The Journal of Laryngology and Otology
April 2000, Vol. **114,** Supplement No. 26, pp. 1–29

Window on the Ear: Barbara Hepworth and the Fenestration Series of Drawings

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Abstract

In November 1943, one of Barbara Hepworth's daughters (Sarah, one of triplets) developed osteomyelitis of the thigh. This necessitated operation and subsequent treatment at the Princess Elizabeth Orthopaedic Centre in Exeter by Mr. Norman Capener. Artist and surgeon subsequently became friends and she encouraged his activities as a 'weekend sculptor'. At his invitation she came to the hospital in November 1947 watching him in out-patients but more particularly in the operating theatre; other visits to London and Exeter followed. These studies of orthopaedic procedures form the great majority of Hepworth's sixty-plus hospital drawings/paintings but there is also a small group of six paintings involving an operation on the ear made in April and May 1948. The link between these two and the introduction to the ear surgeon, Mr Garnett Passe, is unclear.

Five of the paintings of the ear operation are still in circulation but there is also a sketchbook containing no fewer than 28 drawings. A selection of the sketches together with the fenestration series of paintings will be discussed and also the relationship with the surgeon, Mr Garnett Passe.

Key words: Fenestration, labyrinth; Otosclerosis; Paintings/drawings; History of medicine, 20th century

Introduction

Of the six fenestration paintings, five are still available to be seen and of these the author has seen four, that is all but the one in Melbourne. The irony of this is that the one which is now furthest away, was less than one hundred yards from his residence for more than 25 years during which period Garnett Passe's widow had the house, literally round the corner and within direct view across the rooftops! The sixth painting, which the artist recorded as 'the little one', was never photographed and has not been traced for many years.

The preliminary sketches are in a sketchbook held at the Science Museum and were made at the London Clinic. The final paintings are all dated April or May, 1948. The surgeon in the much larger corpus of orthopaedic subjects was Norman Capener who had treated Sarah, the third of the triplets, born to Barbara Hepworth and Ben Nicholson in Hampstead, London, in October 1934. On the outbreak of war, the family moved to St. Ives in Cornwall. Sarah was to develop osteomyelitis of the left thigh in November 1943 and the treatment was to last for several years. So started the associated between Hepworth and Norman Capener, the Consultant Orthopaedic Surgeon at the Princess Elizabeth Orthopaedic Centre in Exeter. The Capeners also had four young children with whom the triplets played and met on holiday.

Hepworth[1,2] recalled that '. . . in about the middle of 1947, a suggestion was made to me that I might watch an operation in a hospital. I expected that I should dislike it; but from the moment when I entered the operating theatre I became completely absorbed by two things: first, the extraordinary beauty of purpose and co-ordination between human beings all dedicated to the saving of life, and the way that unity of idea and purpose dictated a perfection of concentration, movement, and gesture, and secondly by the way this special grace (grace of mind and body), induced a spontaneous space composition, an articulated and animated kind of abstract sculpture very close to what I had been seeking in my own work.'

'We are all conditioned to seeing the nerveless kind of scurrying movement of modern life: dressed often in absurd clothes and with tense faces, blind to all but the necessity of working one's way through the crowds, we fight our way through the days and week.' '. . . A particularly beautiful example of the difference between physical and spiritual animation can be observed in a delicate operation on the human hand by a great surgeon. The anatomy of the unconscious hand exposed and manipulated by the

Based on a presentation to the Sixth Meeting of the British Society for the History of ENT held at the City Hospital, Birmingham, UK on 25 September 1998.
Accepted for publication: 24 December 1999.

FIG. 1

Portrait photograph of Garnett Passe (with moustache) from London Hospital Medical College student register *c.* 1926. Reproduced by kind permission of the Archivist, Royal London Hospital.

conscious hand with the scalpel, expresses vividly the creative inspiration of superb co-ordination in contrast to the unconscious mechanism . . .'

'For two years I drew, not only in the operating theatres of hospitals, but from groups in my studio and groups observed around me. I studied all the changes and defects which occurred in the composition of human figures when there were faulty surroundings or muddled purpose. This led me to renewed study of anatomy and structure as well as the structure of integrated groups of two or more figures. I began to consider a group of separate figures as a single sculptural entity, and I started working on the idea of two or more figures as a unity, blended into one carved and rhythmic form . . .'

Later, Hepworth[3] was to write in 1966 'In spite of being such a silent and obstinate child, I must have been surrounded by real love and understanding. At home I was allowed to make an awful mess. At school I was allowed to paint and draw whenever I was free to do so. A strange kind of obstinacy made me do studies of my white mice, newts, and frogs, which never got me a prize, but made me highly critical. At a fairly early age I got hold of Thompson's book on Anatomy and studied it furiously. The wonderful structure of the human frame is an architecture of highest proportion . . .'

Norman Capener was to write the Introduction to the exhibition of paintings at the Lefevre Gallery in April 1948, signing himself anonymously as 'A Surgeon': 'Little perhaps do surgeons realise the classic beauty of their surroundings, a beauty based upon perfect architectural conditions – designed for a purpose; the focal point within a space, which

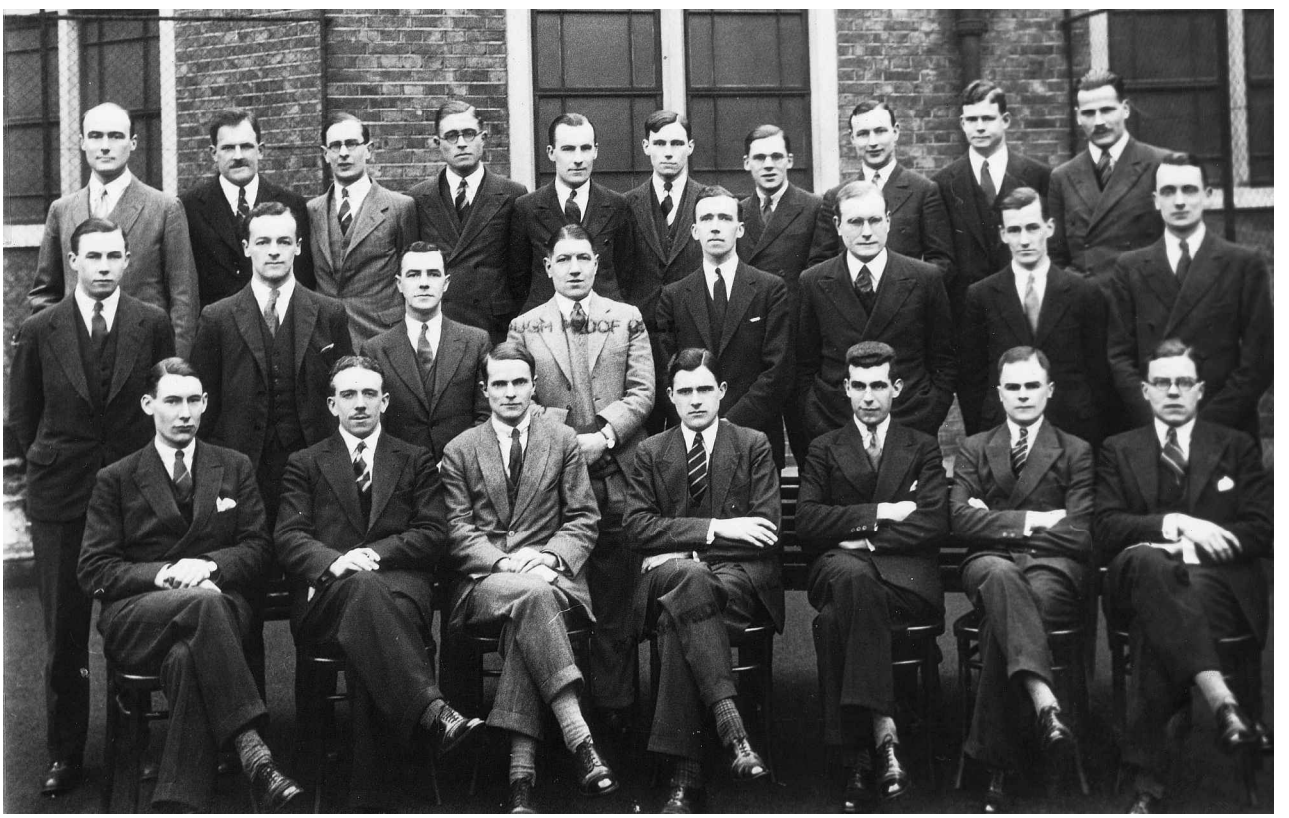

FIG. 2

London Hospital Residents 1930. Garnett Passe is shown third from the left in the middle row. Third from the left in the front row is Clive Butler (a frequent golfing partner). Reproduced by kind permission of the Archivist, Royal London Hospital.

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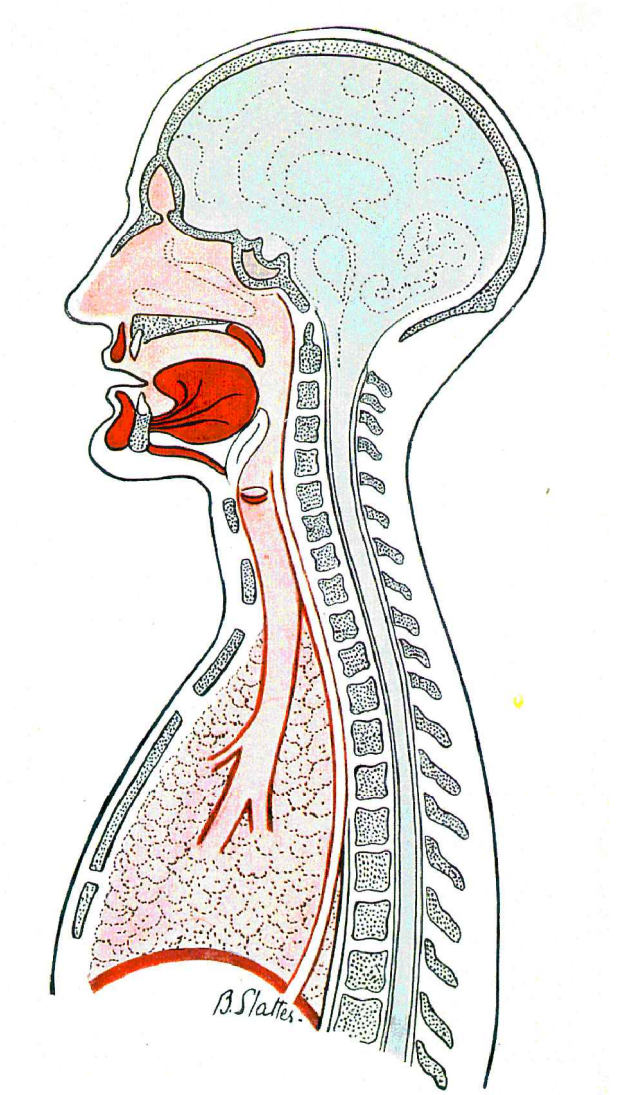

DIAGRAM OF SECTION THROUGH HEAD AND CHEST ILLUSTRATING THE STRUCTURES CONCERNED IN VOICE-PRODUCTION

FIG. 3

Frontispiece drawn by B. Slatter, from *The Singing Voice* published in 1933 by Sir Isaac Pitman and Sons Ltd. Reproduced by kind permission of Financial Times Professional Ltd.

whatever its shape becomes converted visually and mentally into a circle or sphere, a group of individuals, a massing of structures all arranged with simple economy, all with a movement towards one object, one purpose, all co-ordinated rhythmically and in harmony. Rarely has an artist been found with both stamina and vision who can perceive and portray the sincerity and harmony, the power and beauty, the rhythm and tenderness and the simple drama of the operating theatre. Barbara Hepworth has, in these surroundings, shown us the possibilities of symphonic grouping both physically and psychologically; the spirit of enquiry, the intensity of proper solicitude, the power of the craftsman, unhurried activity, energetic poise. And an uncanny sense of the unseen; indeed the sense of the good surgeon himself – always conscious of the unseen 'person' beneath his hands and never callous of his "material" '.

FIG. 4

Surgeon Commander Garnett Passe. (Photograph supplied and reproduced with kind permission of Mr Peter Freeman, the Garnett Passe and Rodney Williams Foundation, Melbourne and the Editor of the *Australian Journal of Otolaryngology*).

David Baxandall, then Director of The National Gallery of Scotland, in his introduction to the Barbara Hepworth Restrospective Exhibition at the Whitechapel Art Gallery in 1954[4] wrote 'In 1947 a change began. In that year Barbara Hepworth was invited to watch an operation and was fascinated by the almost devotional ritual of the gowned figures in an operating theatre. There she began the long series of drawings of surgeons and nurses at work. In these drawings the nobility of the forms and the natural dignity of their grouping seem to emphasize everything that is solemn and priestlike in the task to which the surgeon and his acolytes are dedicated – the saving of human life. This was a complete change from the purely abstract drawings and sculpture of the previous twelve years. The reawakened interest in the human form, which also led to many fine figure drawings, brought about a change in the later sculpture'.

Later, in 1969, Capener[5] wrote: 'During the war it happened that I was brought into touch with the artist's family. In 1947 we met again. It was then that she felt that she must see directly something of the work of surgeons in action. Numerous visits were made to the Princess Elizabeth Orthopaedic Hospital (PEOH) at Exeter and *some elsewhere*

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(author's italics). The result was a considerable series of drawings which were exhibited at the Lefevre Gallery in 1948. The drawings had many remarkable features, being what was for Barbara Hepworth a new form of abstraction'. (By the 'some elsewhere' must mean the London Clinic as apart from visits to PEOH no others have come to light.)

As was written at the time by Herbert Read[6]: 'The hospital is, of course, a dramatic setting, and it is generally from this theatre that Barbara Hepworth has taken her subjects. The pain and the fear are sublimated-absorbed in the creative purpose of the surgeon, into the patient faces of the nurses, who stand in the wings like a Greek chorus. Rembrandt and other Dutch painters were fond of such subjects, but it is not their type of realism of which we are reminded – rather of the austere humanism of the Quattrocento in Italy. There is a sense of monumental form which can only come to artists conscious of abstract form.' 'With the other drawings atmosphere more than likenesses were expressed; in the final work, '*Concourse*', she went as near to portraiture as she was prepared to go. Barbara Hepworth placed herself at the extreme left margin of the picture, and the other *dramatis personae* are recognizable mainly by their postures.'[5]

It is uncertain how the ENT Surgeon, Garnett Passe, came to meet Barbara Hepworth; there seem to be three possibilities. The first is that when Capener visited his colleagues in London and watched them operate in The London Clinic, Garnett Passe could have been performing in an adjacent theatre on the top floor carrying out this relatively new style of surgery and been interested or fascinated enough to have popped in to have a look. Several of the theatres were paired with their own changing room and scrubbing up area. Capener used to come and watch Reginald Watson-Jones (W-J) and Smith-Petersen. Either or both of them may have known Garnett Passe; W-J was on the staff of The London Hospital. The second possibility is that, being an aspiring sculptor, he could have visited one of Hepworth's exhibitions e.g. that at the Lefevre Gallery in October 1946, and that she could have been present – although Garnett Passe never seems to have bought or possessed any of her sculptures.

