

DEPARTMENT of MEDICAL PHYSICS

ROYAL PERTH HOSPITAL

A BRIEF HISTORY

Bruce Hedland-Thomas M.Sc.

FOREWORD

The comprehensive accounts of the Medical Physics Department will be found in its Annual Reports so long as they continue to be filed and archived. The difficulty of producing a report suitable for conclusion in a larger journal may be illustrated by the fact that the submitted annual reports were never included in the Hospital's Annual Report.

This manuscript is a, possibly personally biased, account of the significant events in its life. Up to 1986 they are a fairly accurate account of the calendar year. Thereafter, changes to the timing and style of annual reporting, also to include budget estimates, made it more convenient to describe the financial year

THE DEPARTMENT OF MEDICAL PHYSICS, ROYAL PERTH HOSPITAL

A BRIEF HISTORY

The Pre-history of Medical Physics

Radium from the CX-RL (Commonwealth X-Ray and Radium Laboratory) had been used by the Radiotherapists since at least 1929. In 1955 it was suggested that a branch laboratory of CX-RL should be established in Perth. Apparently, by 1956, Mr B R Dunlop was operating such a branch laboratory from the Department of Physics at the University of Western Australia. In that same year a Therapeutic Trials Committee was established at RPH. Also the 31st August 1956 saw the inauguration of a Standing Committee on Radioactive Isotopes.

On the 4th April 1957, RPH wrote suggesting that the Commonwealth Department of Health should share the cost of the appointment of a full-time physicist at the level of Reader. The response to this is unknown except that it obviously did not happen.

On 19th August 1958, the Standing Committee on Radioactive Isotopes was incorporated into the Laboratory Advisory Committee. It then had the oversight of isotope usage in:

Thyroid diagnosis ^{131}I	}	for Biochemistry
Haemochromatosis ^{99}Fe		
Pleural effusion treatment ^{198}Au	}	Radiotherapy
Thyrotoxicosis ^{131}I		
Lymphosarcoma, Polycythemia Vera ^{32}P		
Vitamin B ₁₂ absorption ^{58}Co	}	Haematology
Red cell survival, total blood volume ^{51}Cr		

In August 1959 a Department of Medical Physics was established "on paper" to be sited in the former Residents Quarters.

The History Proper

1960

The visit by the Lieutenant Governor on 10th October 1960 marks the date from which the Department of Medical Physics commenced to function. The annual report for that year shows the following personnel.

Mr R W Stanford	Head of Department
Miss L J Worsham	Department Secretary
Mr R F Fleay	Assistant to the Physicist
Mrs Diane Scott	I/C Radioisotope tracer studies
Miss K Swan	ECG Recordist (trainee) replacing Miss M Dowling
Mr Don McLernon	Workshop Technician

R W Stanford was former Senior Reader in Guy's Hospital Medical School, Physics Department. R F Fleay transferred from the RPH Radiotherapy Department where, it is believed, he was Head Radiographer. Diane Scott transferred from RPH Biochemistry Department. Don McLernon came from the UWA Department of Physics.

The Medical Physics Department provided physics services to the departments of Radiotherapy, Biochemistry, Medical Photography and the Cardiovascular Investigation Unit. R W Stafford lectured to 3rd and 4th year Medical Students and was External Examiner for the 1st Year Medical Students physics examination.

1961

Perth's first linear accelerator, incidentally bought by public subscription, was commissioned by the Department in the newly established Institute of Radiotherapy. Dr John Holt, formerly of Bristol, had been appointed its Director in January of that year.

1962

Miss J Hayward from Adelaide University Department of Physics at Royal Adelaide Hospital was appointed as Assistant Physicist. Miss Meg Harris was appointed as Junior Physicist. R W Stanford was appointed Visiting Physicist to King Edward Memorial Hospital.

The gynaecological radium treatments were transferred from RPH to KEMH, necessitating planning for protection and handling facilities. 53 treatments with unsealed sources and 104 treatments with sealed sources were administered. Renal function studies were introduced on an evaluation basis. Work commenced on the accurate dosimetry of ultra-violet radiation. Cardiac pacemakers were developed and constructed in the Department.

For Radiotherapy, a Simulator was designed, specified and built in Perth by S Van Dal and Co, which had no equal counterpart in Australia. At the Institute of Radiotherapy, arc therapy from a linear accelerator was performed for the first time in Australia and preliminary work on the Dosimetry of grid therapy was undertaken.

1963

Miss J Hayward resigned and her post was filled by Miss Ray Kurle, a graduate of the University of Melbourne. Miss Agatha van der Schaaf became the first undergraduate student to work in the Department, carrying out in-vitro studies of radio-iodinated L-Thyroxine

A radiation survey was performed in the Radiotherapy Department requiring, as a result, the specification of additional shielding.

