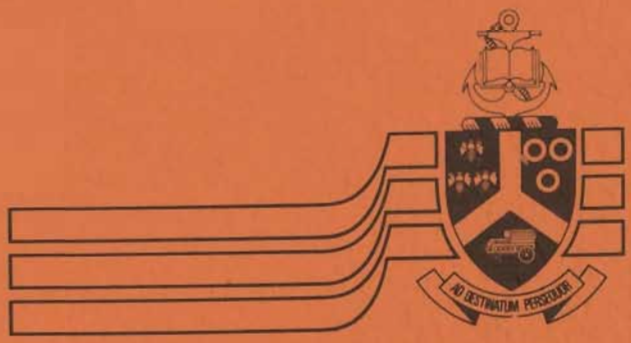


Universiteit van Pretoria

"Kernkrag: 'n Vredesreis"
"Nuclear Power, Journey for Peace"

"Kernkrag: 'n Vredesreis"

Prof M.P. Iturralde

Intreerede gelewer op 31 Oktober 1985 by die aanvaarding van diew Professoraat en Hoofskap van die Departement Kerngeneeskunde, Fakulteit Geneeskunde aan die Universiteit van Pretoria.

CURRICULUM VITAE
PROF M.P. ITURRALDE

Mario Paulino Iturralde is op 25 September 1933 te Sucre in Bolivië gebore. Hy ontvang sy primêre en sekondêre skoolopleiding aan die Anglo-Amerikaanse Skool te Oruro, Bolivië en ontvang die Britse Raadstoekenning vir die beste sekondêre skoolleerling.

In 1953 skryf hy vir die BA-graadkursus aan die Tegniese Universiteit van Oruro in Bolivië in. Hierna skryf hy aan die Fakulteit van Geneeskunde, Universiteit van Mayor, Reáy Pontificia de San Francisco Xavier, Sucre, as geneesheer in 1960 met die behaling van die MD-graad — die ekwivalent van ons MBChB-graad. Vervolgens promoveer hy in 1962 met 'n proefskrif getitel "High altitude biology studies using radioactive isotopes" aan die Universiteit van Mayor, Reál Pontificia de San Francisco Xavier, Sucre, Bolivië. Vanaf 1962 tot 1964 onderneem hy nagraadse mediese Istudies in Kerngeneeskunde met 'n beurs van die WGO aan die volgende instansies, naamlik: Institutode Energia Atómica, Universiteit van Sao Paulo en die Braziliaanse Atoomenergiekommissie, Sao Paulo, Brazil; Puerto Rico Nuclear Center, Universiteit van Puerto Rico en die VSA se Atoomenergie-agentskap te San Juan, Puerto Rico; en Universiteite van Colorado en Kalifornië, VSA (Donner Laboratorium en Lawrence Instituut vir Straling).

Vanaf 1964 tot 1966 is hy in diens van die Boliviaanse Atoomkragraad, Sentrum vir Kerngeneeskunde te La Paz, Bolivië en wel as hoof van dié departement. Vir die tydperk 1966 tot 1972 is hy as hoof van die departement Radiobiologie in diens van die Nasionale Instituut vir Arbeidsgesondheid in La Paz, Bolivië. Vanaf 1966 tot 1969 tree hy ook op as wetenskaplike adviseur oor Kernwetenskap en as persoonlike geneesheer van die President van die Boliviaanse Republiek.

In 1968 verwerf hy die Diploma in Hoër Militêre Studies aan die Skool vir Hoër Militêre Studies (Oorlogkollege van die Boliviaanse Gewapende Magte) te La Paz, Bolivië en in 1971 voltooi hy 'n kursus in Longskandering aan die Puerto Rico Atoomenergiesentrum te San Juan, Puerto Rico.

Hierna verhuis professor Iturralde na Suid-Afrika en is vanaf 1973 tot 1980 verbonde aan die Provinsiale Administrasie van die Oranje-Vrystaat en die Universiteit van die Oranje-Vrystaat te Bloemfontein onder meer as kliniese assistent in Interne Geneeskunde, spesialis, senior lektor, medeprofessor en hoof van die departement Kerngeneeskunde. In 1975 promoveer het aan die Universiteit van die Oranje-Vrystaat met 'n proefskrif getitel "Radionuclide cisternography imaging and study of the cerebrospinal fluid circulation".

Op 1 Januarie 1981 word professor Iturralde as professor/hoofspesialis in

Kerngeneeskunde by die Departement Radiodiagnostiek van die H F Verwoerd-hospitaal en die Universiteit van Pretoria aangestel. Met die totstandkoming van die departement Kerngeneeskunde op 1 April 1985 word hy tot professor/hoofspesialis in en hoof van die department Kerngeneeskunde bevorder.