The third possibility, which is thought to be the most likely, is that he saw the reviews of the exhibition by Hepworth (and Lowry) in April 1948 in either *The Listener*[6] or *New Statesman*.[7] The suggestion is therefore that having read these or knowing about the exhibition, he went to the gallery and met Barbara Hepworth there. Seeing the orthopaedic operations portrayed he might well have suggested that perhaps she would like to come to The London Clinic and see him perform this new most fascinating procedure on the ear to restore hearing. There is just the possibility of an additional piece of evidence. After Garnett Passe died, his theatre sister (Margaret Moir) moved down to Cornwall in about 1958/9 as a companion to Lily MacDonald, the widow of Duncan MacDonald, who was a director of the Lefevre gallery! Margaret Moir had also looked after Lily MacDonald at her flat in London after she became widowed (1950). What is unknown, is when and how Margaret Moir might have met Duncan and Lily MacDonald; was it as a result of her assisting Garnett Passe whose operations Hepworth was to portray or did she already know the MacDonalds who, like herself, were Scottish.

It may be of interest to add that there was some 'medicine in the Hepworth family'. Although the relationship between Barbara's father, Herbert, and his brother Arthur, was not close, the latter was a surgeon until his death in November, 1944. He had won a scholarship to St John's College, Cambridge and obtained a first class honours degree in the Natural Sciences Tripos in 1900. He completed his training at St Bartholomew's Hospital qualifying with the Conjoint in 1903 and obtaining his F.R.C.S. (Eng.) in 1907. He served in the RAMC during the Great War and was decorated with the OBE for his services. After the war he became surgeon to the hospital in Saffron Walden and senior surgeon in 1940. There is no record that Barbara consulted him for advice about Sarah and it seems unlikely that she did so. (She had taken Arthur's son, Jack, as an art pupil in 1931).

This article looks at Garnett Passe, the sketchbook and finally the paintings, bringing them together for the first time because amazingly this remarkable series of drawings and paintings has never been put together either as an exhibition or in print!

The fenestration operation

The operation of fenestration was designed to create an alternative window or fenestra into the vestibular path of the labyrinth thereby by passing the footplate of the stapes which had become immobile due to the process of otosclerosis. Politzer[8] makes no mention of the procedure when discussing the treatment for otosclerosis. The first operation is credited to Passow from Heidelberg[9] but the initial hearing improvement only lasted a few days but was still better than before surgery.[10] Passow[9] in fact made his opening not into the lateral semicircular canal but into the promontory adjacent to the oval window; he operated on further cases but obtained only transient improvements in the majority. A similar unsuccessful attempt at fenestration in this area was later made by Holmgren,[11] who had in 1917 performed fenestration of the superior semicircular canal. Alderton[12] tried different surgical methods, one of which was to drill through the stapes footplate but without lasting success. Floderus in the same year[13] (1898) suggested not only the possibility of opening through the wall of the labyrinth but also to create a fistula into the semicircular canal, covering it with a thin layer of squamous epithelium corresponding to a Thiersch graft in order to achieve a thin and mobile membrane.

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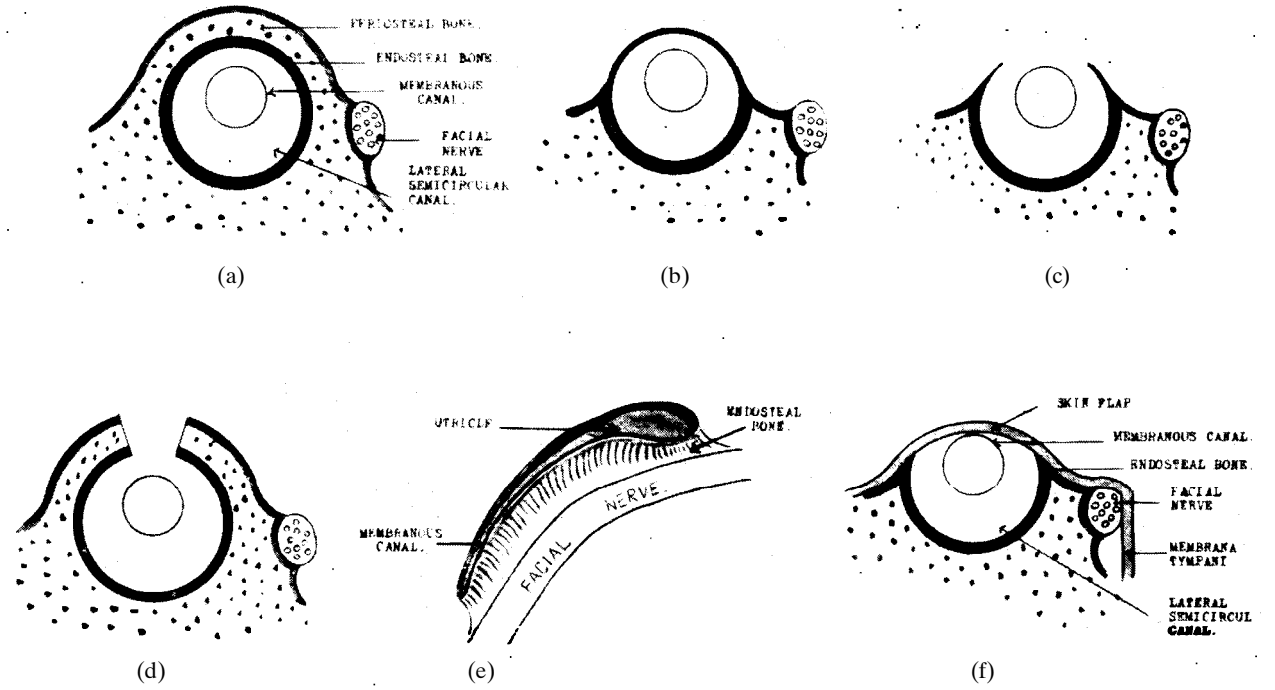

FIG. 5

(a) Cross section of lateral semicircular canal. (b) Periosteal bone removed down to endosteal bone over a large area. (c) Endosteal bone thinned down until the roof is finally removed. (d) The old type of fenestra made for use with the cartilage stopple. (e) Lateral view of the fenestra in roof of vestibule and canal showing fenestra seated on top of a ridge. (f) Skin flap *in situ*. Note that it is in contact with the membranous canal. Reproduced with kind permission of the Editor, *Proceedings of the Royal Society of Medicine*.[44]

In 1910, Bárány[14] suggested that one should site a fistula in the posterior semicircular canal after first dissecting out the mastoid process, expose the semicircular canals and then open the posterior canal.[14,15]

In August 1913, Jenkins[16] from King's College Hospital, reporting on the clinical features and experimental procedures in otosclerosis to the XVIIth International Congress of Medicine in London, described two cases in which he had made an opening into the lateral semicircular canal. Jenkins believed that the lesion responsible for the clinical features of otosclerosis in the earlier stages was in the labyrinthine fluid and that the changes in the foramen ovale and elsewhere were only associated or secondary. His aim was to alter the character of the labyrinthine fluid.

After his presentation he was questioned by Dr Bárány (Vienna)[17] who reasoned that, because of the ossification of the fenestra, sound could not enter the labyrinth. He decided to create a 'point of relief' by opening the posterior canal without opening the antrum. Both he and Jenkins agreed that there was an initial improvement in hearing but that this was not sustained.

During the early part of the first world war Bárány was serving with the Austrian Army and was captured by the Russians. As a Nobel prize winner he was allowed, through the good offices of the International Red Cross, to go to a neutral country (Sweden) where he continued to work.[18] There, he attracted the attention of the Swedish otologist, Holmgren, who in 1917,[19] continuing on the same lines and believing that decompression of the perilymph space was the answer to the problem, chose the superior semicircular canal, his object being to make an opening at its upper surface so that the dura might fall back on the top, thus delaying any bony closure. The French otologist, Maurice Sourdille of Nantes was visiting Bárány and Holmgren in 1924 and was much impressed by the work that they were doing. Sourdille felt that the key to the problem lay in making and maintaining an opening in the perilymph space in such a manner that airborne sound waves could reach and be transmitted to the labyrinthine fluids. He felt that the best way of achieving this was to cover the fistula made in the lateral canal with a mucocutaneous flap continuous with the tympanic membrane (tympanolabyrinthopexy).[20–22] Initially the operation was done in stages but it was Julius Lempert who described the one stage operation in 1938.[23] At first Lempert continued along the same lines as Sourdille, removing the head of the malleus and leaving the incus intact but later he removed the incus as well and brought the fenestra further forward. By doing this, the opening could be covered by mucous membrane (Shrapnell's membrane) instead of the mucoperiosteal lined membrane with the posterior meatal wall. It was felt this would give less chance of the fenestra closing up by new bone formation.

In a recent article, Shambaugh[24] reminds us that when he finished his residency in Otolaryngology at the Massachusetts Eye and Ear Infirmary in 1932,

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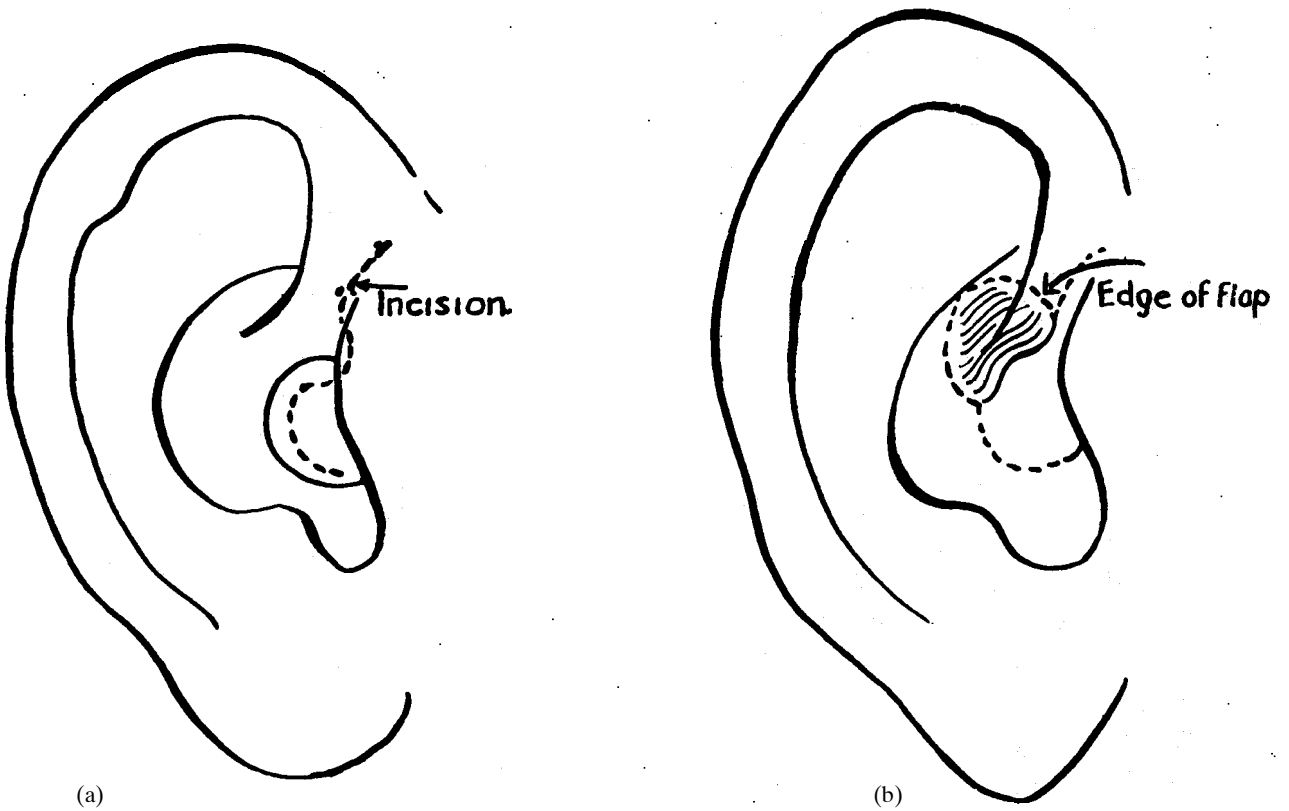

FIG. 6

(a) Single 'S'-shaped incision cutting tongue of skin; (b) shows tongue of skin tucked upwards and backwards into mastoid cavity. Reproduced by kind permission of the Editor, *Postgraduate Medical Journal*.[45]

otosclerosis was not a condition that should be diagnosed lightly because at that stage it was generally recognised to be incurable and only a hearing aid was available for help. The following year Maurice Sourdille introduced his operation to improve hearing in patients with otosclerosis. In the autumn of 1935 Sourdille was invited by Dr Edmund Fowler Jr. to lecture to the New York Academy of Medicine. Present in the audience at that time was a young otolaryngologist called Julius Lempert who was tremendously impressed by the talk and invited Sourdille to dinner plying him with questions on the details of the operative procedure.

In 1928, Lempert[25] had introduced in an article in the *Archives of Otolaryngology* the endaural approach to the mastoid bone. This procedure had initially been developed in Germany by Joachim Heermann but Lempert applied the endaural approach to the Sourdille operation; however in all other respects he followed Sourdille's technique closely at that stage except for the addition of the dental surgical burr to open the mastoid and assist in exposing the horizontal semicircular canal in the attic. To create the fenestra in the horizontal semicircular canal Lempert used the plug finishing burr as used in dentistry. This differed from Sourdille's method of using a little scraper to gradually thin down the prominence of the horizontal semicircular canal in the attic until he created the opening. Sourdille had named his operation tympano-labyrinthopexy because he connected the horizontal semicircular canal opening to the tympanic membrane by means of a plastic flap derived from the ear canal attached to the upper edge of the tympanic membrane. Lempert used a similar means of closing the fenestra at that stage.