It became increasingly apparent, with misgiving, that the slender margin of time and manpower available to assist research projects outside the Department and to maintain any research within was steadily diminishing.

1964

It was now five years since the Department was established and there was a need to review its progress and assess its future needs. This was considered to be of such importance that the Hospital Board established a committee from amongst its members.

A Packard Auto Beta/Gamma Counter was purchased and installed to enable the assay of tritium and ¹⁴C labelled samples. It was installed in a small room specially prepared with full electrical screening, formerly the male Medical Students lavatory!

The total quantity of radioactive material had increased by 75% and the numbers of patients by 20%.

All of the original work on grid therapy and xeroradiography had ceased, presumably for lack of time and personnel.

1965

1965 was a seminal year for the Department. Miss Diane Scott resigned after five years in the Department. Miss Kurle, Miss Harris and Mr McLernon resigned. The Board, however had authorised substantial increases in professional and technical staff. Despite world-wide advertising and personal contact with every major U K department only one physicist with previous experience could be appointed. The appointee was Walter Keith Jones.

A Biochemist, Miss Louis Evans was also added to the staff. This enabled the range of isotope studies to be increased, encompassing all those described in the standard reference by Veall and Vetter*. Placenta localisation studies using iodinated albumin were also commenced.

Other staff appointees were Bruce Hedland-Thomas and Lyn Oliver (as Medical Laboratory Technologists), Stuart Milne (Electronics Technician) and Miss R V (Verna) Gray (Department Secretary). Mrs Raissa Mogyorory commenced a long association with the Department as EEG Recordist.

Radiation protection and design surveys were performed for three rooms in Radiology indicating that other departments were also "on the move". Dr Michael Quinlan, Saw Research Fellow, commenced investigating pancreatic disorders using selenium-75. Bruce Armstrong took a year off from his medical degree to do a research project for his Bachelor of Medical Science using radioactive cobalt labelled vitamin B₁₂ to study its absorption and excretion. This led to his being parodied carrying faeces collection containers in the Biochemistry Christmas Revue.

1966

Bob Fleay was awarded one of the first Churchill Fellowships, enabling him to spend four months at the Brookhaven National Laboratory in New York. R W Stanford attended the XIth International Congress of Radiology in Rome and also the 1st International Congress of Medical Physics in Harrogate U K. He concluded that, judged on an international basis, the range and quality of investigation and treatment and the working facilities available at RPH compared very favourably indeed with those in many Western Countries.

A Picker Magnascanner, a rectilinear radioisotope scanner was delivered. It was the first fully transistorised model, capable of producing scan data in colour, in Australia. As was to be almost universally the case, it was damaged in transit and could not be put into use for a further month until it was repaired. The facility to perform many organ scans required an increased variety of radioisotopes. Furthermore, the increase in the number of patients attending the Department highlighted the inadequacies in the waiting area and the complete absence of patient changing facilities.

The volume of work for the Electronics Technician was steadily increasing. Seven small items of development apparatus had been constructed ranging from a taste analyser to a nerve stimulator.

The first Trainee Physicists were appointed, Mr Livio Mina and Miss Anne Chester

- *Radioisotope Techniques in Clinical Research and Diagnoses, Veall & Vetter, Butterworth & Co 1958*

1967

The increase in the number of patients undergoing radioisotope investigation, 1200 in all, made it clear that either additional scanning equipment would be needed or double shift working have to be introduced.

Medical Physics took part in the Busselton Community Health Survey, the first comprehensive survey of the health of an entire community. A device was constructed and used for measuring the ankle reflex response on a time scale, believed to be a measure of thyroid activity. Some 3000 traces were obtained which would require detailed analysis.

The bulk of gynaecological radium treatments were transferred to King Edward Memorial Hospital.

Of the previous year's Trainee Physicists, having completed their training year, Anne Chester resigned to study for a medical degree and Livio Mina was appointed to the permanent staff. Verna Gray was succeeded as Department Secretary by Miss Pippa Aldberry.

1968

The Department underwent one of its cyclical renewals. A waiting/reception area was created by enclosing the Tee Junction formed by the verandah and the covered way outside the front door of the Department. The Department also expanded vertically downwards into part of the area vacated by the Equipment Store.

A sterile room was created in order to be able to elute a technetium generator under sterile conditions to obtain a local supply of the short lived isotope ^{99m}Tc . First steps were taken to label pharmaceuticals with this isotope. This included the acquisition of a Kipps Apparatus to produce hydrogen sulphide (rotten egg gas) which led to much practical joking with delivery tubes being inserted under office doors.

Preparations were made to keep all patient records on punched cards.

1969

The first routine clinical computer program was written 'in house' for determining the therapeutic radiation dose delivered by implanted radioactive sources. Radioisotopes of both technetium and indium for diagnostic purposes were being 'milked' from parent isotopes.