Professor Iturralde het reeds 'n wye reeks artikels in tydskrifte, opsommings (abstrakte) en hoofstukke in boeke gepubliseer en talle referate en voordragte by nasionale en internasionale kongresse gelewer. Hy is vyf tale magtig, naamlik Spaans, Engels, Portugees, Frans en Afrikaans.

Hy dien tans, of het gedien, op 'n verskeidenheid van komitees, verenigings en ander liggame, veral met betrekking tot kerngeneeskunde en lewenswetenskappe. Hy is ook assessorlid van die Boliviaanse Nasionale Akademie vir Wetenskap; lid van die Suid-Afrikaanse Instituut vir Internasionale Aangeleenthede; lid van die Sentrum vir Latyns-Amerikaanse Studies aan Unisa; en is geregistreer as spesialis by die Suid-Afrikaanse Geneeskundige en Tandheelkundige Raad.

Professor Iturralde is ook met die toekenning van die Meriete-orde van die Nyl van die Verenigde Arabiese Republiek in 1968 te Kaïro, Egipte vereer asook met die Goue Medalje vir die eerste Chris Jansen-gedenklesing van die Suid-Afrikaanse Vereniging van Kerngeneeskunde, Universiteit van Pretoria.

Ladies and gentlemen.

We have in our midst on this important occasion in the career of one of our esteemed colleagues, representatives of several diplomatic missions in the Republic of South Africa:

*The Ambassador of Chile and Mrs Ramirez;
*The Ambassador of Paraguay and Mrs Fretes-Davalos;
*The Ambassador of Portugal and Mrs Villas Boas;
*The Charge D'affairs of Switzerland and Mrs Cuquoz;
and also:
*The former South African Ambassador in Bolivia and Mrs Von Gernet.

To these very special guests a hearty word of welcome.

No doubt particularly the aforementioned guests will be aware of the fact that our medium of teaching in this University is Afrikaans. However Professor Iturralde will be delivering part of his Inaugural Address in English, also for your benefit.

My introduction thus far was devoted, almost entirely to Professor Iturralde's *curriculum vitae*, and I would like to repeat a few items in English:

— Professor Iturralde was born on 25 September 1933 in Bolivia where he

received both his primary and secondary education, and university training in medicine.

- Between 1962 and 1964, aided by a WHO Bursary, he undertook post-graduate study in nuclear medicine in Brazil, Puerto Rico, and the USA.
- Following a period of work in several capacities back in his land of birth, he came to South Africa in 1973 and was attached to the University of the OFS in Bloemfontein until 1980.
- On 1 January 1981 Professor Itturalde joined the H F Verwoerd Hospital and the Faculty of Medicine of the University of Pretoria, where he was appointed to the Chair of Nuclear Medicine on 1 April 1985.

Professor Iturralde will now address us on what he calls: *Kernkrag, 'n Vredesreis — Nuclear Power, "Journey for Peace".*

Nuclear Power: Journey for Peace

Early on the morning of the 6th August, 1945, the "Enola Gay" named after the pilot's mother, cut east to west across the rivers of Hiroshima, opened its hatches, and an atom bomb fell free. From that moment to this, nothing has ever been the same in the world. The people of Hiroshima, the course of World War II, subsequent wars, subsequent peace, the position of science, the role of the military, international politics, the nature of knowledge, art, culture, the conduct of lives all changed. Other ages in history were characterized by heroes or ideas. The Atomic Age is characterized by a weapon and a threat.

Forty years now we have been living in that age, no longer new, yet nothing has replaced it. Coming to terms with the bomb means first accepting a basic fact about nature. When the bomb was dropped, much was made of how man had conquered nature, exposed its deepest mysteries; in a sense, how nature, like Japan, had been brought to its knees. Yet it did not take long for the realization to sink in that the splitting of the atom not only gave people no greater authority over nature than they had before, it proved how helpless they were when handling natural forces. Since that time, there seems to have been a general divorce of human life from other natural phenomena. It is as if people concluded that with atomic chain reactions nature played a trick on the world, and is no longer to be trusted as an ally.