In 1936, Dr Kopetsky gave a verbal introduction to the report by Julius Lempert on a 'new operation for otosclerosis'. After the talk Shambaugh asked Kopetsky if he might come and see some of his patients but was referred by him to talk to Lempert who was also at the meeting. Julius Lempert invited George Shambaugh Jr. to come and see him operate in New York at 9 a.m. the following morning and he duly turned up on time but as was Lempert's custom he arrived anything between one and two hours late having never been an early riser. The operation was carried out under local anaesthesia and Shambaugh was greatly impressed by the operation and the surgical skill of Lempert in rapidly opening the mastoid bone, starting with the antrum, enlarging the opening, exenterating the mastoid cells, and exposing the incus, the head of the malleus, and the attic with the bony horizontal semicircular canal. He then carefully and skillfully separated the skin of the ear canal from the bone of the superior wall of the meatus, until he had a flap attached to the upper edge of the tympanic membrane; then he removed the remaining bridge of the bone, and finally he created the fenestra with the plug finishing burr. As the horizontal canal was opened the patient cried out, 'I can hear! My God, I can hear!' Shambaugh said, 'Chills ran up and down my spine. It was the single most exciting and impressive moment in my

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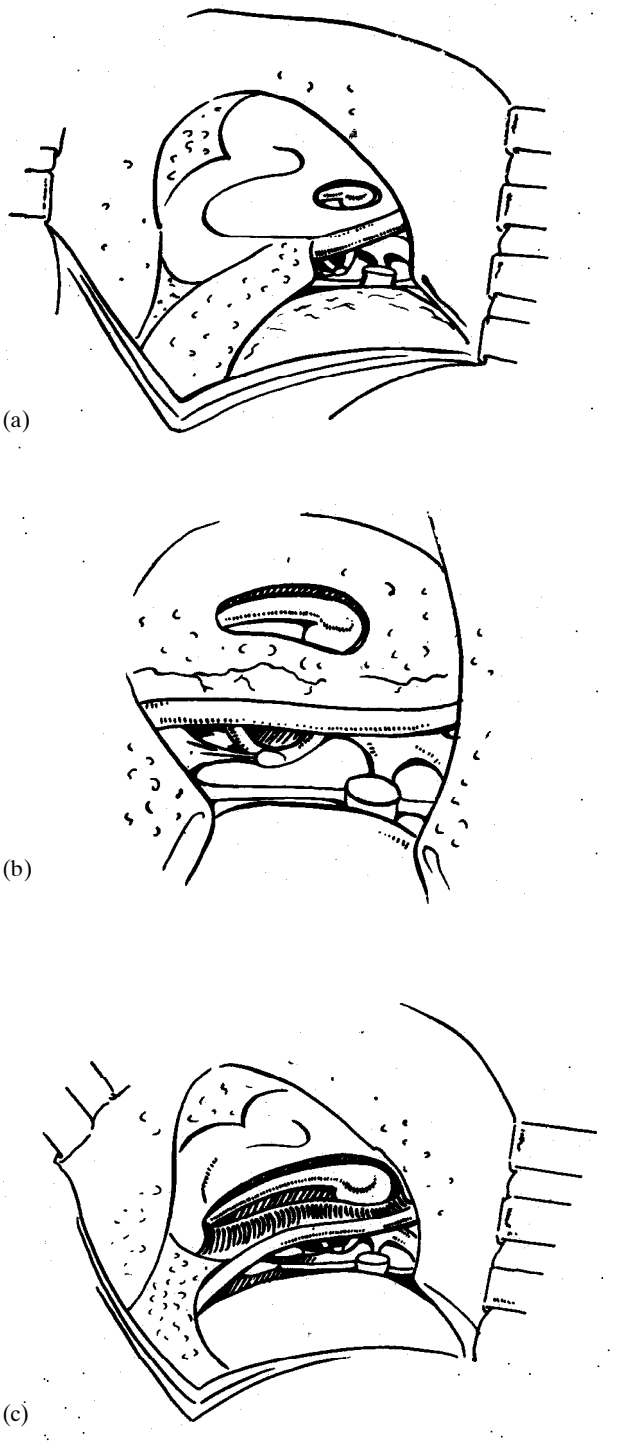

FIG. 7

(a) Fenestra according to Lempert. (b) Fenestra according to Shambaugh. (c) Fenestra according to Passe. Reproduced by kind permission of the Editor, *Irish Journal of Medical Science*.[46]

entire medical career. Dr Lempert glanced up at me, stepped back from the table and whispered numbers; the patient repeated them. He stepped out into the hall whispering more numbers (in a slightly louder voice), and still she repeated them. The moment was miraculous and never to be forgotten'.

Shambaugh soon found that the major difficulty with the operation was not its original performance but keeping the fenestra open for in most of them there was evidence of closure both by decline of the initial improvement in the hearing and by evidence of reduction in the size of the fenestra shortly after operation. Shambaugh found by experiments on monkeys that it was necessary to use continuous irrigation whilst doing the drilling to make sure that no bone dust settled in the ear and it was necessary to expose widely the primitive endochondral bone around the fenestra because, with its sluggish osteogenic potential, this meant that the growth of bone across the fenestra rarely occurred.[26–28] Shambaugh found the Leitz dissecting microscope with a magnification of 10 times made the surgey much easier. These modifications and improvements were reported in 1942 in an article that was noted by Professor Horst Wullstein in Wurzburg, Germany, who was greatly impressed by this. He went to the Zeiss optical company to encourage them to construct a microscope especially designed for ear surgery and this was later demonstrated by Professor L.B.W. Jongkees at the International Congress of Otolaryngology in Amsterdam in 1956. Sadly Lempert insisted that he had invented the fenestration operation and never gave any credit to Sourdille whose operation was essentially the one that Lempert had copied and named the fenestration operation.

The operating microscope had first been used in Stockholm by Nylén[29] but his head of department Gunner Hölmgren insisted that he should be the first to use it for operation on a patient.

In the United Kingdom, the fenestration operation was developed by Simson Hall, Terence Cawthorne, and John Angell-James[30,31] but one who showed particular interest in this early work was Garnett Passe.

Garnett Passe

(Edward Roland) Garnett Passe was born in South Africa in June 1904. His father had enlisted in the

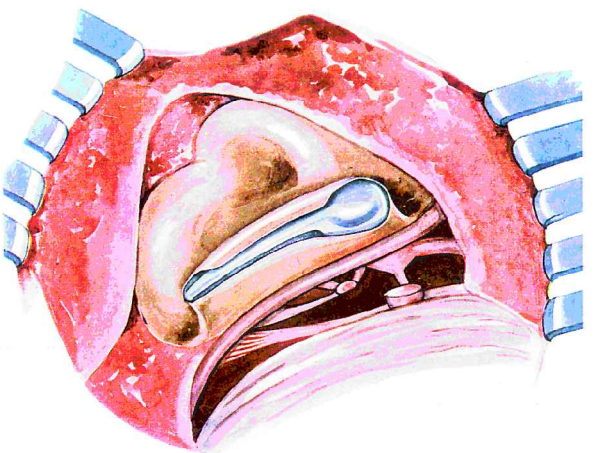

FIG. 8

Enchondralized fenestra, described by Passe, "constructed on outer surface of lateral canal with 'hood' projecting from medial border protecting the membranous canal. Note that the fenestra in the region of the hood is placed on lateral surface of the canal". Reproduced by kind permission of the Editor, *Journal of Laryngology & Otology*.[48]

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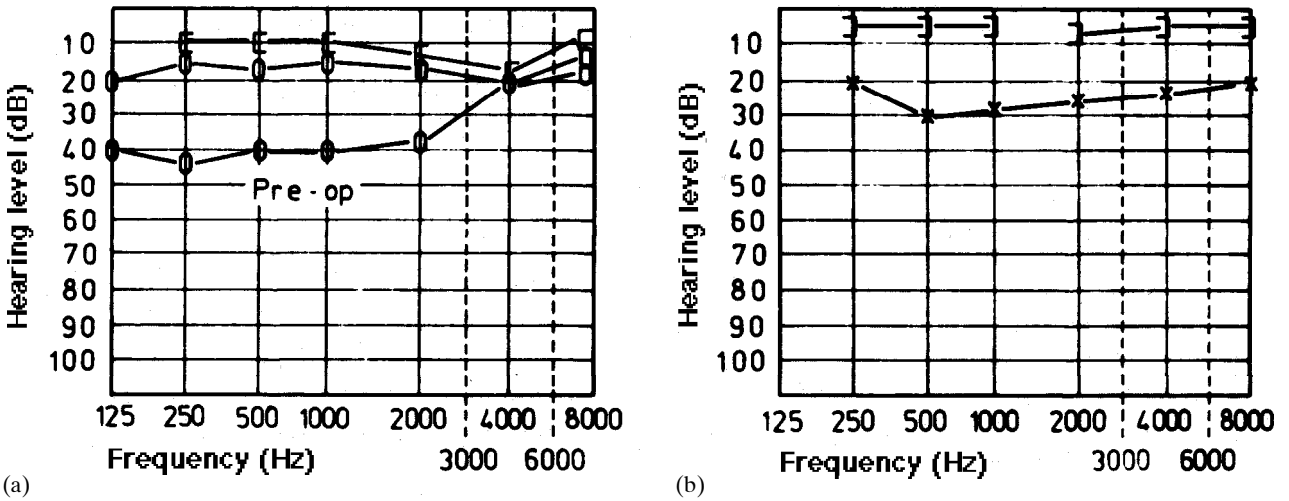

FIG. 9

Pure tone audiogram showing "Comparison of hearing, in 1977, after (a) right stapedectomy (by Beales in 1966) and (b) left fenestration (by Monkhouse in 1953). Air conduction right 0-0, left X-X. Bone conduction right {-{ left }-}". Reproduced by kind permission of Philip Beales and the Editor of the *Journal of the Royal Society of Medicine*.[30]

Boer War but the family returned to Australia soon after the birth of their second son (Garnett Passe). Later the boy passed the entrance examination for Melbourne Boys' High School and subsequently went on to Melbourne University where he completed a dental course graduating with a B.D.Sc. in 1926. A fellow student describes him as being patient and persevering although reserved. After graduating as a dentist he soon went to London coming to The London Hospital and qualifying with the Conjoint {(M.R.C.S.(Eng.) L.R.C.P. (Lond.)} in 1929.[32] (Figure 1).

Records at The London Hospital show that he entered in October 1926; he was a surgical dresser to Sir Hugh Lett, C.B.E. and W. S. Perrin, and later Russell Howard and George Neligan, M.C. in 1927. He underwent clinical clerkships with Doctor Cecil Wall and Dr (later Sir John) Parkinson and finally under Sir Robert Hutchison and Dr (later Sir Alan) Rowlands. After qualifying he decided to remain in England and practice in London and served an initial period as clinical assistant in the chemical laboratory moving on to six months in the receiving room (Accident and Emergency) (Figure 2). He was appointed Aural House Surgeon from September 1930 to March 1931. There was also a period as house officer in Stroud. It seems likely that after this period he then went on to the Central London Hospital (now Royal National Throat, Nose and Ear Hospital) in Grays Inn Road; he obtained the D.L.O. (London) in 1931. He is recorded as starting as a Clinical Assistant to the Aural department of The London in January 1933 becoming First Assistant to the same department in December 1936 under Norman Patterson, Geoffrey Carte and Donald Wheeler; in the same year he passed his F.R.C.S. in general surgery. First Assistants were allowed to engage in private practice and his activity in this quarter may not have endeared him to his superiors. This has been cited as one of the reasons he failed to obtain a consultant post at The London when such a vacancy became available (the appointment went to JS Lindahl who had an M.S. (London) in addition to his Fellowship. He was also unsuccessful in his application for one of the two posts of Assistant Surgeon at Gray's Inn Road (William Mackenzie and Anthony Radcliffe were appointed to fill the vacancies).

A fellow Melbourne otolaryngologist (Walter Williams) wrote of him, 'I first met Garnett when I was a house surgeon at the Central London in 1932. He was very well dressed and insisted on obtaining his hats and collars only from the most distinguished suppliers in London, namely Lock's and White's. His collars were made to order, and he said that it was nice to be able to ring up and obtain collars cut to his exact measurements within a few days.'

'A year or so later I visited him in Queen Anne Street, where I was met at the front door by a manservant, dressed in full morning clothes with a long-tailed coat. I was escorted to his one room in which he slept, bathed and had his meals, and that also served as his consulting room. The rents there were high and Garnett had only a small practice, but at all costs he insisted on keeping up appearances, which were so important for a consultant in England at that time. He was a lovable fellow, ever willing to give helpful advice'.

His first entry in the Medical Directory is for 1933 when he had an address in Devonshire Place; at that time he was Second Assistant at the Central London Hospital, but also Clinical Assistant in ENT at Maida Vale Hospital then known as the Hospital for Epileptics and Paralytics. In that year he also published a book of some 80 pages entitled *The Singing Voice* (the book was dedicated to his mother and priced 6/-).[33] Interestingly at the end of the preface he thanks a Miss B. Slatter for the illustrations, of which she did three including that shown in Figure 3 together with one showing the vocal cords as seen by a laryngeal mirror, also in colour, and another showing the chest, trachea and larynx. He remained an out-patient assistant at the Central London until 1938 and as Clinical Assistant

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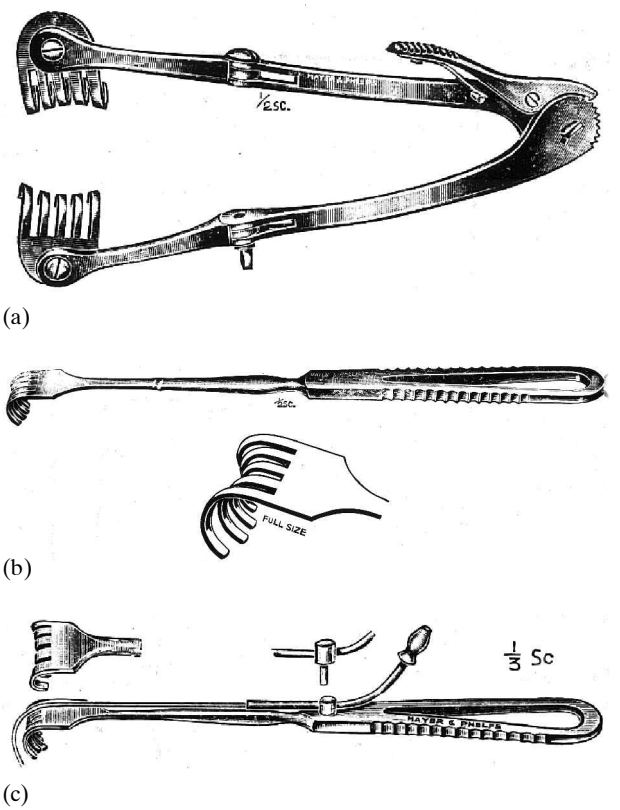

FIG. 10

(a) Passe's modification of Mastin's retractor, with curved blades, 5/5 teeth, adjustable angle. (b) Passe's modification of Lempert's retractor with concave blade, 5/5 prong, 9½ in. long. (c) Passe's modication of Lempert's *stainless steel* retractor with detachable suction tube of virgin silver with *stainless steel* mount. Reproduced from Down's Catalogue 1955, by kind permission of Aesculap Downs.

at Maida Vale until the same year he was appointed Consultant to that hospital. He was appointed Surgeon to the ENT department at Queen's Hospital for Children in Hackney in 1936 but this seems to have been for a relatively short period. By 1938, he was First Assistant and Registrar to the Aural department of the London Hospital, becoming a Fellow of the Royal Society of Medicine in the same year. By 1939, he retained the appointment at The London and at Maida Vale but was now Aural Surgeon to Hounslow Hospital and second Consultant Aural Surgeon to King Edward Memorial Hospital in Ealing. In 1935, he moved house to 93 Harley Street where he remained until 1945, so far as his practice address is concerned, with a brief sojourn at 32 Devonshire Place in 1946, finally giving his residence as 36 Weymouth Street for the first time in 1947. He bought this house from Geoffrey Carte although it had been hit by an incendiary bomb during the London blitz. (All these dates are taken from the Medical Directory of that year and could therefore have occurred at some time in the latter part of the previous year. Likewise the entrant decides which address to give whether it be consulting rooms and/or residence.) In 1946, in addition to his appointment at Hounslow he became Consultant at Wembley Hospital; he gave up the appointment at Maida Vale after the war.

A further note about Geoffrey Carte is perhaps appropriate. After attending Rugby School he went to New College, Oxford, where he obtained a second class honours degree in physiology and then proceeded to St Bartholomew's Hospital taking the Conjoint in 1912. He was later appointed assistant surgeon to the Throat and Ear department of the London Hospital and surgeon to the ENT department at Dollis Hill, having previously been surgeon to the Nose, Throat and Ear department of The Metropolitan Hospital and Registrar to the Aural department at The London Hospital. At this time he was also Consultant Laryngologist to the Royal Navy. A little earlier from 1922 to 1932 he had been private assistant to Sir Milsom Rees, a Bart's graduate and Consultant to the Royal Opera House, at the interesting address of 18 Upper Wimpole Street! Carte was much interested, as might be expected from his family background, in both music and the stage. It would be interesting to know his reaction when Garnett Passe published his book *The Singing Voice* in 1933! Geoffrey Carte gave his address as 36 Weymouth Street from 1932 until 1942 and certainly owned the house for much of this period.

