and the complications of treatment are fully discussed. The section describing the pre-treatment "briefing" of the patient is most practical, for all patients on cortisone must know something of the problems to be faced, and this knowledge helps to prevent undue disappointments later if success is not achieved.

The second section is less comprehensive than the first because of condensation, but it provides a good summary of the use of cortisone in a wide variety of diseases, including such collagen disorders as systemic lupus erythematosis, polyarteritis nodosa and dermatomyositis, and the allergic states.

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DR. SEWARD has revised the classification usually employed by medical texts and tries to view the problems of clinical diagnosis from a consideration of the patient's dominant presenting symptom. Because this is a practical approach, Dr. Seward has succeeded. The student or physician who uses this book to aid in unravelling a difficult clinical case will not only obtain immediate help, but will eventually train himself to think in a logical fashion. The fourth edition of this book in eight years indicates its deserved popularity. R. A. W.

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