Assisted by impetus given by Sir George Bedbrook a post of Medical Engineer was created and fitted by Mr Edward Scull. This placed RPH in the forefront of Australia teaching hospitals. Mr Peter Henson from Leeds University was appointed as radiation physicist jointly by Royal Perth and Sir Charles Gairdner hospitals and the Institute of Radiotherapy. Mr John Wyburn was appointed as Medical Laboratory Technologist with experience in handling radioisotopes gained in the Royal Navy nuclear submarine service. Miss Carolyn Young joined the electronics workshop as workshop attendant. B Hedland-Thomas, having completed his course at the newly opened WA Institute of Technology was appointed as Trainee Physicist for one year limited tenure. Later in the year Messrs. Hedland-Thomas and Oliver both left the Department to study for M.Sc. degrees, the first resigning to go to the University of Surrey, the second taking unpaid leave to attend the University of London.

1970

Livio Mina, having initially been broadly Trained in all aspects of medical physics had been finding his forte' in computing. He attended a course run by the Digital Equipment Corporation in the PDP12 computer and worked for a week at the Melbourne Alfred Hospital.

A PDP 12 computer was installed in the Biochemistry Department. All film badge monitoring having been transferred to punched card, a program was devised for using it to process their results. Work was also proceeding on a program for the dosimetry of Yttrium-90 sources implanted in the pituitary gland.

The Bioengineer (formerly referred to as Medical Engineer) was getting into his stride by commencing programmes for the development of a elbow prosthesis and on investigation into the nature and cause of corrosion in stainless steel orthopaedic implants.

The future potential for the investigation of the mechanism of special trauma was greatly helped by the donation by the Red Cross Auxiliary of a Instron 1341 testing machine for measuring the mechanical strength of bone, muscle and cartilage.

In January 1970 a Department of Nuclear Medicine was established headed by Dr Michael Quinlan. This coincided with the purchase of Perth's first Gamma Camera. Radioisotope scanning was still performed in Medical Physics and the two departments were interdependent and closely integrated.

Miss Carolyn Blackwell was appointed Radioisotope Technician to help with the scanning. John Wyburn was joined by a former navy colleague, Mr Alan Jamieson (Jamie) as Medical Laboratory Technologist. Mr Stuart Sherlock was appointed as Trainee Physicist.

1971

The department expanded further into a remodelled area of the whole of the ground floor including the former Equipment Store and the whole of the area beneath Nursing Administration and the School of Nursing. This incorporated a space allocated to the Department of Nuclear Medicine. This enabled the Gamma Camera to be put into clinical use.

A Cobalt-60 Teletherapy Unit was installed in the Radiotherapy Department, its ^{60}Co source being the most powerful in Australia and one of the most powerful in the world. The viewing window containing zinc bromide solution was locally designed and manufactured. The unit's commissioning (dose distribution plotting) was facilitated by the donation of a Toshiba Isotope Plotter by the Ladies Auxiliary of the Cancer Council

The Film badge monitoring computer program of the Biochemistry PDP12 was extended to other hospitals and copies of the programme were sent to Adelaide, Sydney and India. The dosimetry of implanted Yttrium-90 rods and teletherapy rotational treatment plans were also computerised.

The Bioengineering Section was re-housed in a new laboratory and fatigue testing of biological and non-biological materials commenced. A grant from the Medical Research and Special Purposes Fund enabled the launching of a research programme on the physical properties of spinal cord tissue. Equipment was variously assembled, commissioned and constructed for spinal cooling during certain operative surgery in spinal injury.

The amounts of radioactivity handled continued to increase (30% therapy, 53% diagnostic) as had radioisotope scans (40% patients, 70% number of scans).

Much heartache was caused to the responsible physicist by the loss of two Caesium-137 sources, although, it has to be said, this was the first ever loss of radioactive material from the department and resulted as a further strengthening of precautions. These included a new state of the art Radium Store as part of the extensions.

There were significant staff changes with four resignations and thirteen appointments, seven being radiographers associated with Nuclear Medicine. Those above names which would be associated with the area for a long time were Jean Grieve, Cheryl Robb, Diane Cheong, Helen Stretch (nee Banister), Pat Barker and a physicist from Rhodesia, Mr Peter Klemp. It was stated that there should not need to be any significant staff changes for some time to come!

1972

The computer needs of the department were reviewed resulting in a submission to provide a small dedicated computer during the ensuing year.

All aspects of radiation work continued to increase, inward shipments by 20% and outward shipments to other hospitals by 300%.

It started to become clear that considerable effort was required to maintain safe working conditions. Higher level safety measures would include clothing, restriction of access to working areas, personal and clothing monitoring.

A major installation was of a Liquid Scintillation Spectrometer, fully automated and able to assay batches of 300 samples.

The Head of Department, R W Stanford, spent three weeks in the U.K inspecting developments in his field of interest as a guest of the British High Commissioner to Australia.