Garnett Passe was a member of the Royal Navy Volunteer Reserve and, on the outbreak of war, was mobilized. He served at Plymouth during the early days of the war, and subsequently in a cruiser

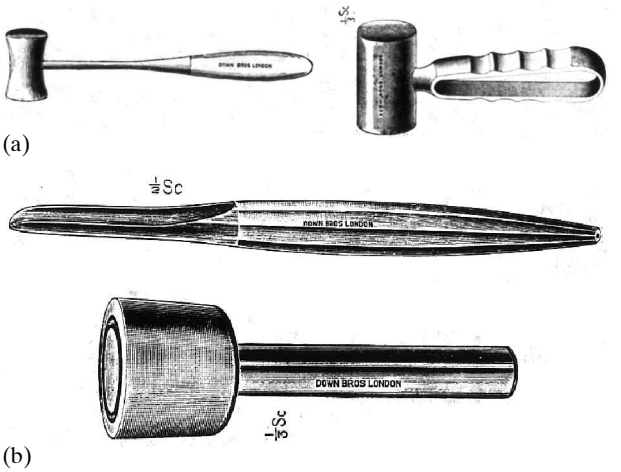

FIG. 11

(a) Note 153/C Godlee's *stainless steel* Mallet. Reproduced from Down's Catalogue, 1955, by kind permission. (b) Carte's zinc headed mallet, and gouges. The description in the original catalogue reads as follows 'The Gouge is a simple modification of the tools used by sculptors. For some 4,000 years the sculptor had been using a hammer and chisel or gouge as instruments of precision, and it was strange indeed if he had not evolved the best tools during this period. The spindle-shaped octagonal grip and small concavity in the shaft are taken from a sculptor's studio. The grip cannot slip – the concavity adds touch through the hammer. The Mallet also is of the sculptor's pattern – round-faced. It is made of zinc. The sculptor uses different materials from his hammer according to the hardness of the substance carved. This metal is used in the hammer for cutting stone of moderate density, and has been used here as the consistency of the bone met with in the average mastoid operation is much the same'. Reproduced from Down's Catalogue 1955, by kind permission of Aesculap Downs. (An exact match for the mallet/hammer illustrated in the paintings/drawings has proved impossible — it may just possibly be a sculptors' mallet, or alternatively not be an exact replica).

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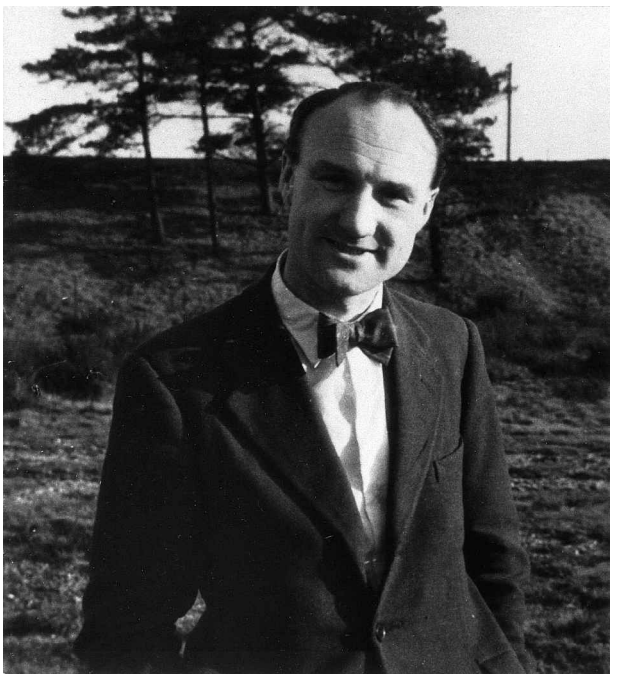
(a)

(b)



(c)

FIG. 12

(a) Photograph of Garnett Passe, wearing head light with cinematography camera and operator in background, at foot of operating table. The tray of instruments is seen on a stand at the head of the table while the surgeon (seated) operates on the patient's right ear. Sister is to be seen assisting on the other side of the table; she has been identified as Margaret Moir. Note the self-retaining retractor in use. (b) Garnett Passe with drill held in right hand. The drill cable is covered in cotton stocking coming down on this right side. Note also the rubber tubing beneath his right hand – presumably going to suction irrigator. The surgeon's mask has now been moved below the nose. Photographs supplied and reproduced by kind permission of Garnett Passe and Rodney Williams Foundation. (c) Photograph of James Seymour, who was assistant to Garnett Passe, as depicted in the series of sketches and drawings/paintings. Photograph supplied and reproduced by kind permission of Mr T. J. Wilmot.

squadron when he was involved in the convoy runs to Murmansk (Figure 4).

He served on HMS Cumberland including a period in Scapa Flow. Later he was posted to Bermuda as surgical specialist but during that time became ill. Whilst on sick leave he took the opportunity to visit Julius Lempert in New York; they had met previously in Stockholm at Gunnar Holmgren's clinic. He rose to the rank of Surgeon Commander and was awarded the V.R.D. (Volunteer Reserve Decoration). In December 1939, he married Barbara Hope Slatter. She had been born in Kenya in 1909 although her parents came from Rhodesia and she subsequently spent most of her childhood in each of these countries but much of her schooling was done in England. She trained as an artist at the Edinburgh College of Arts and in early 1938 was sent out by the *Illustrated London News* to India commissioned to prepare paintings as she wrote 'I went to paint and loved it . . . some so very handsome . . . with aristocratic features . . . and blue eyes. I went up the Khyber Pass – quite a feat in those days . . . pre war'. (Enquiries at the *Illustrated London News* and a search of that magazine for the period of 1937–9 (inc.) which was published weekly, failed to provide any evidence of this connection). For most of her period in India she lived in Kashmir and in adjacent areas, usually in a harem, but was able to go out and ride. Most of her work was line-drawing and water colours. She had a brother serving in the Indian Army, and presumably this is thought to have been the reason which attracted her to that particular region; he was subsequently killed in Burma later during the war.

Garnett Passe put through a long distance call to her in 1939 advising her to return to London. Prior notice was given of the phone call and, with the manual exchanges of those days, it appears that a significant proportion of India took part in the call. She returned in early September 1939, and was in the first convoy to leave Port Said for passage through the Mediterranean after the outbreak of war. The Jervis Bay was in convoy.[32] They were married in Marylebone Register Office on 22nd

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December of that year; his address was 2 Devonshire Place and hers, 11 Basil Street, London SW3 (M. E. Howard and D. J. Turnbull were the witnesses.)

He became a Fellow of the American College of Surgeons in 1945 (although this did not appear in his Medical Directory entry until 1952) and a Corresponding Member of the Societé Francais d'Oto-Rhino-Laryngologie.

Garnett Passe went on to perform more than 1,000 fenestrations. He demonstrated the operation to Dutch otologists in 1947 in Utrecht and gave another demonstration in Dublin later the same year; in 1949 he demonstrated the operation to Egyptian surgeons in Cairo.

Whilst continuing his interest in otosclerosis and fenestration surgery, as noted in the obituary in the *British Medical Journal*,[34] 'he became more and more interested in sympathectomy for the relief of tinnitus and nerve deafness as well as Ménière's disease ... Passe's operation, was at first, stellate ganglionectomy, coupled with the stripping, ligation and division of the vertebral artery; but in 1951 he substituted pre-ganglionic section of the second and third thoracic ganglia and division of the sympathetic trunk below the third thoracic ganglion. The encouraging results of this operation aroused much interest among otologists at home and abroad'. He read a paper on this subject at the Fourth International Congress of Otolaryngology in London in 1949 and gave a report on 110 cases at the Royal Society of Medicine in August 1951.[35,36]

He read a paper on sympathectomy to the Latin-American Congress of Otolaryngology in Sao Paulo in 1951 and was awarded an honorary degree at Rio de Janeiro.[37]

At the Annual Meeting of the British Medical Association in Dublin in July 1952 he reported on 200 sympathectomies over a 10-year period with good results for the relief of Ménière's disease. Immediately after this meeting he went with his wife on a fortnight's holiday to Cornwall. He was a genuine all round sportsman playing down to a handicap of 8 at golf being a frequent attender at meetings of the Medical Golf Society and a member of both Sunningdale and Wentworth Golf Clubs. It is recorded that he played golf with Dr S. Leonard Simson who recalled a round with him and another Australian, Norman von Nida, some two months before he died. At the age of 47, he gained a Silver Medal for ski-ing at Davos. He was greatly troubled both in his later days in the Navy and subsequently by headaches (migraine) and raised blood pressure and had been advised to take life more quietly. He had an interest in sculpture before the war and took this up more seriously after warnings about his health. It was during his last holiday that he spent much of his time working happily with Barbara Hepworth in Cornwall. He showed considerable skill in drawing and it was due to Barbara Hepworth that he learned how to work in stone.

Garnett Passe was on his way back from his recuperative holiday; one account says he died of a heart attack and another of a massive haemoptysis.

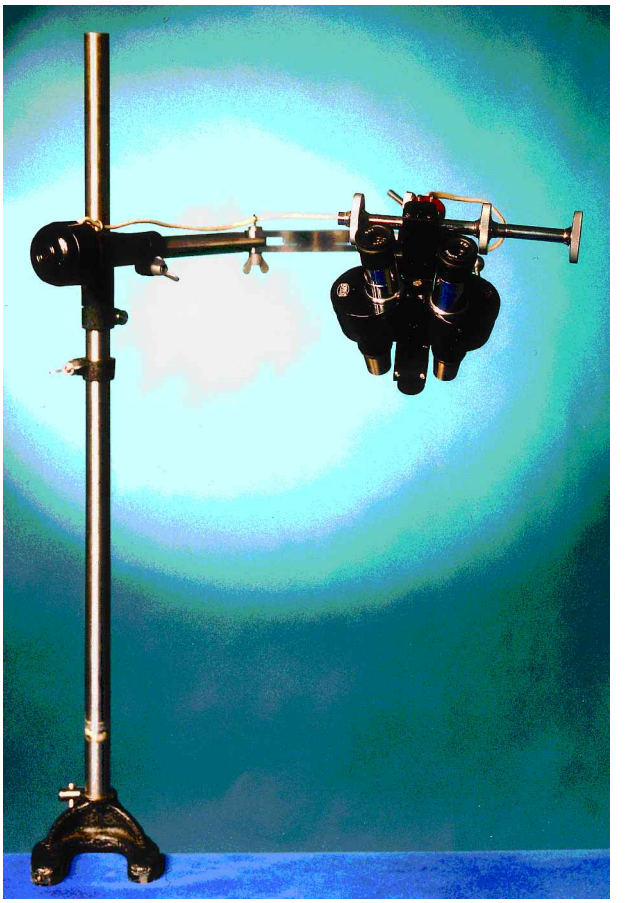

FIG. 13

Beck Lomag binocular microscope. The handle (seen projecting from the right) could be attached to either side and detached for sterilization. Magnification was altered by changing the eye pieces (× 6.5, × 10, × 13.5). Garnett Passe used it attached to the operating table as shown here. The switch, similar to a domestic light switch of the period, can be seen on the main stem with the flex passing along the horizontal, coming into the self-contained light fitting situated between the eye pieces. The light was a 6 volt, 15 watt bulb. (Photograph taken of instrument still in possession of Aural Dept., London Hospital!)

However the records show that he was admitted to the Royal Cornwall Infirmary on 1st August 1952, aged 48, where he died. A subsequent post mortem examination showed pulmonary oedema, a left internal capsular haemorrhage and hypertension as certified by Dr NJ Croft. The person reporting the death was a Mr EB Whitford of 12 Tregolls Road, Truro but there is no evidence that Mr and Mrs Passe had a home in Truro itself (all hospital records from that period have long since been destroyed). In his obituary in *The Lancet*[38] he was described as 'tremendously keen on work'. Dr Leighton F Johnson, Professor of Otolaryngology in the Boston University School of Medicine after visiting him in London described him as 'a very easy, relaxed, and rapid yet punctilious operator. His surgery was beautiful to observe and performed with consummate skill.' It was his opinion that he would be in the first rank of any group of the world's most distinguished surgeons. He was described as a most accomplished technician in the surgery of the labyrinth. (Garnett Passe was the owner of a Bentley

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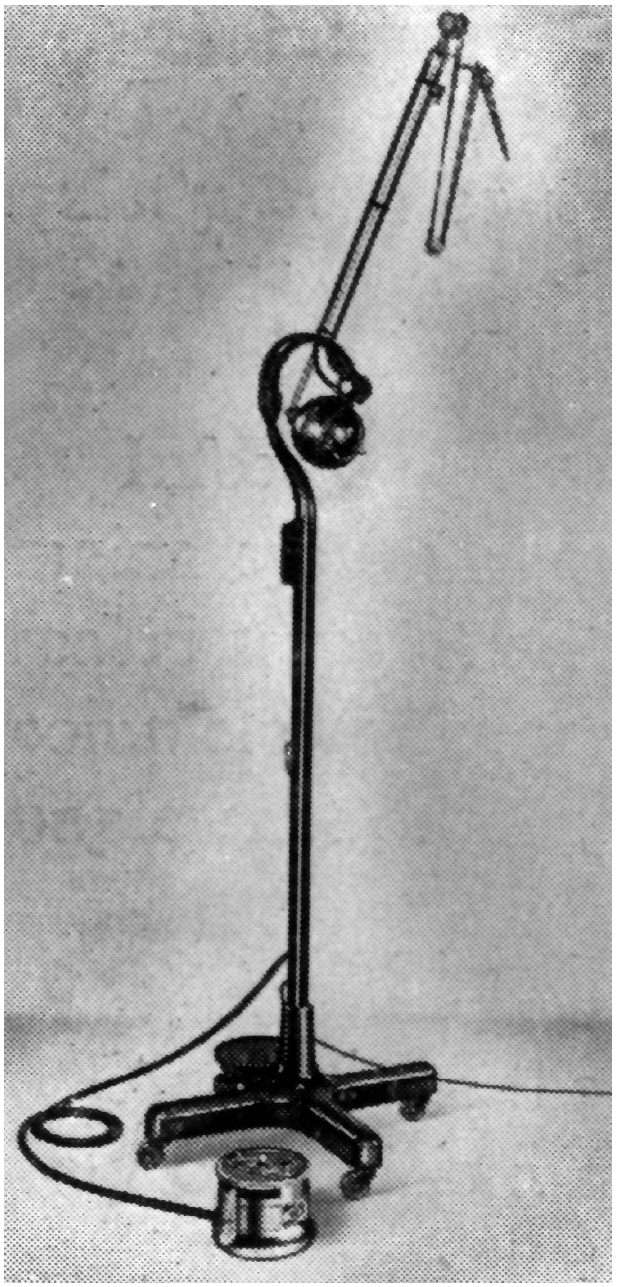

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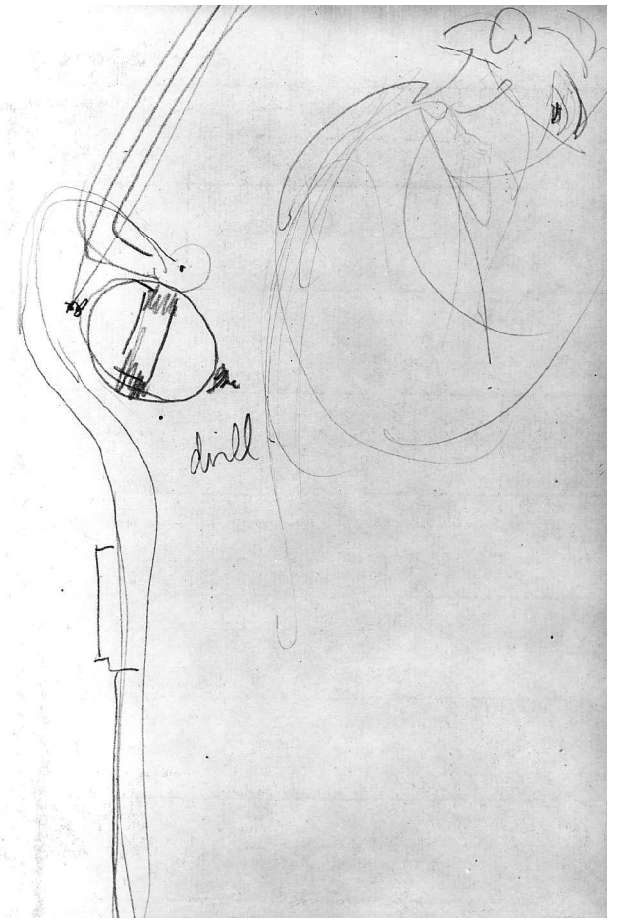

(b)

FIG. 14

(a) Sterling dental drill with foot pedal to alter speed (top 7 000 rpm, four speed forward and four reverse). The hand piece could be sterilized in A.C. 10/Soda solution. Reproduced by kind permission of Aesculap Downs. (b) Sketch of drill by Barbara Hepworth, from which identification was made (page 20, Science Museum Sketchbook Ref. 1309/78). Science Museum/Science & Society Picture Library. © Trustees of the Barbara Hepworth Estate.

number ENT 444 which was subsequently bought by Mr Gill-Carey; the telephone number of the London Clinic was/is WELbeck/935 4444!).