The field of nuclear energy must surely be unique in that it holds awesome implications for the entire world should misuse be made of its great potential, so much so that its development has evolved along two parallel courses. Inevitably, as a terrible weapon of unimaginable destructiveness, the military faction has adopted and refined it to the stage where possession of nuclear weapons capability defines the ranking order of the so-called superpoweres, each striving to outmatch the other in quantity and sophistication of their armaments. The manoeuvres and posturing of these powers have now gone beyond the comprehension of the common man who, to preserve his sanity, holds blindly to a hope that the balance of horror can and will be maintained without a plunge into frightfulness. So powerful and overwhelming has this prospect been that it has overshadowed and retarded the second course of the peaceful application of this form of energy to meet the world's steadily rising demands for electric power. Yet even here the hysteria has spilled over into grotesque exaggeration of the potential hazards of 'going nuclear' — principally the contamination of the environment by accidental releases of radioactivity and through unreliable methods of waste disposal. But one thing is very certain in my mind. In spite of objections to nuclear power, some of which have a certain validity, we must

go on hand in hand with the formidable giant we have created; we must ensure that it remains tame and safe and in service for the good of mankind.

Just as Hiroshima was the first city where the bomb was used, I pray that Nagasaki will be the last. It will be a victory for mankind if the first and last use of the bomb occurred 40 years ago, when the bomb's destructive power was still measured in kilotons and not megatons.

When people think of atomic energy they often have the destructive power of the bomb in mind. Few, however, realize that another aspect of nuclear energy has changed their daily lives during the past 40 years. It is not widely known, for example, that radioisotopes and radiation are used in day to day life to improve food crops, preserve food, determine underground water resources, sterilize medical supplies, analyze hormones, X-ray pipelines and possible structural faults of airplanes, control industrial processes and study environmental pollution. And, amazing as it may sound, a great many of the objects we use in our daily life have in some way benefitted from radiation during their production.

What is less known, and perhaps even ignored is that every plant, animal and human being that has ever lived on this earth has been bathed in nuclear radiation for every second of its life. Man has always been subjected to natural radiation. He is exposed to radiation from the sun and outer space; naturally occurring radioactive materials are present in the earth, in the structures we inhabit, and in the food and water we consume. There are radioactive gases in the air we breathe, and our bodies are themselves radioactive.

In addition to natural radiation, man is exposed to sources of radiation of his own creation. X-rays and radioactive isotopes used for medical purposes, fall-out from testing nuclear explosions and radioactive materials released in the course of nuclear power production are some examples. It soon became apparent that this type of radiation could be either beneficial or harmful depending on its use and control, and that protection measures were necessary. The effects of radiation are better known than those of all other harmful agents and the regulations and monitoring measures to protect us against these effects are more complete and more advanced. However, the benefits of radiation and radioactive materials, in their various uses, greatly outweigh the risks.

In the late 1890 Roentgen discovered x-rays land Becquerel first observed natural radioactivity. These discoveries were almost immediately put to use in the medical world and the disciplines of radiology and radiotherapy were born and developed rapidly. The science of nuclear medicine which essen-

cially embraces the use of radioactive isotopes to determine body functions, only really developed in the 1940's, when following the construction of the first reactors and cyclotrons, artificial radioisotopes first became commercially available.

Nuclear Medicine is defined as that specialty of the practice of medicine dealing with diagnostic, therapeutic (exclusive of sealed radiation sources), and investigative use of radio-nuclides.

As with x-rays, computerized tomography, ultrasound, etc, the great value of nuclear technology lies in its capability for non-destructive measurements, but there are important differences. Where radiographs and other imaging procedures provide information primarily about the body structures, radio-active tracers make possible measurement of regional function. By being able to track the course of labelled molecules or cells as they travel through the body it is possible to measure both the site and rate of important biological processes, and detect abnormalities as regions of dysfunction, redefining patient problems in terms of measuable body functions.

An impressive and ever increasing array of instruments and techniques based upon physical principles have extended the exploration of living materials to the molecular level. The discovery of artificial radioactivity and the availability of radioisotopes has become one of the most useful tools since the discovery of the microscope. We have been given eyes to see what was formerly invisible.

Research tools of this sort greatly facilitate the identification, measurement, isolation, and characterization of the components of living systems. The result has been increasing precision in the perception, measurement and definition of biologic phenomena.

Nuclear Medicine "imaging devices" permit us to measure regional as well as total organ function. This ability helps us to solve one of the most important problems in diagnostic medicine, biological variability. No two persons look alike, behave alike or have identical values for physiologic parameters that we measure, nor do symmetrically paired organs, such as the kidneys, or lungs. By applying the principle of homogeneity we can detect, for example, regional abnormalities of cerebral blood flow and the biliary function of the liver. The earliest sign of renal disease is often revealed by one kidney having significantly reduced function compared to the other, while overall renal function is still within the normal range. The study of functional homogeneity is implicit in nuclear medicine, but should perhaps be made more explicit. It can be stated: "Regional abnormalities can often be detected while the overall function of an organ remains within normal limits".