1973

A shadow shield whole body monitor was installed to enable the measurement of the total amount and distribution of a radioisotope in a patient. The steel shield weighing 7½ tons was fabricated by the State Engineering works.

Considerable prominence commenced to be given to the electrical safety of patients whose physiological functions were being monitored by mains operated electronic devices.

The former Instrument Workshop headed by Len Young was placed under the direction of Medical Physics. It was planned to integrate this and the Departmental Electronics Workshop into a single Technical Services Division.

Stuart Milne having resigned, Mr Dennis Yovich was appointed an Electronics Technologist. Carolyn Blackwell also resigned.

It was noted that at the close of the 1972 Academic Year the following awards were conferred.

Mr D Yovich Assoc. in Communication Eng. (WAIT)

Mr R Fleay B.Sc. (WAIT)

1974

During the year much effort was directed to planning the Department in the new North Block. The main department was to be on level 4 in conjunction with Nuclear Medicine and Radiology and the Bioengineering and Technical Services Divisions on level 1. Electronic and instrument design, construction, installation inspection and repair services were integrated into Technical Services. It was to be accommodated in the vacated Equipment Store until finally finding its home in the new building. There had been a significant increase in the workload associated with both electronic equipment and manual instruments deriving from the opening of the South East Extension.

A second computer was installed intended for multi tasking facilities for the departments of Nursing Administration, Haematology, Psychiatry, Cardiology and the Institute of Radiotherapy. It was found to have insufficient memory for this purpose. This was only partially remedied by the purchase of further memory and improved software being prepared by the suppliers. The Film badge monitoring program continued to be run at the Treasury ADP Centre.

A significant trend was that the number of radioisotope tracer tests declined while there was an increase in the number of radioisotope scans. This resulted in the handling of more specially labelled compounds. This was to be a glimpse of the future where visualisation of both organs and dynamic function were to be the norm. The requirement for therapeutic radioisotopes was unchanged however.

The Bioengineering Division was now firmly established.

1975

The Technical Services Division was re-housed in the former Equipment Store but there were insufficient funds to complete the building works and the conditions were noisy and dirty, adversely affecting the functioning of equipment.

Following discussion between the Hospital Board and the Public Service Board positions of Technicians, Senior Technicians and Supervising Technicians were created and the existing staff slotted into them. Despite the output of students from tertiary colleges and alleged unemployment it was still found necessary to recruit staff from the U.K who were, in any event, trained to a higher level.

The new computer (PDP 11/40) remained a single-user facility due to lack of finance. The film badge monitoring program was transferred to the WA Regional Computing Centre (WARCC) as was much processing from clinical departments.

Active steps to limit radiographic examination of women of child-bearing age to only those which were clinically essential produced a new task - the assessment of probable ovarian dose.

A technician was appointed to radiology whose primary concern was assessment of performance of TV chairs and x-ray equipment together with preventive maintenance which led to a significant reduction in down time and, equally, improvement in consistency of operation of diagnostic equipment in Radiology.

A new 7000 Curie Co-60 source was installed on the Toshiba teletherapy unit in Radiotherapy. Tungsten penumbra trimmers were fitted to the unit and a re-commissioning carried out. Differences were found in calibration factors for radiation dosimeter calibrated at the Australian Radiation Laboratory in Melbourne and instruments sent from the U.K with a National Physical Laboratory calibration. The suggested solution was for a secondary standard to be held in Perth. In future years the actual solution was to be for a secondary-standard-quality dosimeter to be purchased but for it to be inter compared with another secondary standard held in Melbourne.

Ward 10 was reconstructed with improved facilities for patients of either sex undergoing treatment with radioactive sources but disposal of liquid radioactive waste was still crude and difficult.

The Institute of Radiotherapy had meantime become the Department of Radiotherapy of Sir Charles Gairdner Hospital but Physics services continued to be supplied by Medical Physics RPH. Much effort had been directed to radiation protection design of the building to house the new electron linear accelerator (Dynaray 18) due in September 1975.

A Curietron gynaecological radiation afterloading machine was commissioned at King Edward Memorial Hospital enabling the treatment of gynae cancers without the radiation dose received by clinicians and nurses as with the former use of live sources.

It had become clear that the provision of diagnostic ultrasound facilities was somewhat overdue at RPH. Staff had obtained valuable experience in the field from providing physics services to King Edward Memorial Hospital and Perth Radiological Clinic.

Twelve projects were in hand in Bioengineering with half being diverted to immediate clinical problems. There were satisfactory relationships with the Departments of Neuropathology, Orthopaedic Surgery and the Spinal Injury Unit. An informal Bioengineering Advisory Unit was set up to ensure that the work of the Division was soundly based and relevant to hospital problems. A visit from Professor Kenedi, Head of Bioengineering Unit at the University of Strathclyde confirmed that the hospital was unique in having such a unit and that the integration achieved with clinical work was undoubtedly the best method of working.