Garnett Passe's experience of the fenestration operation

Garnett Passe published his first paper on fenestration in 1939;[39] at that stage he had operated on 14 cases, 12 using the two stage Holmgren technique, and two the Lempert one stage operation. In the former technique the first stage consisted of isolating the lateral semicircular canal and closing the aditus by means of a graft from the posterior meatal wall. In the second stage, approximately three months later, the lateral semicircular canal was decompressed and the opening covered by the membranous lining which had formed in the excavated mastoid antrum. In the one stage Lempert method, the tympanic membrane was mobilized and the pars flaccida drawn backwards to cover the opening in the lateral semicircular canal, after removing the head of the malleus. Garnett Passe commented that the hearing showed improvement in five cases, as recorded by the audiometer, but only three improved to an appreciable extent where conversation was concerned.

Of Lempert's first 300 operations, 88 cases had shown partial or complete closure of the fenestra in the external semicircular canal. The interval between operation and closure varied from two to five months. He re-opened 72 of the 88 cases and found two distinct types of closure: bone regeneration, or closure by the formation of fibrous connective tissue. If inspected but left untouched this change became hyalinized and later appeared to become calcified and undergo bony metaplasia.

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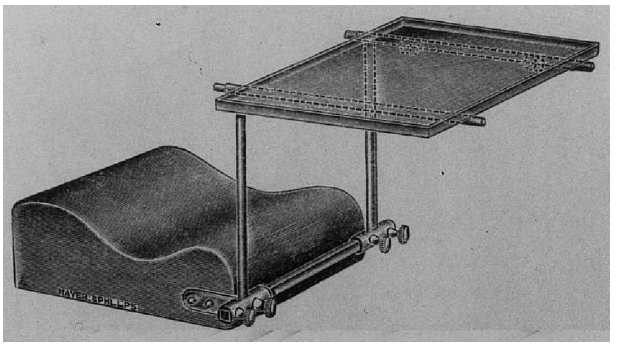
Every incomplete closure occurred in a case in which the fenestration had been begun somewhat more anteriorly over the ampulla. Likewise in every case in which closure of the fenestra was found to be incomplete there was a positive fistula test prior to inspection provided that the improvement in the hearing was maintained, indicating continued patency of the fenestra. It was this improvement in results which led Lempert to recommend fenestration of the ampulla (or anterior part) of the lateral semicircular canal which he termed 'fenestra novovalis'. This enabled him to create a fenestra measuring about 5 mm in length and 2 mm in width. He continued trying to find ways by which the fenestra might be kept open and in the same paper described the insertion of an obturator made of platinum and iridium.[40] As in all his papers meticulous operative instruction was always elegantly illustrated (Alfred Feinberg).

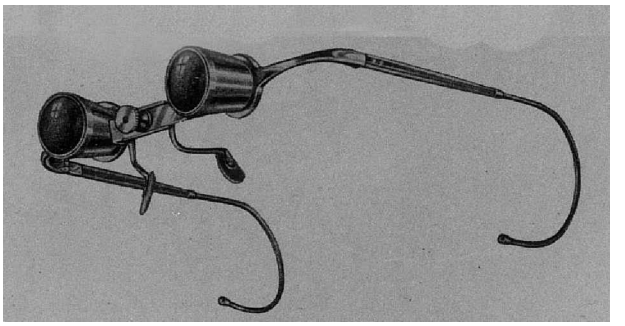
The obturator gave way to the stopple made of autogenous cartilage. He also hoped that this would prevent the serous labyrinthitis which occurred postoperatively.[41] At this time he was able to report on 1,000 cases carried out in the last seven years needing only 140 revisions, 88 of which had occurred during the first 300 cases. Moving the fenestra forwards over the ampulla and ensuring that all bone dust was removed from the operation site and that none went into the fenestra itself, gave continued improvement in the results.[42] Throughout Lempert carried out his surgery using a Zeiss magnifying lens but he never went on to using the operating microscope; the loupe bearing his name and manufactured by Storz (USA) had adjustable magnification from 3–6 power, that could be altered while being worn. By 1948, he had carried out 3,400 fenestration operations including 414 revision procedures.

In 1945, Lempert had recommended the construction of a speech audiometer for selecting patients for fenestration surgery. At that time he also thought that successful fenestration halted progression of the disease affecting the cochlear nerve but as yet the reason for this is not clear. He also stated that the majority of his patients were already wearing a hearing aid when seeking surgery and he worried that this lulled them into a false sense of security forgetting that the disease was progressive.

In 1946, Shambaugh[27] gave an account of 822 fenestration operations performed under continuous irrigation using a binocular dissecting microscope; Passe was impressed by the improvement in technique which he readily adopted.[43] Passe describes the operative technique as follows: 'Lempert endaural approach. The mastoid antrum is opened, and sufficient mastoid cells exenterated. Working forwards the outer attic wall is removed to expose the incus and the incudostapedial joint. The incus is removed, together with the head of the malleus. The posterior bony meatal wall is taken down until the annulus forming the notch of Rivinus is removed. The cutaneous lining of part of the postero-superoanterior meatal wall is then made into a flap which is



(a)



(b)

FIG. 15

(a) Headrest for endaural operations as designed by E. Garnett Passe and J. N. Cave. (b) Binocular loupe, giving magnification ×2; working distance 9 in.
Reproduced by kind permission of Aesculap Downs.

accurately moulded over the vestibular dome. Using a Zeiss binocular magnifying lens the fenestra is now made by means of a series of fine burrs in the dome of the vestibule ampulla of the lateral semicircular canal. This part of the procedure is performed under continuous saline irrigation. The edges of the fenestra are polished smooth with a gold burr and the endosteum open. The last stages of fenestration are performed under a dissecting microscope. The average duration of the operation is two hours.' There is no doubt that his dental training and use of the drill greatly helped to produce the high degree of technical skill which was the hallmark of his surgery.

By the outbreak of war Passe reported that he had performed 36 operations, and a further 100 operations since August 1945 using the fenestra novovalis, with or without insertion of the cartilage stopple (taken from the spine of the helix). Shortly after this paper was published, both Lempert and Passe abandoned the stopple technique.

At a Meeting of the Section of Otology at the Royal Society of Medicine in December 1946, Garnett Passe showed a colour film of the fenestration operation performed through the endaural approach.[44] (Figure 12A). In the operation shown on the film a cartilage stopple was inserted. Illustrations were also shown of the new fenestra without the cartilage stopple insertion and since the first 100 cases using the stopple, this had been abandoned and in a further series of 70 cases he had modified the fenestra (Figure 5). The cartilage stopple was given up for the following reasons: 'the cartilage stopple did not permit as great an increase in the hearing

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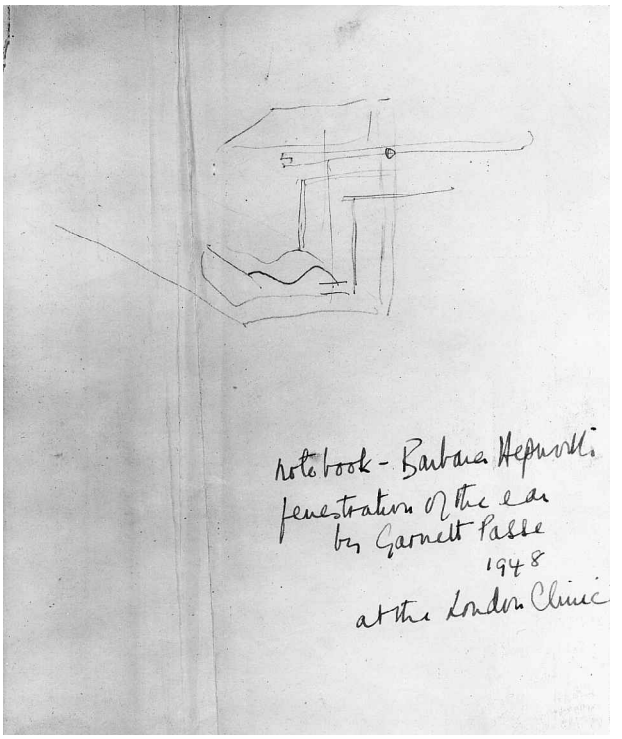
acuity. It does not materially reduce post-operative serous labyrinthitis. It does not necessarily prevent bony or fibrous closure of the fenestra and there is the further difficulty of insertion and the added risk that the membranous labyrinth may be injured during its insertion and associated manipulation'. As previously Passe had carried out the operations under Pentothal anaethesia together with the first dressing which was also carried out under similar anaesthesia six days later. Passe was meticulous in carrying out his post-operative dressings himself whether on hospital or private patients.

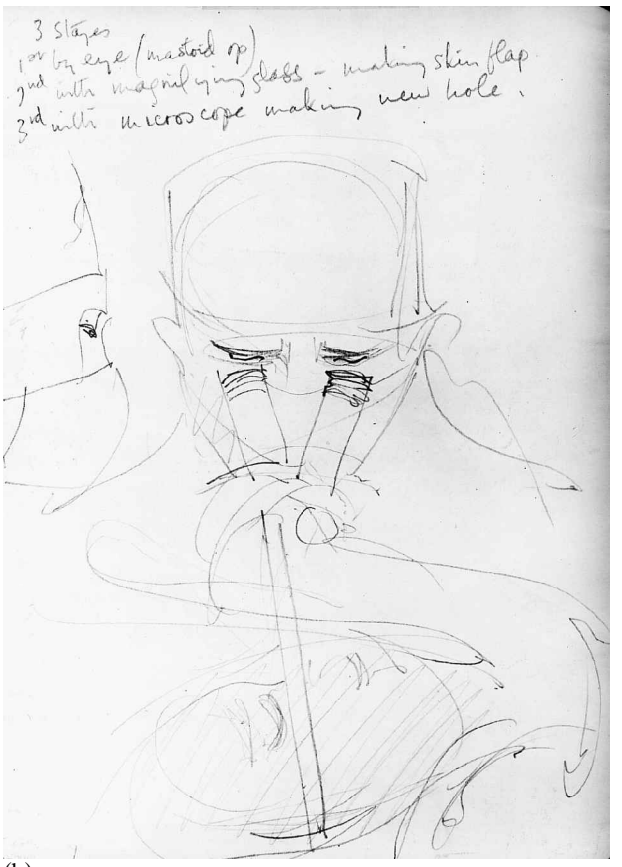
The fenestra created by Passe was much longer than that of Shambaugh and more of the endosteal bone was exposed.[45] By using this method he was able to obtain a fenestra in some cases almost a centimetre in length. The flap which Passe used was formed of the anterior meatal wall and he found that it was almost possible to cover the dome of the vestibule and the ampulla of the lateral canal with its very thin skin but it did not always prove possible to cover prolongation of the fenestra around the bend of the lateral canal with the anterior meatal wall (Figure 6).

When he had needed to revise those cases in which the cartilage stopple had been inserted, he found it to be immobilized or even extruded by fibrous tissue but not by bony growth, although bone was found on section embedded in the fibrous tissue. He noted that, should damage occur to the endolymphatic system during the operation, escape of endolymph occurred and this led to a reduction in the amount of hearing gained, although it by no means prevented partial restoration of hearing.

In January 1948, Passe was invited to give a paper to the Royal Academy of Medicine in Ireland.[46] By this time Passe had classified patients into three groups according to their potential results. In group 1, he expected an 80-90 per cent improvement in the restoration of the hearing to practical conversational level. In group 2, which he regarded as borderline, were included those cases in which tests showed the apparent extent of the cochlear nerve damage such that it had been necessary for the maximum improvement to be obtained if the practical hearing level is to be reached. In this group of cases he expected success in only 20–40 per cent. In the third group were those cases in which the cochlear nerve had so far deteriorated that the operation improvement was potentially practically nil. He later gave up all surgery on groups 2 and 3. In this paper he gives the greatest amount of practical detail in any of the papers which he published. The head of the table is slightly raised and novocaine and adrenalin are injected at the site of the incision. He then made a single cut in an S-shaped manner leaving a tongue of skin in the postero-superior angle which may be tucked inwards and backwards into the mastoid cavity at the close of the operation. The mastoid cavity was then exenterated to a degree sufficient to give ready access to the attic and antrum. He skeletalized the lateral semicircular canal, superior



(a)



(b)

FIG. 16

(a) Title page or frontispiece with sketch of microscope above (page 1, Science Museum Sketchbook Ref. 1290/78). Science Museum/Science & Society Picture Library. (b) Shows surgeon looking down the eye pieces of the operating microscope – twin beams with light in between. The Sister is seen on the surgeon's right (left of picture). (Page 27, Science Museum Sketchbook Ref. 1316/78). Science Museum/Science & Society Picture Library.