In the past ten years new approaches and notable advances in medical imaging have resulted from new conceptrs and developments in computer science and applied mathematics. At the same time there has been an increasing realization that the identification of human disease depends significantly on early characterization of local organ disfunction, rather than just on destroyed tissue structure.

Positron Emission Tomography (PET) combines the administratioon and detection of positron emitting radioisotopes of the basic biological elements, the in-vivo tomographic reconstruction of absolute tissue concentrations, and the modelling of trace kinetic equations to measure human physiological processes. Already new clinical and scientific information is emerging that hold great promise.

Medical scientists have already used PET's inherent ability to show biochemical processes to obtain striking images, not obtainable by other methods, of the cerebral metabolism of oxygen and sugar, clearly visualizing precisely which portions of the brain are active, at a given time, in such specific activities as seeing, hearing or touching.

It has been said that perhaps the greatest contribution of the space age is the picture of the earth obtained from a spacecraft, a picture that reveals the beauty but also the fragility of our planet. A picture of comparable significance, it seems to me, is the picture of the brain obtained by new techniques of nuclear medicine — a picture that shows metabolic activity of the brain as we examine, for the first time, chemical events associated with thoughts in the living human being. It is easy to imagine the potential extensions of analogous studies of regional brain chemistry in patients with neurological and psychiatric disorders, such as Parkinson's disease, schizophrenia, Alzheimer's disease, epilepsy, chronic pain states and other conditions. It is hoped that PET will continue at the vanguard of Nuclear Medicine studies, with steady progress in elucidating the physiology of the human brain.

Some researchers have observed distinctive patterns of brain metabolism in mental illnesses. Others have used PET to gain new insights into the immediate and delayed biochemical effects of stroke and heart attacks; the metabolism of fats, sugar and oxygen in heart muscle; and the distribution of neuro-receptor sites in the brain. In brain tumors also examined by other methods, only PET scans have been able to clearly distinguish between biochemically active and inactive (necrotic) tissues, pinpointing the optimal site for placing biopsy needles used to obtain samples of malignant cells for laboratory analyses crucial to the management of the disease. Dynamic PET scans of recent stroke victims are used to show several biochemical

processes in the affected area. This provides definite clues whether the remaining viable brain tissue can be revitalized by vascular surgery, or whether such surgery would only expose the patient to a useless hazard and expense.

Most importantly, because of its ability to visualize and quantity both immediate and delayed biochemical effects of administered radiopharmaceuticals in living organisms, PET holds immense promise for the accelerated development of new, safe and effective therapeutic agents for many of mankind's most dreaded diseases.

We have entered a period when biologic phenomena can be defined in chemical terms — in terms of chemical structure and dynamics. In the next decade or two, considering the accelerating expansion of scientific knowledge, we are almost sure to witness progress in understanding the material of life which will cause basic reorientation in our approaches not only in the biology and medicine, but also to the study of human behaviour and, I may add, which will call upon the physical sciences for their utmost support. Perhaps no field in the life sciences so typifies this revolution as the field of nuclear medicine, which in the past 40 years, has emerged as an integrated medical discipline.

Nuclear medicine is an example of the happy convergency of many scientific disciplines with those of medicine emphasizing the use of radioactivity in diagnosis and therapy, and suggest that such eclecticism may well be a prophetic model of future advances in all fields of medicine.

On 5 September, 1959, the South African Cabinet formally approved the proposed nucelar research and development programme submitted to it by the Atomic Energy Board. Now, twenty six years later, the progress which has been made sets the Republic on a par with most developed nuclear countries which have recognised the manifold advantages to be derived from the peaceful applications of nuclear energy; the achievements that have been chalked up in this span of relatively few years are truly remarkable for any country with very limited scientific manpower resources.

The National Accelerator Centre (NAC) is a multi-disciplinary research institute of the Council for Scientific and Industrial Research (CSIR). It was set up in 1977 to provide facilities for basic and applied research using particle beams for particle radiotherapy for the treatment of cancer, and to supply accelerator produced radioactive isotopes for nuclear medicine, industry and research. Several accelerators are now operated by the NAC. These are the 16 MeV deuteron cyclotron on the CSIR premises in Pretoria, the 6 MeV

Van de Graaff accelerator at Faure, and adjacent to it, the 8 MeV injector cyclotron which provides light ions for the new 200 MeV separated-sector cyclotron. The NAC, the Medical Research Council, the Atomic Energy Corporation and the South African universities have actively encouraged efforts to bring together scientists working in medical, biological and physical sciences who are interested in accelerated particle beams. Thus opportunities are provided for research in these separate discipline, and mutual interest in the interdisciplinary areas are stimulated.