At this time there was no other Department of Medical Physics in Australia which was as broadly and soundly based. It was comparable with the best practice in the U.K and markedly superior to many provincial hospitals therein.

1976

The financial restrictions of the previous couple of years were eased somewhat. This enabled the reconstruction of Technical Services to be completed. A steady increase in maintenance schedules brought about improvement in the breakdown - free times of many items of equipment. The policy of inspecting new items of equipment commenced to find acceptance in the departments and was valuable in detecting damage, malfunction and electrical hazards due to incorrect colour coding of cables. Some 80 instruments and 10 electronic devices were inspected during the year.

Interest in the use of the PDP 11/40 computer was shown by Biochemistry, Ophthalmology, Clinical Immunology and Radiotherapy. Within the Department, systems covering film badges, dose distribution, technical services workload and x-ray outputs were extended or re-written. The concept of programming assistance from Health Computing Services was found to be impractical. They had neglected the whole field of dedicated computers of which there were increasing numbers in the hospital and which needed to be under the control of the hospital. The necessity was becoming obvious for in-house, computer oriented scientific officers to deal with the hospital's needs.

A Project Engineer Mr Philip Noble was appointed to investigate the manner in which the incidence of pressure sores might be reduced. Hyperthermia as a modality for cancer treatment became a hot topic (!) and was supported by the introduction of accurate temperature measuring equipment to facilitate the use of hot saline solution for the treatment of bladder cancer. In preparation for the introduction of diagnostic ultrasound into Radiology, Peter Henson and Keith Jones went to work on the evaluation of physical measurement techniques and the design of suitable test objects for assessing resolution.

1977

A PDP 11/34 computer was delivered and it was expected that it would greatly facilitate the work of the Bioengineering Division in the field of gait analysis and pressure sores. The involvement with the Rehabilitation Hospital revealed that there was a lack of co-ordination between clinical, social, engineering and scientific services, possibly leading to misdirection even of some services.

The commissioning of the Dynaray 18 electron linear accelerator, which was delivered and installed last year, required the development of sophisticated methods of automatic data collection, analysis and presentation for the x-ray beam. The electron beam, hitherto not available in Perth, required the development of new photographic apparatus and techniques to provide data for treatment planning.

The Australian Radiation Laboratory was about to re-locate and close down its radon generator. There was some uncertainties about which sealed radioactive sources would replace radon needles and whether afterloading techniques would provide an effective substitute.

A post of Deputy Head of Department was created and advertised. The Annual Report noted that hitherto in the absence of the Head of Department Mr Bob Fleay had acted to the satisfaction of all concerned.

There were some other noteworthy events that year. Phil Noble received the degree of M.Eng. Sci. (Melb); Mr Joe Ashton was appointed from England as Engineer in Charge of Technical Services Division; David Stobbart joined the Department as Rotary International Fellow; and Dr Barry Page was appointed Physicist in the Computer Division.

1978

1978 was a year of considerable consolidation and innovation.

With the expectation that the Hospital would shortly purchase a CAT scanner, extensive measurements were carried out in two private practices of the patient's radiation dose relative to the quality of the image produced, to enable objective assessment of the machines under consideration for purchase. The message was starting to reach the wider hospital that objective scientific measurements were vital before deciding on the chance of new equipment.

The conclusion from an extensive survey of the literature relating to the mitotic activity of cells was that hyperthermia had a place in the treatment of cancer.

There was a resurgence of interest in radioisotope techniques for research. For example, the University Department of Medicine utilised triple labelled microspheres; Cardiology using Rubidium 86 required the introduction of Cerenkov counting; Biochemistry introduced a labelled protein binding assay. A centralised counting and consulting service for all these was provided by Medical Physics.

Changes to the Australian Radiation Laboratory had their effect on the Hospital. Sealed radium sources, on loan since the original agreement of 1929, were gifted to the Hospital. Other radioactive substances were to be procured from the Australian Atomic Energy Commission and private companies. The Hospital was relieved of being responsible to the Commonwealth for the storage and checking of radium and the "follow up of patients via their local clergyman, policeman or schoolmaster"!

An HP 9825 programmable calculator was purchased and configured as a data collection system for x and γ rays beam data, interfaced to the departmental computer. It used logic and programs written by Stuart Sherlock. Data collection formerly requiring months could be performed in days. When it was demonstrated to the EMI (Medical) Group they were so impressed that Sherlock was awarded a Travel Scholarship to present his work at an International Conference in Europe.

This was the year of innovation in radiation protective walls. A room was designed for the 9500 Curie (357 Terabecquerel) cobalt-60 teletherapy unit in the private radiotherapy practice. Instead of the normal concrete walls of up to two metres thick, the walls were built as hollow cells of brick filled with some 60 tonnes of dry sand, representing a saving both of construction time and cost.