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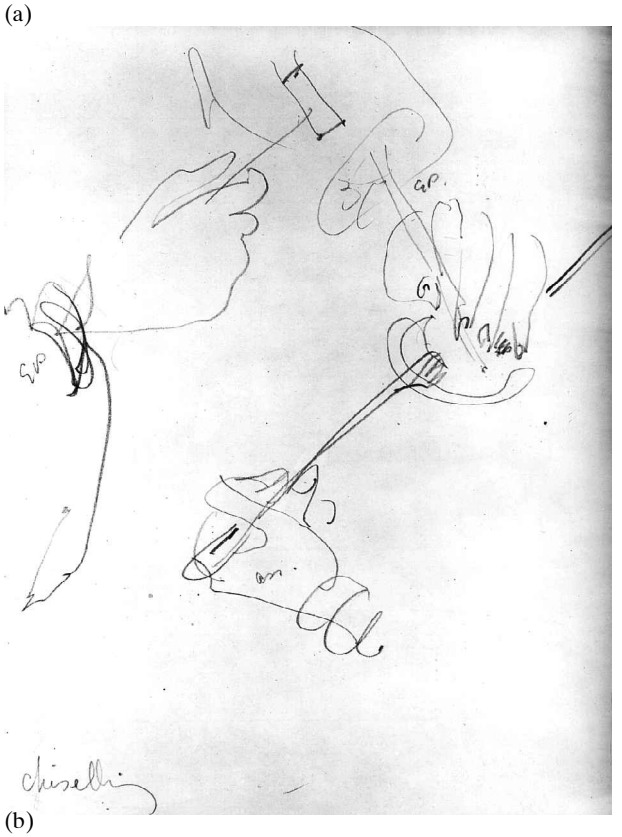
(a)



(b)

FIG. 17

(a) Shows surgeon, seated, on the left of the picture, assistant holding long-handled retractors to keep open the entrance of the ear, with the Sister at the head of the operating table (centre). The surgeon holds the *hammer* in his right hand and the gouge in his left. The two pairs of forceps or possibly towel clips are seen to the right of the wound/ear canal entrance (page 18, Science Museum Sketchbook Ref 1307/78). Science Museum/Science & Society Picture Library. (b) 'Close-up' view of the 'chiselling' i.e. hammer and gouge procedure. Beneath the end of the left retractor may be seen the lobe of the pinna (page 21, Science Museum Sketchbook Ref. 1310/78). Science Museum/Science & Society Picture Library.

(a)

(b)

FIG. 18

(a) Sister is seen in picture top left, the assistant (Seymour) standing with the drill (in outline) behind his back, and the surgeon seated, wearing headlight (page 23, Science Museum Sketchbook Ref. 1312/78). Science Museum/Science & Society Picture Library. (b) The drill is now seen more clearly on the left of the picture. Sister has now moved between the assistant and surgeon to position at head of table. Eyes and head lamp of surgeon clearly shown (page 16, Science Museum Sketchbook Ref. 1305/78). Science Museum/Science & Society Picture Library.

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surface of the posterior canal, the posterior surface of the superior canal by removal of the cancellous bone lying in this triangular area.

Furthermore he completely removed the bone down behind the facial ridge below the canal in order that the flap would lie over a convexity from before backwards as well as medially and extend in front of the eustachian orifice, posteriorly over the dome of the vestibule, the lateral canal and the posterior canal. The fenestra should be as large and as long as possible, not only to increase the mobility of the perilymph and endolymph, but also to prevent osteogenetic or fibrous closure of the fenestra (Figure 7). Passe made the skin flap from four-fifths of the total skin lining the external auditory meatus; in fact he utilized all the skin except the actual floor of the meatus. The flap was carefully fashioned, fitted in position and tried in its eventual resting place before the actual construction of the fenestra. The fenestra was created as described previously.

At a meeting of the Section of Otology at the Royal Society of Medicine in May 1948, Lempert was the guest speaker and spoke on his 'fenestra nov-ovalis for the restoration of practical unaided hearing in clinical otosclerosis: its present status.'[47]

The following year Passe[48] presented his first 500 cases with a follow-up between one and 13 years and this 'throws considerable light upon the value of the operation and also upon the cause of failure to obtain an improved hearing maintained at a useful level'. He was able to obtain a follow-up of 90 per cent of the cases resident within the British Isles and nearby continental countries but had to rely upon the co-operation of other otologists for periodical reports of patients living further abroad. In assessing his results he always asked what he called the supreme test i.e. 'Is the patient satisfied that the hearing gained has been sufficient from the individual's economic and social requirements to have made the operation worthwhile?' The patient was also asked to bear in mind the advantage he would have obtained from a hearing aid and also the probability of further hearing loss as time went by if an operation had not been performed.

This paper contains a watercolour sketch of the author's enchondralized fenestra showing the 'hooding' projecting from the medial border thereby protecting the membranous canal (Figure 8; the illustration, is unsigned.) Also in this paper are six small colour diagrams, in two groups of three, which show very clearly his technique and the reasons for it. The 'hood' is effected by cutting around the enchondralized roof or dome with a cupula knife or by pulverization using constant irrigation, and the operating microscope.

At a meeting of the Section in Otology at the Royal Society of Medicine in February 1950, Garnett Passe again spoke, making three comments on the operative technique.[49] Should the mastoid process be exenterated or should the surgeon be content with as small an approach in the form of an atticotomy as possible? Having used both extensively he was wholeheartedly in favour of the mastoid being exenterated. Should the fenestra be made using the lead burr? He felt that insufficient time had yet elapsed to judge its value but was concerned about the presence of a potentially noxious foreign body increasing the tendency to fibrous tissue formation on the under surface of the flap. His third comment was that Holmgren had recently suggested that it was unnecessary to open the endosteum. Passe had found that even under a magnification of 10, it was almost impossible to clean the endosteum of all bone dust and chips without opening into the perilymphatic space. If he was able to preserve the endosteum he preferred to turn it down over the lower edge of the fenestration as suggested by Sullivan.

With regard to healing of the cavity he had soon found that the rate of healing was in direct relationship to the dryness of the cavity. In the three years since he had abandoned the stopple insertion he had performed 611 cases obtaining the following results. Cases three years old: just over 70 per cent showed hearing improvement of 11 dB. Two year old cases: 73 per cent showed a maintained hearing improvement of over 11 dB (Figure 9).

In the early 1950s, he became interested in speech audiometry, both as an aid to diagnosis and in the evaluation of the results of the fenestration operation. He was able to send his patients to be tested at the Acoustics Laboratory at the RAF Central Medical Establishment in central London (supervised by a young Squadron Leader Peter King, personal communication, 1997).

He developed his own self retaining, hand-held and suction-irrigation retractors (Figure 10a,b,c). The hand-held retractor will be seen again in the sketches and paintings by Barbara Hepworth. Note also the chisels and mallet designed by Carte and the catalogue description (Figure 11a, and b). Figures 12(a) and (b) show Garnett Passe performing the operation itself. (The assistant in Figure 12a has been recognized as Miss Margaret Moir. The cine camera was in all probability from the Film Unit, at the Royal Society of Medicine; was it the making of the film shown in December 1946?).

The assistant depicted in the sketches and drawings/paintings was James (Croley) Seymour who was South African by birth and who qualified from St Bartholomew's Hospital in 1945 (Figure 12c). He later became the Bernhard Baron research scholar at the Middlesex Hospital working in the Ferens Institute and performing work for C.S. Hallpike and Victor Negus. In spite of being a motoring enthusiast he was nevertheless sadly killed in a road traffic accident. His last entry in the Medical Directory was for 1961 when he was recorded as being 'recently deceased'.

Reference to Table I in the article by Nylén[29] would appear to confirm that Garnett Passe used the Beck Lomag microscope which was introduced in 1946 and it appears to be this which is illustrated in the Hepworth sketches and paintings (Figure 13). The Zeiss Optom familiar to those starting their training in the mid-fifties onwards was introduced in

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(a)

(b)

FIG. 19

(a) This sketch clearly relates to the third picture in the series. The sleeve containing the drill comes across the right shoulder of the surgeon. Sister is in charge of her instruments on the tray at the head of the table. The assistant (right) retracts (page 5, Science Museum Sketchbook Ref. 1294/78). Science Museum/Science & Society Picture Library. (b) 'Close-up' of the lobe of the pinna with retractors, instrument in surgeons right hand and ? outline of sucker in his left (page 19, Science Museum Sketchbook Ref. 1308/78). Science Museum/Science & Society Picture Library. © Trustees of the Barbara Hepworth Estate.

1953. The drill used in this particular case has been identified as being manufactured by Sterling and is reproduced in the Down Bros. catalogue of 1955 which in turn was the revised edition of that brought out in 1952 (Figure 14). Passe provided and owned all his own instruments including the drill and microscope. With J. N. Cave he also developed a headrest (for endaural operations) which was a wooden block covered with sponge rubber but incorporating a tray holder for the instruments (Figure 15); also shown is the binocular loupe or 'magnifying glasses'.

Dr J(ohn) N(eville) Cave was a South African by birth and a staff anaesthetist at St George's Hospital. He qualified from the University of Cambridge and St Thomas' Hospital and was a specialist anaesthetist to RNVR from 1939–46 returning home after the war.

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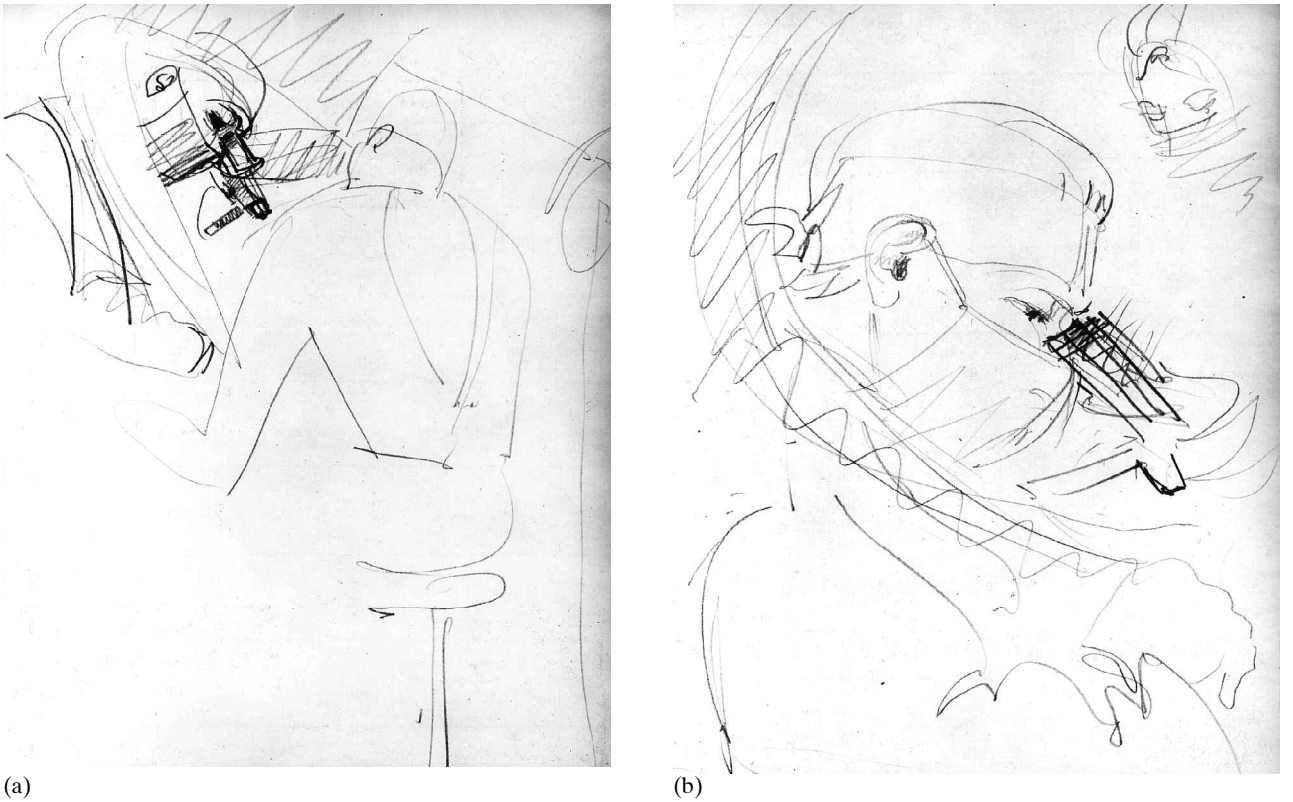
(a) (b)

FIG. 20

(a) Shows the surgeon on the left with headlamp but with magnifying spectacles etched in. Top left can be seen for comment "hole stuck up with bone" which would seem to imply that this is a revision operation due to closure of the first/earlier attempt at keeping open the fenestra. 'Flap of skin makes new drum' i.e. meatal skin rotated over fenestra (page 10, Science Museum Sketchbook Ref. 1299/78). Science Museum/Science & Society Picture Library. (b) 'Close-up' from surgeon's right side with magnifying spectacles etched in over eyebrows and around ears (page 22, Science Museum Sketchbook Ref. 1311/78). Science Museum/Science & Society Picture Library. © Trustees of the Barbara Hepworth Estate.



(a) (b)

FIG. 21

(a) Surgeon (left) and assistant (right), both seated. Sweep of drill in canvas sleeve around/over right shoulder of surgeon, who is now quite obviously looking down microscope (page 14, Science Museum Sketchbook Ref. 1303/78). Science Museum/Science & Society Picture Library. (b) 'Close-up' of right side of surgeon's head. Eyes concentrated looking down microscope. Sister's face seen top right corner (page 26, Science Museum Sketchbook Ref. 1315/78). Science Museum/Science & Society Picture Library. © Trustees of the Barbara Hepworth Estate.

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(Those operating in theatre at the London Clinic during this period wore white gowns; those at the Princess Elizabeth Orthopaedic Hospital wore green.)

Garnett Passe did not publish further papers on the subject of fenestration although in his obituary, i.e. by the time he died in 1952, he is alleged to have carried out more than 1,000 such operations. From 1948 onwards, he published a series of papers on Ménière's syndrome 'and its successful treatment by surgery on the sympathetic nervous system'.[35,36,37,50,51]

Science Museum sketchbook

A sale of Modern British and Irish Paintings, Drawings and Sculpture was held at Christie's on Friday 17th June 1977. Lot 243: Sketchbook; fenestration of the ear by the surgeon Garnett Passe was put up for sale. It was purchased for £500 by Dr (Lindsay) Sharp then the Assistant Keeper of the Pictorial Collection at the Science Museum. The sketchbook is approximately quarto size with an Oxford blue cover entitled *SKETCH BOOK* bearing in the lower left hand corner No. 5 and bottom right H.J. Ryman Ltd. London (priced 4/-). (Barbara Hepworth died on 20th May 1975).

The Sketch Book is perforated at the left hand margin and seven pages have been removed before the text starts. A further page is torn out between drawings 2 and 3, six more after drawing 31, then a single page and finally the last 25 pages making a total of at least 40 that have been removed. Whether these were used for other drawings which were found unsatisfactory is completely unknown. There are some 28 drawings/sketches (including the title page). All of the subsequent paintings were dated April or May 1948. (There are two further drawings although one is only a rough sketch, both of the lumbar/sacral vertebrae).

Figure 16(a) shows what might be called the frontispiece with a good example of the artist's handwriting, above which is seen a sketch of the microscope (from the side). The inscription is written in blue ink while all the other writing on the drawings is in pencil.

The sketchbook contains the 'on the spot drawings' for the fenestration operation. Also acquired at the same time was a letter dated Sunday – September 14th (1952 – the year in pencil in top right, but 5 and 2 unsteady, ? in another hand) from Barbara Hepworth 'dear Barbara Passe – it was so very good of you to write to me. At long last I have traced one of these old notebooks – I send it by registered post and please keep it until I reach London to stay with Lily on September 30th. I hope you won't be terribly disappointed. I had to work at such speed that I merely made sort of shorthand notes incomprehensible to everybody but myself. If there's anything which has a meaning for you too – please tell me & I will inscribe it to you – when I see you. With love from Barbara.' (Science Museum Inventory No. 1977–500). As will be seen from illustrations reproduced, many of the sketches are remarkably informative although one does not often see an exact match with the finished paintings. On some occasions there is more than one sketch per page, usually an enlargement of some specific detail for later reference. Until more recent methods of sterilization were introduced for instruments used in operation, the lead and handle for a drill were passed into a sterilized canvas sleeve or cotton stockingette which was then tied at each end around the cable and hand piece. In the case of the operating microscope it was wiped down with antiseptic, or alternatively sterilized handles were applied to the bits touched by the surgeon, or similarly enveloped in a sterilized sleeve of canvas or cotton stockingette.