Fundamental research is interdisciplinary, it knows no boundaries, no nationalities and no limits, so that South Africa's nuclear scientists, in elucidating the basic understanding of natural mechanisms underlying the applied efforts of their practical colleagues, are at the same time contributing to the sum total of Man's increasing knowledge. For this they have received international recognition and the acknowledgements of their counterparts in many countries.

South Africa as an advanced nuclear country with a more-than-passing interest in the major portion of the fuel cycle from uranium mining through nuclear power to the ultimate disposal of spent fuel, there are many fields requiring extended research and development. While close international collaboratorion would yield the maximum benefits, the current political climate militates against unhampered co-operation, and accordingly the Republic will perforce have to advance along a somewhat solitary path. Nevertheless, nuclear research and development will be maintained, at levels dictated by circumstances as they change. A mere glance at the changing pattern of Western World relationships is all that is needed to demonstrate the impermanence of international political attitudes capable, unfortunately, of impeding progress in the science of nuclear energy and in its application for the peaceful advancement of civilization.

Even if we should be totally cut off from cooperation with the rest of the world, we will still go ahead in our *journey for peace.* It will take time, but I have no doubt that we will eventually actively share whatever the future may bring. It is no good to reach a turning point and not turn.

Peace and freedom are not granted, they have to be strived for.

Die Universiteit van Pretoria het in April van hierdie jaar formeel besluit om die Departement Kerngeneeskunde 'n volkome selfstandige departement te maak.

Dit is inderdaad 'n besondere mylpaal in die geskiedenis van Kerngeneeskunde waarmee reeds jare gelede aan die Universiteit van Pretoria begin is.

Ek sal my plig versuim as ek nie hulde bring aan die pioniers op hierdie gebied nie. Sommige van hulle het ons reeds ontval, byvoorbeeld Prof Sarel Oosthuizen en Prof Chris Jansen. Hoe graag sou hulle nie hierdie dag wou beleef het nie! Ons is dankbaar vir hulle versiendheid en insette.

Ander het hierdie Departement sedert 1963 aan die gang gehou — soms onder moeilike omstandighede. Hulle lojaliteit en ondersteuning word baie waardeer. Baie verdien erkenning, en sonder om ondankbaar teenoor ander te wees, wil ek graag 'n spesiale woord van dank uitspreek teenoor my gewaardeerde vriende Proff B J Meyer, J van Niekerk, S Prinsloo, S Greyling en P Fourie, en Dr I Dormehl, sowel as teenoor baie van my personeel wat vir jare in die Departement werksaam is.

Ek dra hierdie lesing in beskeidenheid aan hulle op.

KERNKRAG: 'N VREDESREIS

Nadat die piloot die vrag van sy vliegtuig, die "Enola Gay" — vernoem na die moeder van die piloot — vroeg op die oggend van die 6e Augustus 1945, oor Hiroshima afgegooi het, was die wêreld nie meer dieselfde nie — nie polities nie, nie wetenskaplik nie, nie militêr nie en nie kultureel nie. En tog nou, 40 jaar later, leef ons met die atoombom en kernkrag in 'n kerneeu oënskynlik gelukkig. Gelukkig, omdat ten spyte van die vernietigingspotensiaal van atoomkrag, dit ook 'n groot inset gemaak het in die verskaffing van elektriese krag aan die wêreld, in die evaluering van ondergrondse waterbronne, in tuinbou, en in geneeskunde (navorsing, diagnosties en terapeuties). In dié verband moet beklemtoon word dat mens, dier en plant sedert tye her aan natuurlike kernstraling — afkomstig uit die buitenste ruim, die aarde en sy eie liggaam — blootgestel is. In ons tyd het mensgeskepte bronne (X-strale, radioaktiewe isotope afkomstig van atoombomontploffings, kernreaktors, mediese bronne) bygekom.

In hierdie praatjie gaan dit veral oor kerngeneeskunde, en kerngeneeskunde kan gedefinieer word as die spesialiteitsrigting in geneeskunde wat te doen het met die navorsing, diagnose en behandeling van siektetoestande met behulp van radionukliede. Die groot verskil tussen die mediese aanwending van roentgenologie, tomografie en eggografie enersyds en radionukliede andersyds is dat radionukliede hulle leen vir besonder selektiewe kwantitatiewe evaluering van sel-, orgaan- en totale liggaamsfunksie omdat hulle lotgevalle presies gemonitor kan word. Met die indrukwekkende spektrum van nuwe meetinstrumente, tegnieke en radioisotope wat deurlopend beskikbaar kom, word dit al meer en meer moontlik om klein komponente van lewende stelsels te identifiseer, te meet, en te isoleer — ons is "oë"