Computing was starting to make inroads to all areas. Indeed it was said that technology advances were so rapid that prediction beyond a year and sometimes even beyond a month could be outdated. The PDP 11/34 computer was being used for the acquisition and storage data from the Bioengineering dynamic spinal cord experiment and the Instron Universal Tester. Statistical services were provided to a variety of users and analysis and data storage facilities provided to Cardiology, Biochemistry, Anaesthetics, Cardiothoracic Surgery and the Dental Hospital.

Early results from the Pressure Clinic, established following discussions with the Spinal Unit and Department of Orthopaedic Surgery and conducted by Bioengineering staff and a nursing sister, were most encouraging.

1979

This was an interesting year in a number of ways. The routine work of the department continued much as usual. Cardiology, which has been next door to Medical Physics just along the verandah of the 1870 Hospital, moved to a pre-fab sited on top of the laundry block and reach by an enclosed ramp. Medical Physics expanded into the vacated area gaining a library/conference room and several offices with windows overlooking Murray Street.

Dr Richard Fox was confirmed in his appointment as Deputy Head of Department, having already made significant contributions to the Department's scientific work. Phil Noble was awarded a Churchill Fellowship to enable him to visit centres in Europe and North America, thus becoming the second such fellow from the Department, Bob Fleay having been awarded the first Churchill Fellowship in 1965.

A development which marked the end of an era of harmonious and flexible relations between staff and management, particularly in a small department which relied on staff being able to cover for one another, was the establishment of a Classification Review Committee.

Abandonment of the nexus between the Hospital and the Civil Service and the Staff duty statements became highly structured significant and inflexible. The Committee itself gave no reasons for its decisions; no appeal was permitted; the views of the Head of Department were not admissible; and cases were dealt with on piecemeal basis without any regard to departmental structure. The result was that a much vaunted piece of industrial machinery created more industrial unhappiness than that which it was designed to remove. This unhappy situation continued for many years until the advent of "broadbanding" which forced staff into a condensed scale of grades, which resulted in most staff being downgraded by one level.

On a happier note, a hovercraft system which had been proposed by Stanford fourteen years previously for moving heavy objects but received little encouragement, was implemented for the hyperbaric oxygen chamber in Radiotherapy. It enabled the chamber with a mass of approximately one tonne to be positioned with an accuracy of a few millimetres by two girls.

The computer development commenced in 1977 was completed with the addition of extra memory and interfacing equipment opening the way for the development of real time analysis of dynamic gait studies. Of special interest was the attempt by Trevor Jones to develop Moire Topography as a non-invasive screening technique for the detection of spinal scoliosis. Its effectiveness was demonstrated in a survey of Hollywood High School students although but ultimately it did not find general acceptance.

In Technical Services four operating theatre tables were completely overhauled. They were upgraded mechanically, repainted, replated and fitted with new tabletop material. This method of extending the life of theatre tables continued up until the nineteen nineties and even beyond. As recently as 2002 one was reconditioned to use in the High Dose Rate (HDR) Brachytherapy Suite in Radiotherapy.

1979

In the diagnostic radioisotope field, an example of the most advanced liquid scintillation soft beta counting equipment available on the world market was installed in the Radiochemistry Suite. It was (of course) microprocessor controlled and could operate unattended from Friday evening to Monday morning, which was bad news for the technician who formerly had to feed a machine twice during a weekend on overtime rates.

The 3rd National Conference of the Australian Institute of Physics was held in Perth. It was attended by six members of the Department, all of whom presented papers (Stanford, Scull, Jones, Hedland-Thomas, Fleay).

The 'in house' hand and face monitor for the detection of contamination of workers in the Radiochemistry Laboratory was finally commissioned. It had a sensitivity of some 30 times that of commercial instrumentation, which may have been the origin of some of its problems. At one stage the Head of Department was heard to say, "Dennis Yovich will get the hand and face monitor working this year or resign his job". He did in fact resign the next year but not for any connected reason.

R W Stanford retired after twenty years of dedicated service to the Hospital. Comments were passed on his enthusiasm and originality and his skill in committees.

1980

In something of a first the Hospital funded by special grant the acquisition of an Atomic Absorption Spectrometer for the determination of elements in biological tissue. It enabled a one-off investigation of the levels of vanadium in urine of workers de-scaling boilers at ALCOA Kwinana, which determined that the level of ingestion was low. Of long lasting benefit was the determination of metallic elements in biological specimens from prosthetic implants due to either wear or corrosion, which is continuing to this day.