The sketches provide not only a visible guide to the subsequent paintings but the written comments are also helpful in their interpretation and confirm the artist's complete understanding of what she was witnessing and trying to portray. Figure 16(b) confirms the 3 Stages of the operation – this observation is particularly important in determining the sequence of the pictures – as will become apparent later.

The coarse bone work would normally be done first using a hammer and gouge to open up the mastoid bone or take down/remove the bone at the level of the ear drum to explore the lateral (horizontal) semicircular canal (Figures 17a,b). The surgeon then changes over to the drill for the finer bone work (Figures 18a,b) initially using his headlight (lamp) seen also with close up views (Figures 19a,b). In the second stage of the operation, the surgeon uses magnifying spectacles (ocular loupe) to give him a small degree of magnification (Figures 20a,b). Finally the operating microscope is brought into use to give the greatly increased magnification helpful in making the fenestra itself (Figures 21a,b). Some of the other sketches show individual parts of the operation or surgeon in more detail viz Figure 22(a) – the surgeon's headlamp, Figure 22(b) looking from his right side down the microscope and Figure 22(c) and 22(d), the magnifying loupe, from the side and from in front, beneath the headlamp i.e. the spectacle position.

Drawings/paintings

Barbara Hepworth is believed to have made six oil and pencil works on the theme of 'Fenestration of the Ear'. Five of these were painted on supports (two vertical and three horizontal) of two different sizes (Table I), and both their vertical/horizontal orientation and their titles seem sometime to have been given incompletely or interchangeably (see later).

The grounds of these works are generally described as gesso but the artist told the conservation department of the Birmingham Museum and Art Gallery 'I have always made my own grounds by building up several layers of the best flat paint procurable, and each surface I rubbed down or scraped down until it got the hardness and depth that I required. The paint that I used during the years in question 1948–1951 was Ripolin flat white' (later this became unobtainable): 'As I worked, I used an

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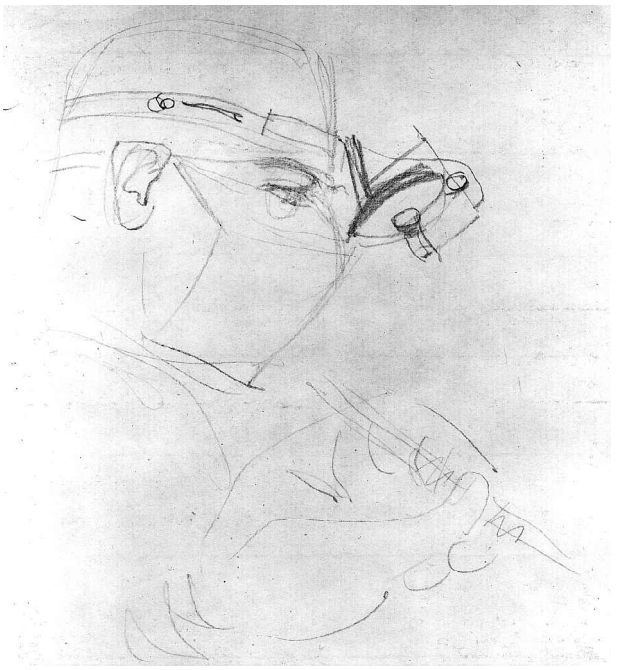
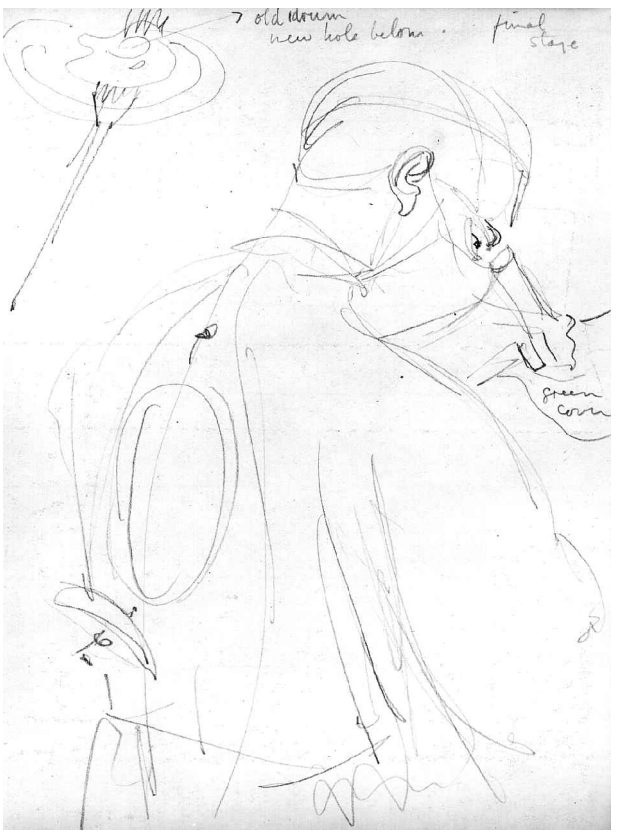


(a)



(b)

(c)

(d)

FIG. 22

(a) 'Close-up' with surgeon, mask covering nose, headlamp on, mirror etched in with bulb on front, electric wire going to mount visible. Sketch of finger and thumb (left hand) holding an instrument (page 3, Science Museum Sketchbook Ref. 1292/78). Science Museum/Science & Society Picture Library. (b) At microscope stage of procedure, a sketch showing right pinna "old drum – new hole" (top left – "final stage"). Main sketch shows surgeon's back, microscope in green cover (in position), gown tied at the back (between shoulders) and possibly headlamp dangling behind (page 28, Science Museum Sketchbook Ref. 1317/78). Science Museum/Science & Society Picture Library. (c) Magnifying glasses – detail of right side of head with loupe between eyes and headlamp. Second sketch below with emphasis on actual magnifying spectacle in front of right eye (page 8, Science Museum Sketchbook Ref. 1297/78). Science Museum/Science & Society Picture Library. (d) Surgeon with ocular loupe in position, sister's head to his left (right of sketch), holding instruments in each hand. The sweep across the left is to represent the assistant's right shoulder and sweep at bottom right the retractors/assistant's arms on either side of meatal opening (page 25, Science Museum Sketchbook Ref. 1313/78). Science Museum/Science & Society Picture Library. © Trustees of the Barbara Hepworth Estate.

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TABLE I

			Signed	Dimensions	Format	
1.	*The Beginning*	5/48	BLH	$10\frac{1}{4}'' \times 14\frac{1}{2}''$	H	Foundation, Melbourne
2.	*The Hammer*	4/48	TLH	$15\frac{1}{8}'' \times 10\frac{5}{8}''$	V	Tate Gallery, London
3.	*The Lamp*	4/48	BLH	$13\frac{1}{2}'' \times 17\frac{1}{2}''$	H	Leeds City Art Gallery
4.	*The Microscope*	5/1948	BLH	$14'' \times 18''$	H	Spink-Leger Gallery, London
5.	*The Magnifying Glass*	4/48	BRH	$17\frac{1}{2}'' \times 13\frac{1}{2}''$	V	Bolton Museum and Art Gallery
6.	*Blue Drapery*	1948		(Little one)		Location unknown

BLH = Bottom left hand corner; TLH = Top left hand corner; BRH = Bottom right hand corner; H = Horizontal; V = Vertical.

infinite number of razor blades as well as brushes and pencils and the paints I used were Winsor and Newton. This gave me great flexibility and I approximated more to a carving technique. The pencils I used were Venus H-4B according to the hardness of the surface I had created. No varnish was used and I am afraid my technique would fall down if varnish was used as it would simply lift off the pencil, and would only be left with the oil paint on the ground . . .'[52] The conservators at The Tate Gallery have identified the ground of *The Hammer* drawing, as combining Ripolin flat white (an alkyl resin-based household paint), white lead and chalk. A thin glaze, soft blue grey in colour, was painted over the ground in the case of *The Hammer*. This layer was then rubbed down and scraped with a blade so that areas of white ground became more visible and the texture of its brushwork was accentuated. The picture in The Tate is now thought to be the second in the series and has been entitled *The Hammer* by Alan Bowness and certainly this is a most apt description. In this painting pencil is applied over the rough ground and the cobalt blue area at the top and brown towards the bottom painted last.[53]

Capener states that the figure in the periphery, in the top left corner of *Concourse 2*, the last of the operation series of drawings, was Hepworth herself. The work was presented in the presence of the artist by Norman Capener to the Royal College of Surgeons of England (of which he was then Vice President).[5] Stephens has suggested that in the similar position the slightly shadowy head in the first of the fenestration series, entitled *The Beginning*, may be another such self portrait. The six fenestration pictures have never been shown together and indeed the five shown in this article have been brought together and are published here as a series for the first time.

In all five of Barbara Hepworth's larger Fenestration of the Ear oil and pencil works, the other two figures are his assistant Mr James Seymour and his private theatre sister and assistant in private practice, Miss Margaret Moir; she was later to become Barbara Hepworth's secretary for a period at her studio in St Ives after Passe's death. The entry in the Tate Gallery (1976–8) *Illustrated Catalogue of Acquisition*[54] quotes Miss Moir, in a letter 30 years later, recalling that 'Barbara Hepworth came to the London Clinic on several occasions in the space of two or three weeks, each time a fenestration operation was being performed by Mr Garnett Passe. She made brief sketches during these visits, at all stages of the operation'. Gale and Stephens[53] quote from a letter from Barbara Hepworth to Herbert Read (6th March 1948) which she wrote from Cornwall 'I was in ''the theatre'' for 10 hours one day last week.'

Exhibitions

In her 'first exhibition just after the war, (October 1946) Barbara Hepworth exhibited both sculpture and drawings at the Lefevre Gallery. In addition to the 32 sculptures there were also 30 paintings and drawings though some of these were preliminary sketches for sculptures but relatively few. In April 1948, also at the Lefevre Gallery, there was an exhibition of paintings by Barbara Hepworth and L.S. Lowry at the Lefevre Gallery. It was at this exhibition that the first of the paintings and drawings entitled *In An Operating Theatre* appeared; 33 such works were shown and there was an illustration of one entitled *Median*, which was later bought by Dr J.D. Bernal, F.R.S.; as was stated earlier, the introduction to the catalogue was written by 'A Surgeon' (Norman Capener). According to the catalogue the works included some drawn in ink, some red chalk but mostly oil and pencil although

TABLE II

			Signed	Dimensions	Format	
2.	*The Hammer*	4/48	TLH	$15\frac{1}{8}'' \times 10\frac{5}{8}''$	V	Tate Gallery, London
1.	*The Beginning*	5/48	BLH	$10\frac{1}{4}'' \times 14\frac{1}{2}''$	H	Foundation, Melbourne
3.	*The Lamp*	4/48	BLH	$13\frac{1}{2}'' \times 17\frac{1}{2}''$	H	Leeds City Art Gallery
5.	*The Magnifying Glass*	4/48	BRH	$17\frac{1}{2}'' \times 13\frac{1}{2}''$	V	Bolton Museum and Art Gallery
4.	*The Microscope*	5/1948	BLH	$14'' \times 18''$	H	Spink-Leger Gallery, London
6.	*Blue Drapery*	1948		(Little one)		Location unknown

BLH = Bottom left hand corner; TLH = Top left hand corner; BRH = Bottom right hand corner H = Horizontal V = Vertical.

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FIG. 23

The Hammer. Oil and pencil on board. © Trustees of the Barbara Hepworth Estate, Tate Gallery, London 1998. (See Figs. 17a,b, 22a).

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FIG. 24

The Beginning. Inscribed on the reverse, written in pencil: Fenestration of the Ear the beginning (probably in Barbara Hepworth's handwriting). Illustration supplied and reproduced with kind permission of the Trustees, Garnett Passe and Rodney Williams Foundation, Melbourne, Australia. (See Figs. 18a,b). © Trustees of the Barbara Hepworth Estate.

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FIG. 25

The Lamp. Illustration supplied and reproduced with kind permission of Leeds City Art Gallery. (See Figures 19a,b). © Trustees of the Barbara Hepworth Estate.

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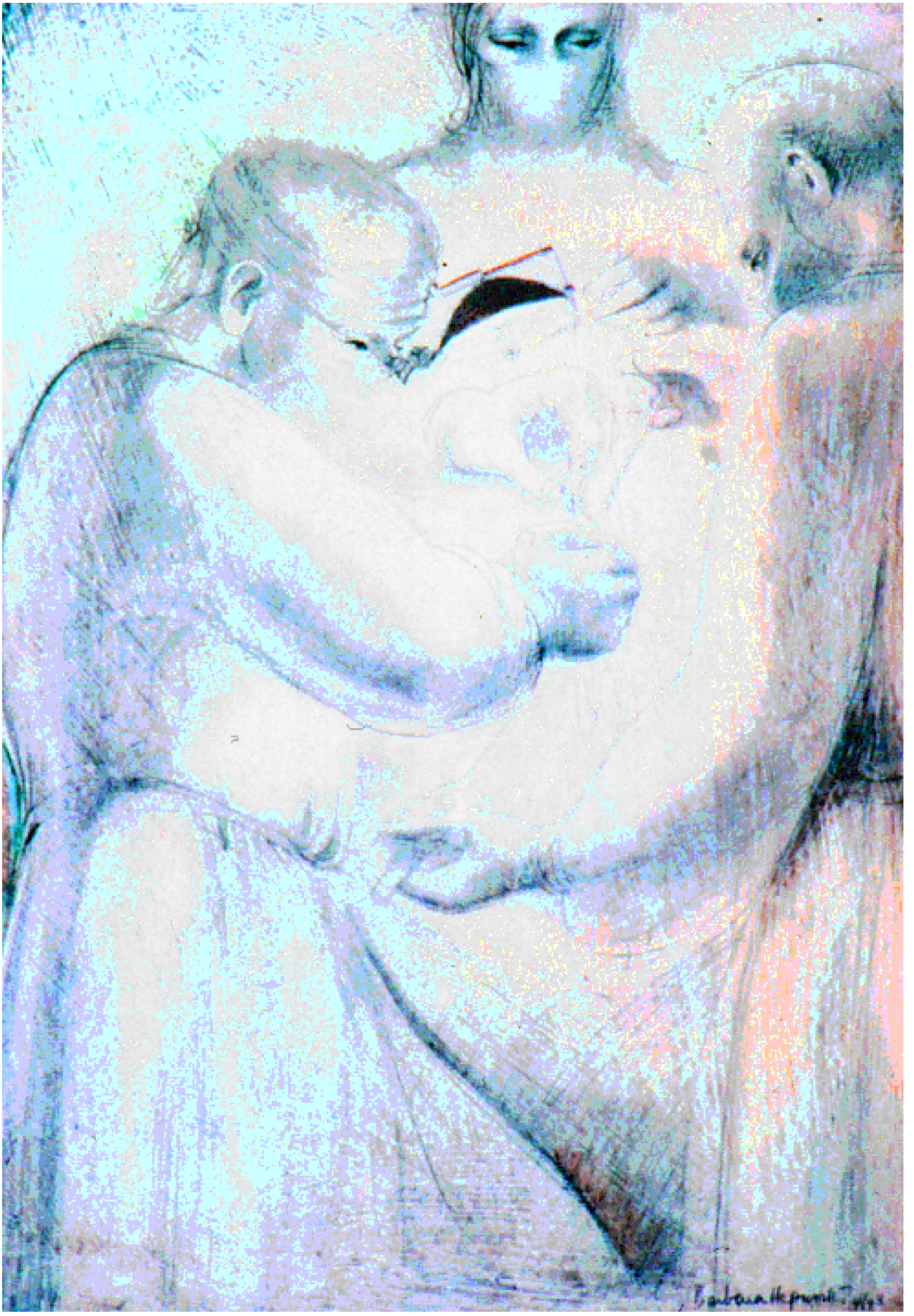

FIG. 26

The Magnifying Glass. Oil and pencil on thin board. Illustration supplied and reproduced with kind permission of the Bolton Museum and Art Gallery. (See Figs. 20a,b, 22c,d). © Trustees of the Barbara Hepworth Estate.