geskenk om dinge te sien wat vroeër onsigbaar was. Met behulp van radionukliede is dit tans byvoorbeeld moontlik om normale en abnormale bloedvloei in bepaalde gebiede van die brein of lewer na te gaan. Hierdie aanwending van isotope het onlangs nog 'n hupstoot gekry met die beskikbaarstelling van positron-emissie-tomografie (PET) — 'n tegniek wat groot belofte inhou en reeds aangewend is om metaboliese veranderinge op omskrewe sellulêre vlak in die brein na te gaan tydens gehoor-, visuele en ander stimuli. Daar is beweer dat die grootste bydrae wat die ruimte-eeu gemaak het, die onvergelykbare beeld van die aarde — sy skoonheid en sy mooiheid — vanuit die ruimteskip is. Miskien sal die grootste bydrae van Kerngeneeskunde wees die ontrafeling van die dinkproses, geheue en psigotiese afwykings (sielsiektes).

Ons leef in 'n periode waar biologiese verskynsels in terme van chemiese struktuur en dinamika verklaar word. In die volgende 40 dekades sal daar beslis gepoog word om tot die essensie van lewe deur te dring — en as ons die vordering oor die afgelope 40 jaar in aanmerking neem, sal Kerngeneeskunde hier die kern wees waaromheen vordering sal wentel.

Op 5 September 1959 het die destydse regering formeel die Kernnavorsingsprogram wat deur die RAK voorgelê is, aanvaar. Nou, 26 jaar later, is die vordering wat gemaak is sodanig dat die RSA nie agterstaan by ander vergelykbare lande wat betref die aanwending van atoomenergie om die lewenskwaliteit van sy mense te verhoog nie. Maar om tred te hou, sal die RSA nie kan terugsit nie — nee ons reis op pad na vrede en geluk vereis navorsing van die hoogste gehalte — ook wat betref Kerngeneeskunde.

Veertien jaar gelede het my familie saam met my ons vriende in Bolivië verlaat om na Suid-Afrika te kom.

Vandag is Suid-Afrika ons tuiste. Die afgelope 14 jaar het vir ons baie geluk en vreugde gebring, en ons is trots daarop dat hierdie land met sy vriendelike mense, skoonheid en baie geleenthede ons aanvaar het.

Vir dit alles sê ek namens my familie en myself via u opreg dankie aan Suid-Afrika.

Vyf van ons het gekom, maar ons is reeds sewe — 'n skoondogter en kleinkind het bygekom — die eerste Suid-Afrikaans-gebore Iturralde: Dit wil al lyk of u maar sal moet leer om hierdie familienaam te spel.

Aan die Bestuur van die Universiteit beginnende by Prof Joubert en Prof van der Schijf, aan Prof Geldenhuys, en kollegas van die Fakulteit Genees-

kunde, aan die Registrateurs, en in besonder aan die departement van Onderrigmedia, die personeel van die H F Verwoerd-hospitaal, en aan die personeel van die Departement Kerngeneeskunde wat betrokke was by die voorbereiding van hierdie voordrag, sê ek baie dankie.

Laastens my opregte dank aan u, my gewaardeerde vriende vir u aanwesigheid vanaand en u ondersteuning.