New patient treatment room with integral radioactive sealed source handling and storage facilities was opened at King Edward Memorial Hospital. The facility was designed by Keith Jones of RPH Clinical Physics. All of the x-ray treatment units of the private radiotherapy practice which were transferred from McCourt and Cambridge Streets to Salvado Road were re-commissioned. An interesting project was the re-welding and crack testing of the source wheel of the Picker Co-60 Teletherapy unit, which required the safe removal and storage of the highly radioactive source on two occasions. The design of the shielded room for a new 4 MV Linac at Sir Charles Gairdner Hospital was completed.

Among many other staff movements, Len Young retired after a long and worthwhile career in surgical instrument making.

The new Head of Department, Dr Richard F Fox, took up his post in January 1980 in an atmosphere of worsening industrial relations and financial stringency.

1981

The year commenced with a requirement by the management to reduce the staff by three members. This was accommodated by the voluntary resignation of Stuart Sherlock and Robyn George (clerk/typist) and the sacrifice of an untitled establishment post. The implications were that any capacity to undertake major projects in radiotherapy were seriously undermined. A major recalibration of the Hospitals Co-60 teletherapy unit would not be possible in the foreseeable future. The installation and commissioning of the New 4M Linac at SCGH had, fortunately, been completed before the staff restrictions were enforced. The workload in the Pressure Clinic had increased to the extent that waiting lists for wheelchair services and repair had extended beyond 20 weeks.

Errors were made in the purchase of equipment by other departments which Medical Physics was required to maintain. This was due to inadequate consultation with Medical Physics. On a happier note the Department was heavily involved in the preparation of the tender document and selection of the successful tender, as well as the acceptance tests and quality control procedure, of the Hospital's first CAT Scanner.

The investigative work done by Bob Fleay and the use of heavy metal filters to reduce radiation dose in radiological processes resulted in their routine use. A Cancer Council grant was received to enable Bob Fleay and Richard Fox to extend this work to paediatric radiology.

A new 10,000 Ci (370 TBq) source was installed in the Toshiba Co-60 unit. The first whole body irradiation using the Marsden Hospital technique for the treatment of leukaemia was performed in early 1981.

Computer usage had increased by 50% on the previous two years. The effect of increased real time load and extra users had been to increase the number of "hang ups" caused by insufficient memory in the system.

Alan Ross was appointed to the post of Technician in Charge (Mechanical). In both the Mechanical and Electronic Divisions of the Technical Services Division requests for routine preventive maintenance by outside departments could not be met. They could be serviced only for breakdowns. The pre-existing workload was increasing due to equipment's being kept in service long past the time when replacement was warranted.

A number of individual construction projects were undertaken where commercial equipment was not available. These included:

- a monitor for writers cramp (Psychiatry)
- an interface between a CCTV system and a computer (Gait Assessment)
- a dose rate ratiometer (Varian linac commissioning)
- a wideband UV irradiation system (Dermatology)
- a posture chair (handicapped patient seating)

Dr Richard Fox, Head of Department, was made a Fellow of the Institute of Physics London.

Bob Fleay had been made an Honorary Fellow of the Royal Australasian College of Radiologists in July 1980, recognising his outstanding contribution to Australian radiology.

Phil Noble, project engineer was commissioned by the World Rehabilitation Fund (New York) to write a monograph on "The Prevention of Pressure Sores for Persons with Spinal Cord Injuries".

1982

Financial stringency continued. The previous years complaints of; not being permitted to replace resigning staff; an even increasing workload; and being expected to maintain other department's equipment which Medical Physics had no part in selecting, were again rife.

The department was called upon for the commissioning of two new gamma cameras in Nuclear Medicine, a CAT Scanner and cardio-angiography unit in Radiology and two gamma cameras at Fremantle Hospital.

Livio Mina was appointed to the Technical Review Committee. A computer system developed for Cardiothoracic Surgery was extended to cover Cardiology and the Intensive Care Unit.

Phil Noble had left the Department in November 1981 but was not able to be replaced by Warren Macdonald until May 1982, which delayed most of the routine and development programmes in Bioengineering.

A storage problem with low-level radioactive waste was solved by the construction of a small shed with a cellar within the radioactive waste compound at Royal Perth Rehabilitation Hospital.

Construction was commenced on a new Traverse Unit to facilitate the collection of radiation beam data. To ensure the desired rigidity, its fabrication was rather along the lines of a railway wagon!

Joe Ashton, Engineer in Charge of Technical Services resigned in July to take early retirement in the U.K. He was replaced by David Pearn-Rowe but it took a search of seven months to find Rod Bostock to replace David. Ed Scull was made a Fellow of the Institution of Engineers Australia in September 1981. The Hospital took out a provisional patent on a speech amplifier for the disabled developed by Tom Shannon in the Electronics Section of TSD.

1983

The dream of a spacious department in North Block faded as the partly constructed building was mothballed. The space problem was particularly difficult in Clinical Physics where six physicists and three technicians occupied three small laboratories, which were also used by staff from other Departments and Divisions. Sir Charles Gairdner Hospital decided to allocate the funds for the appointment of a physicist to service their radiotherapy Department. Omnitronics entered into an agreement to produce commercial versions of the voice operator amplifier developed in TSD.