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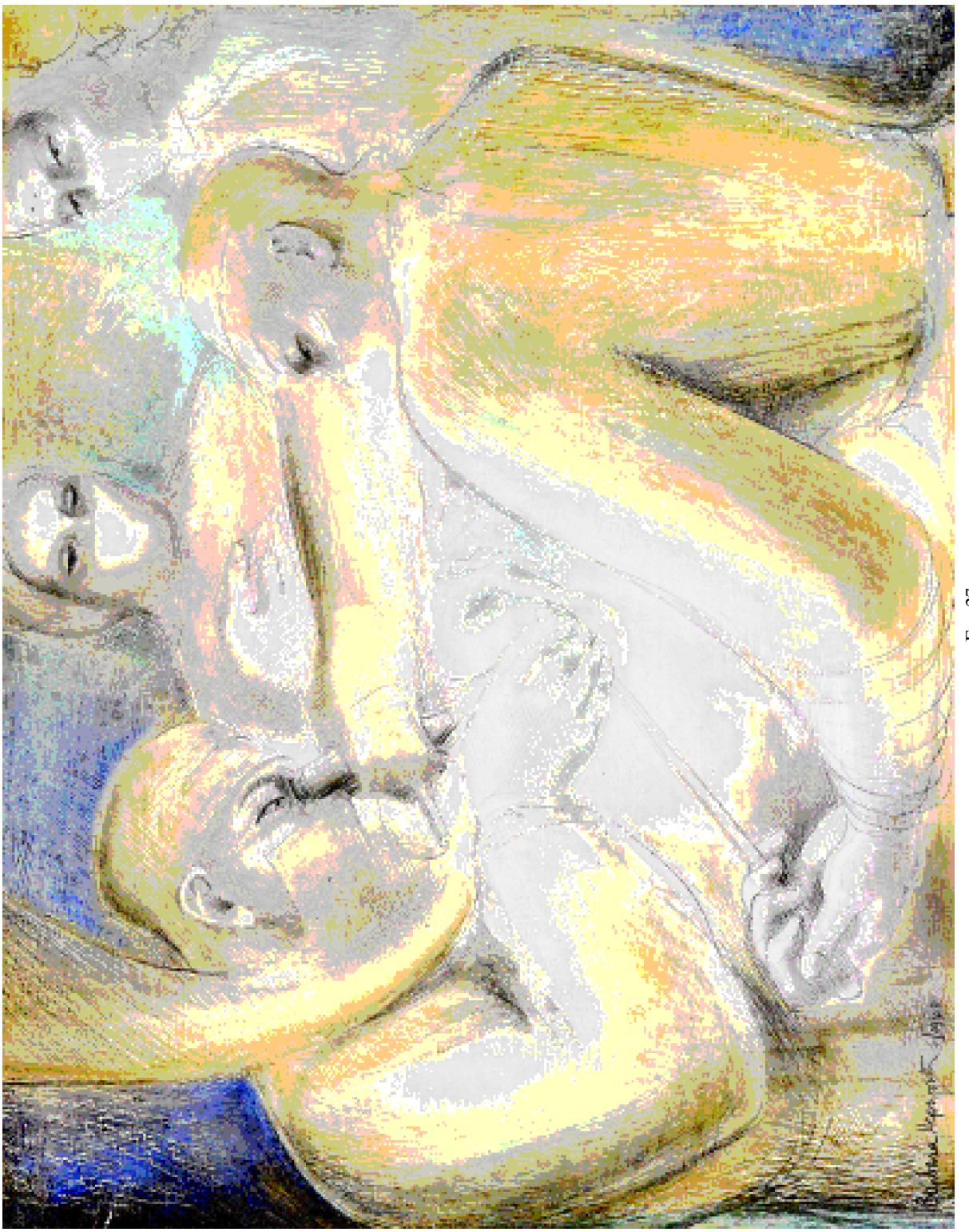

FIG. 27

The Microscope. Pencil and oil on gesso-prepared board. Signed and inscribed on reverse: Barbara Hepworth/Fenestration (the microscope)/1948 (oil and pencil). Illustration supplied and reproduced with kind permission of Spink-Leger Pictures. (See Figs. 21a,b, 16b, 22b). © Trustees of the Barbara Hepworth Estate.

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there were three using ink, chalk, and oil, one wax, oil and pencil and three pencil on oil ground. The prices ranged from 18 guineas for a couple of the simpler studies through to the highest price of £95. (Thirty-one of the operation series of paintings were listed in the catalogue, to which two more were added: *Procession* and *Prevision*). The exhibition also included 21 drawings of nudes, 10 drawings for sculpture and two sculptures.

In an exhibition at the Lefevre Gallery entitled 'Modern British Painting' in August of the same year (1948) Babara Hepworth exhibited two paintings, this time in the fenestration series: *The Lamp* and *The Microscope* both priced at £60. (Table I).

The following year, in October 1949, Babara Hepworth had an exhibition at Durlacher Bros. in New York at which 39 paintings were shown including 20 in the operation series; of the latter, six had previously been shown at the earlier Lefevre exhibition. However included amongst those on offer in New York was another in the fenestration series – the beginning (No.2 in the catalogue – no dimensions given). Three in the operation series bore the suffix '(London)'.

In February 1950, Barbara Hepworth exhibited again at the Lefevre Gallery a series entitled New Sculptures and Drawings and included amongst the latter were eight in the operation series of which three were new, the others having been shown previously at the Durlacher exhibition in New York. (Fourteen sculptures and 31 other drawings/paintings were also shown). (A painting called *Preparation* was shown at each of the three exhibitions but there are two such paintings with the same title; one was marked as 'sold' in the April 1948 sale room catalogue).

The paintings are reproduced here in the sequence of a fenestration operation i.e. initially hammer and gouge, drill work, then using binocular loupe and finally with the microscope (Table II).

No. 2 The Hammer (Figure 23). It was initially shown in the exhibition at Durlacher Brothers in New York in October 1949 and was then entitled *Fenestration (the beginning)*. The same painting was shown in the Retrospective Exhibition at the Whitechapel Art Gallery in 1954 (listed No. 108)[55]. At the time of the 1954 Whitechapel exhibition, this picture was still owned by The Artist. The work was later given by Hepworth to be sold at the Treason Trial Defence Fund Sale held in Cathedral Hall, in Cape Town, South Africa in early 1958. It was bought by Heinrich Nathan and was later sold by Sothebys in a sale in November 1976 and bought for the Tate Gallery by Waddington and Tooth Galleries.

This work which was later renamed by Sir Alan Bowness as *The Hammer* to distinguish it from the first picture in the series which was in private hands. The author would like to suggest that the painting which has since been renamed *The Hammer* should indeed be the first in the operation sequence and that the Passe/Melbourne picture should become second i.e. as jotted down by Hepworth in her sketch (see Figure 16(b), sketch 27). (Tate Gallery (1976–8)) Illustrated Catalogue of Acquisitions, (1979).[54]

No. 1 The Beginning (Figure 24). In the Whitechapel Retrospective Exhibition item No. 109 with almost identical measurements, although in the horizontal format, subtitled *The Beginning* was then owned by Mrs Garnett Passe.[55] This painting with exactly that description written on the back is now in the possession of the Foundation in Melbourne.

No. 3 The Lamp (Figure 25). This was purchased by the Leeds Art Collection Fund. There are no further details on file. It is thought that it was probably brought direct from Alex Reid and Lefevre Ltd. The gallery reference catalogue gives the prices (in this case £60) but does not indicate which items were sold (for any of the artists). The painting was already in the collection of the Leeds City Art Gallery by 1951 when shown in the Festival of Britain exhibition at Wakefield City Art Gallery (May 19th–July 7th).

No. 5 The Magnifying Glass (Figure 26). This was originally given by the artist to G.R. Downing (*c.* 1949) whose widow Mrs Carol Downing gave it to the Westminster Memorial Trust. It was subsequently sold at Christie's on 13th July 1973 (Lot 325A) and bought by Agnews for 3,360 guineas and sold two years later to Bolton Museum and Art Gallery for £4,250.

No. 4 The Microscope (Figure 27). It has been presumed that this is one of the two works exhibited by the Lefevre Gallery in the summer of 1948 and sold to a private collector in England (also priced at £60). It recently came up for sale at Christie's in October 1996 (Lot 32) as the property of an 'Overseas Trust'; it sold for £42,000. More recently still it formed item 16 in the sale of Twentieth Century British Art at Spink-Leger Pictures in April 1998 and was also shown by the same gallery at the Royal College of Art in the summer of 1998.

The artist made photographs of the paintings and three of them have unexplained numbers on the reverse side; *The Hammer* is numbered 33, *The Microscope* 35 and *The Beginning* 36; the other two are not numbered.[53]

Discussion

In 1951, the year of the Festival of Britain, there was an exhibition at Wakefield City Art Gallery, which then toured to York and Manchester later the same year. There were some 43 sculptures on view, 13 abstract drawings, of which eight were available for purchase, and 18 operating theatre drawings of which only three were for sale and indeed one entitled *Tibia Graft* was subsequently purchased by the Gallery itself. Two of the operation theatre paintings, *Prevision* and *Radial*, were illustrated in the catalogue.

At the major retrospective exhibition in 1954 held at the Whitechapel Art Gallery,[55] 75 carvings and 125 drawings were on show; of the latter no less than 24 were operation drawings; included amongst these

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were two in the fenestration series (Nos. 108 and 109) as already discussed. None of the operation drawings was illustrated in the catalogue.

In the Penwith Society Exhibition in 1950 Barbara Hepworth exhibited *The Scalpel* (Cat. Work No. 28, priced at 100 guineas). This was in fact *Scalpel 2* which was later acquired by Herbert Hepworth and subsequently inherited by Barbara's sister Elizabeth who was married to John Summerson. *Scalpel 2* is now owned by The Tate Gallery having been acquired in 1995 in lieu of tax on the Summerson estate.[53]

In the exhibition at the Tate Gallery in 1968,[56] 186 sculptures were shown together with 40 drawings and paintings. Of the latter, five were from the operation series but none of the fenestration operation.

In the Retrospective Barbara Hepworth Exhibition at the Tate Gallery Liverpool in 1994,[57] which later toured the Yale Center for British Art, New Haven and the Art Gallery of Toronto in early 1995, 115 works were shown of which 86 were sculptures and 29 drawings; of the latter there were three paintings in the operation series and a sketch but again none of the fenestration operation.

In 1993, at the Tate Gallery St Ives, there was a study display of 15 items, entitled Barbara Hepworth's hospital drawings. (No catalogue provided). On view were 12 of the operation series including two from the fenestration series – *The Magnifying Glass* lent by Bolton Museum and Art Gallery and the other from the Tate Gallery Collection labelled *The Microscope* although so far as the author knows this work has never been in their hands; it was in fact *The Hammer* which was on view.

There have been two books by Hepworth with introductions by Herbert Read[1] and Alan Bowness[3] that include illustrations and discussion on the operation series. The first contains a total of 12 of the operation series of paintings in three groups including the only one ever to appear in colour (*Preparation*, 1949, Figure 113) and the second containing eight, all in black and white (of which five are the same as in the earlier publication). Two other books on Barbara Hepworth by Hodin[58] and Hammacher[59] each contained two illustrations from the main corpus of the operation series but none from the fenestration series. More recently, Stephens[60] in a chapter entitled *From constructivism to reconstruction; Hepworth in the 1940s* shows five of the operation series of paintings. Unfortunately that from the fenestration series (Figure 39) is entitled *The Microscope* whereas, in fact, it is the Passe/Melbourne picture (*The Beginning*).

Acknowledgements

This article and the associated presentation would not have been possible without the help, encouragement and advice given by Sir Alan Bowness, Trustee of the Hepworth Estate, and also husband of Sarah Hepworth-Nicholson. I am also greatly indebted to Mr Peter Freeman, Chairman of the Garnett Passe and Rodney Williams Foundation, not only for allowing me to reproduce the illustration of the painting in their care but also for Figures 4, 12(a) and (b) and for other help and information. I am much indebted to Wendy Sheridan, curator of the Pictorial Collection, for access and help in respect of the sketchbook and also to the Science Museum, Science and Society Picture Library for allowing me to reproduce many of the sketches.

I am pleased to acknowledge the help which I have been given by the Tate Gallery in London (Chris Stephens, Matthew Gale and Mary Horlock, the Librarian, Meg Duff), and also in St Ives (Mike Tooby). Other galleries which have been most helpful and welcoming have been the Leeds City Art Gallery, (Corinne Miller), Bolton City Art Gallery and Museum, (Lucy Whetstone), Spink-Leger Pictures (Mr James Holland-Hibbert), the Lefevre Gallery (Mr Desmond Corcoran) and Christies (Lynda McLeod). Permission has very kindly been given to me to reproduce in large part the article by the late Dr George Shambaugh and I was obliged to him not only for permission but also to Dr Robert Jackler, Editor in Chief, *American Journal of Otology*.

I am also most grateful to my senior colleagues for their personal recollections of Garnett Passe and the fenestration procedure: John Angell-James, John Ballantyne (who also provided information to the Tate Gallery in 1975), the late Sir Geoffrey Bateman, John Blandy, the late Clive Butler, Ronald Green, Charles Heanley, Air Vice-Marshal Peter King, William Lund, Stuart Mawson, Air Vice-Marshal Manus Moran, Andrew Morrison, Anthony Radcliffe, Leslie Salmon, Henry Shaw and Tom Wilmot. I have also received much help from two former senior theatre technicians at the London Clinic, George Turner and Bill Peters. Others who have tried to identify *The Mallet* have been John Kirkup, Roger Phelps and Alan Humphreys in the UK, Dr Howard House in the United States, Professor Dietrich Plester, Professor Adolf Miehlke and Professor H. Feldmann in Germany. I am indebted to Professor Richard Ramsden for doing the necessary German translation. Dr P. Narain, Curator of the B.D.A. Museum helped to identify the dental drill from the original sketch. Details of their undergraduate years were kindly supplied on Carte and Passe, respectively, by the archivists of New College, Oxford and St Bartholomew's Hospital and by Jonathan Evans, Royal London Hospital.

I am particularly pleased to acknowledge the help and co-operation of Mrs Elsa Capener, widow of Mr Norman Capener, Professor Robert Ling, Mr Chris Jefferiss all from Exeter, and Mr Robert Robins for introducing me to and guiding me round St Ives. This whole project was prompted by remarks from Pandora Hadfield to whom I remain ever grateful.

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