PUBLIKASIES IN DIE REEKS VAN DIE UNIVERSITEIT

1. "Gids by die voorbereiding van wetenskaplike geskrifte" — Dr P C Coetzee
2. "Die Aard en Wese van Sielkundige Pedagogiek" — Prof B F Nel
3. "Die Toenemende belangrikheid van Afrika" — Adv E H Louw
4. "Op die Drumpel van die Atoomeeu" — Prof J H v d Merwe
5. "Livestock Philosophy" — Prof J C Bonsma
6. "The Interaction Between Environment and Heredity" — Prof J C Bonsma
7. "Verrigtinge van die eerste kongres van die Suid-Afrikaanse Genetiese Vereniging" — Julie 1985
8. "Aspekte van die Prysbeheersingspolitiek in Suid-Afrika na 1948" — Prof H J J Reynders
9. "Suiwelbereiding as Studieveld" — Prof S H Lombard
10. "Die toepassing van fisiologie by die bestryding van Insekte" — Prof J J Matthee
11. "The Problem of Methaemoglobinaemia in man with special reference to poisoning with nitrates and nitrites in infants and children" — Prof D G Steyn
12. "The Trace Elements of the Rocks of the Bushveld Igneous Complex", Part 1 — Dr C J Liebenberg
13. "The Trace Elements of the Rocks of the Bushveld Igneous Complex, Part II. The Different Rock Types" — Dr C J Liebenberg
14. "Protective action of Fluorine on Teeth" — Prof D G Steyn
15. "A Comparison between the Petrography of South African and some other Palaeozoic Coals" — Dr C P Snyman
16. "Kleinveekunde as vakrigting aan die Universiteit van Pretoria" — Prof D M Joubert
17. "Die Bestryding van Plantsiektes" — Prof P M le Roux
18. "Kernenergie in Suid-Afrika" — Prof A J A Roux
19. "Die soek na Kriteria" — Prof A P Grové
20. "Die Bantoetaalkunde as beskrywende Taalwetenskap" — Prof E B van Wyk
21. "Die Statistiese prosedure: teorie en praktyk" — Prof D J Stoker
22. "Die ontstaan, ontwikkeling en wese van Kaak-, Gesigs- en Mondchirurgie" — Prof P C Snijman
23. Freedom — What for" — Prof D G Steyn
24. "Once more — Fluoridation" — Prof D G Steyn
25. "Die Ken- en Werkwêreld van die Biblioteekkunde" — Prof P C Coetzee
26. "Instrumente en Kriteria van die Ekonomiese Politiek n.a.v. Enkele Ondervindinge van die Europese Ekonomiese Gemeenskap" — Prof J A Lombard
27. "The Trace Elements of the Rocks of the Alkali Complex at Spitskop, Sekukuniland, Eastern Transvaal" — Dr C J Liebenberg
28. "Die Inligtingsprobleem" — Prof C M Kruger
29. "Second Memorandum on the Artificial Fluoridation of Drinking Water Supplies" — Prof D G Steyn
30. "Konstituering in Teoreties-Didaktiesel Perspektief" — Prof F van der Stoep
31. "Die Akteur en sy Rol in sy Gemeenskap" — Prof Anna S Pohl
32. "The Urbanization of the Bantu Homelands of the Transvaal" — Dr D Page
33. "Die Ontwikkeling van Publieke Administrasie as Studievak en as Professie" — Prof J J N Cloete
34. "Duitse Letterkunde as Studievak aan die Universiteit" — Prof J A E Leue
35. "Analitiese Chemie" — Prof C J Liebenberg
36. "Die Aktualiteitsbeginsel in die Geologiese navorsing" — Prof D J L Visser
37. "Moses by die Brandende Braambos" — Prof A H van Zyl
38. "A Qualitative Study of the Nodulation Ability of Legume Species: List 1" — Prof N Grobbelaar, M C van Beyma en C M Todd
39. "Die Messias in die saligsprekinge" — Prof S P J J van Rensburg