There were no changes to the permanent staff although a number of the senior professional staff took long service leave and Miss Sue Downie took up a temporary physicist post. Ed Scull and Trevor Jones were awarded a Telethon Grant of \$21,000. This enabled the employment of Karen Dutton as a research assistant for 12 months. After some absences for child bearing she was still to be a face in the Department at least 16 years later.

1984

The capacity of senior staff to perform the work of which they were employed was eroded by request to provide comprehensive documentation, justification and description of the Department's work.

Tom Shannon resigned to take up a management post in the U.K. Steve Richards joined the Department as an electronics engineer in TSD. Dr Adrian Perry joined Clinical Physics from Glasgow. It was expected that correcting the staff shortage in this area may be short-lived owing to a sudden upsurge in the application of sealed and unsealed source therapy. There was a promise of an increase of two in Bioengineering for March 1985. Paul Hardisty died unexpectedly as he was due to return after a long illness.

A Hewlett Packard 9836 CS Computer/Calculator system and GTCO Digitiser were commissioned in February. All divisional calculator activity was successfully transferred to it.

1985

Much time and effort was spent in preparing for the Departments part in the Hospital's first Accreditation. This was voluntary but may be a requisite for Commonwealth funding at some future time. Senior staff also spent much time planning for the Department in North Block.

Warren Macdonald resigned as project engineer and Ken Cartmall retired. David Guy was made up to Senior Technician in the Mechanical section of TSD. Ed Scull was elected as Honoured Member of the Manipulative Therapists Association of Australia.

An innovative Iodine-125 seed applicator for the treatment of retinoblastoma for Ophthalmology was designed by Peter Klomp and fabricated by David Guy. Rehabilitation Engineering Clinic Staff, in collaboration with Salco Engineering, developed two prototype manual wheelchairs. Both utilised aluminium technology and incorporated adjustments for balance and wheel alignment. It was expected that they should sell at about one quarter the price of an imported chair.

1986

North Block planning continued to occupy senior staff, not only area planning but designing radiation protection. There was a substantial increase in pressure for the services of the Rehabilitation Engineering Clinic, Radionuclide Laboratory, Vascular Laboratory and Technical Services Division. It was expected that the funds for re-equipping the Departmental in its move to North Block made available for both State and Commonwealth Government sources would prove to be a two-edged sword. The choosing, purchasing and commissioning of new equipment would add further to the Department's workload. It was proposed that a portion of the North Block equipment funds should be set aside for additional staff for equipment commissioning. The lightweight wheelchair developed last year was put into production by Glide Products without any escalation of price.

During the year Bob Fleay retired while Rob Day joined the Department as Project Bioengineer and Andrew Campbell as Scientific Officer. With the retirement of John Wyburn, Pat Barker was made up to Senior Medical Laboratory Technologist in Charge.

1986/87

Peter Lanzon was awarded an M.Sc. degree by the University of WA. Bob Fleay was appointed as Emeritus Consultant to the Hospital, a fitting reward for 40 years of dedicated service. Dr David Causer was appointed to fill Bob Fleay's post as Head of Clinical Physics.

Medical Physics and the Orthotics Department of Royal Perth Rehabilitation Hospital were amalgamated in order to combine resources and expertise.

It was estimated that four percent of the capital cost of new equipment purchased for all departments moving to North Block should be set aside to employ the five additional full-time staff who would be needed for repair and maintenance when the warranty period expired at the end of 1988.

1987/88

The proposed occupation of North Block in 1989 was exercising all minds. This, however, had its downside. Technical Services was continuously under pressure to provide service for new equipment purchased by clinical areas such as Anaesthesia and Intensive Care. Equipment to a value of \$3.4 million was identified.

A list of some 70 Bioengineering projects accumulated over the preceding years was called to 10 realisable projects. Ed Scull and Karen Dutton were awarded a grant of \$72,000 with further funding agreed in principal by the Medical Research Fund of WA. Their project was an investigation of electrical stimulation practices in spinal injury disabilities.

Some thirty-seven specialised items of equipment were developed to meet clinical needs where commercial equipment was unobtainable. In particular, two Constant Positive Airway Pressure (CPAP) systems developed and manufactured in Technical Services were sold to a private hospital, providing the funds to employ temporary staff to make a further six units for the Intensive Care

Department. Alun Duffy designed and constructed a thermoluminescent precision annealing oven. Interest has been shown by the General Electric Company, who are conducting a market survey to assess its commercial potential.

The radiotherapy group was hard-pressed to provide the services required. Reports prepared locally by Dr Fiona Cameron of SCGH and from overseas indicated that the group was understaffed by at least one physicist.