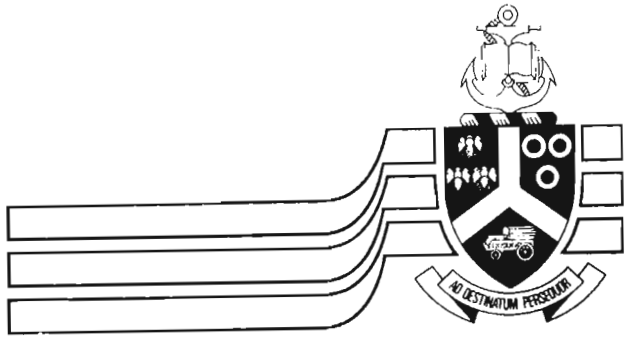
40. Samevattings van Proefskrifte en Verhandelinge 1963/1964
41. "Universiteit en Musiek" — Prof J P Malan
42. "Die studie van die Letterkunde in die Bantoetale" — Prof P S Groenewald
43. Samevattings van Proefskrifte en Verhandelinge 1964/1965
44. "Die Drama as Siening en Weergawe van die Lewe" — Prof G Cronjé
45. "Die Verboude Grond in Suid-Afrika" — Prof D G Haylett
46. "'n Suid-Afrikaanse Verplegingscredo" — Prof Charlotte Searle
47. Samevattings van Proefskrifte en Verhandelinge 1965/1966
48. "Op soek na Pedagogiese Kriteria" — Prof W A Landman
49. "Die Romeins-Hollandse Reg in Oënskou" — Prof D F Mostert
50. Samevattings van Proefskrifte en Verhandelinge 1966/1967
51. "Inorganic Fluoride as the cause, and in the prevention and treatment of disease" — Prof Douw G Steyn
52. "Honey as a food and in the prevention and treatment of disease" — Prof D G Steyn
53. "A check list of the vascular plants of the Kruger National Park" — Prof H P van der Schijff
54. "Aspects of Personnel Management" — Prof F W Marx
55. Samevatting van Proefskrifte en Verhandelinge 1967/1968
56. "Sport in Perspektief" — Prof J J Botha
57. "Die Huidige Stand van die Gereformeerde Teologie in Nederland en ons Verantwoordelikheid" — Prof J A Heyns
58. "Onkruide en hul beheer met klem op chemiese beheer in Suid-Afrika" — Prof P C Nel
59. "Die Verhoudingstrukture van die Pedagogiese Situasie in Psigopedagogiese Perspektief" — Prof M C H Sonnekus
60. "Kristalhelder Water" — Prof F A van Duuren
61. "Arnold Theiler (1867—1936) — His Life and Times" — Dr Gertrud Theiler
62. "Dr Hans Merensky — Mens en Voorbeeld" — Prof P R Skawran
63. "Geskiedenis as Universiteitsvak in Verhouding tot ander Vakgebiede" — Prof F J du Toit Spies
64. "Die Magistergraadstudie in Geneeskundige Praktyk (M Prax Med) van die Universiteit van Pretoria" — Prof H P Botha
65. Samevattings van Proefskrifte/Verhandelinge 1968/1969
66. "Kunskritiek" — Prof F G E Nilant
67. "Anatomie — 'n Ontleding" — Prof D P Knobel
68. "Die Probleem van Vergelyking en Evaluering in die Pedagogiek" — Prof F J Potgieter
69. "Die Eenheid van die Wetenskappe" — Prof P S Dreyer
70. "Aspekte van die Sportfisiologie en die Sportwetenskap" — Dr G W v d Merwe
71. "Die rol van die Fisiologiese Wetenskappe as deel van die Veterinêre Leerplan" — of W L Jenkins
72. "Die rol en toekoms van Weidingkunde in Suid-Afrikaanse Ekosisteme" — Prof J O Grunow
73. "Some Problems of Space and Time" — Mnr K A Schrecker
74. "Die Boek Prediker — 'n Smartkreet om die Gevalle Mens" — Prof J P Oberholzer
75. Titels van Proefskrifte en Verhandelinge ingedien gedurende 1969/1970; 1970/1971 en 1971/1972
76. "Die Akademiese Jeug is vir die Sielkunde meer as net 'n Akademiese Onderwerp" — Prof D J Swiegers
77. "'n Homiletiese Herwaardering van die Prediking vanuit die Gesigshoek van die Koninkryk" — Prof J J de Klerk
78. "Analise en Klassifikasie in die Vakdidaktiek" — Prof C J van Dyk
79. "Bantoereg: 'n Vakwetenskaplike Terreinverkenning" — Prof J M T Labuschagne
80. Dosentekursus 1973 — Referate gelewer tydens die Dosentekursus 30 Jan — 9 Feb 1973
81. "Volkekunde en Ontwikkeling" — Prof R D Coertze

82. "Opleiding in Personeelbestuur in Suid-Afrika" — Prof F W Marx
83. "Bakensyfers vir Diereproduksies" — Prof D R Osterhoff
84. "Die Ontwikkeling van die Geregtelike Geneeskunde" — Prof J Studer
85. "Die Liggaamlike Opvoedkunde: Geesteswetenskap?" — Prof J L Botha
86. Dosentekursus: 1974 — Referate gelewer tydens die Dosentekursus 4—7 Feb 1974
87. "Die opleiding van die mediese student in Huisartskunde aan die Universiteit van Pretoria" — Prof H P Botha
88. "Opleiding in bedryfsekonomie in die huidige tydvak" — Prof F W Marx
89. "Swart arbeidsregtelike verhoudings, quo vadis?" — Prof S R van Jaarsveld
90. "The Clinical Psychologist: Training in South Africa". A report on a three-day invitation conference: 11—13 April 1973
91. "Studie van die Letterkunde in die Taalonderrig" — Prof L Peeters
92. "Gedagtes rondom 'n Kontemporêre Kerkgeskiedenis — met besondere verwysing na die Nederduits Gereformeerde Kerk" — Prof P B van der Watt
93. "Die funksionele anatomie van die herkouermaag-vorm is gekristalliseerde funksie" — Prof J M W le Roux
94. Dosentekursus 1975 — Referate gelewer tydens die Dosentekursus 27 Januarie — 6 Februarie 1975
95. "'n Nuwe benadering tot die bepaling van die koopsom in die geval van 'n oorname" — Prof G van N Viljoen
96. "Enkele aspekte in verband met die opleiding van veekundiges" — Prof G N Louw
97. "Die Soogdiernavorsingsinstituut 1966—1975"
98. "Prostetika: 'n doelgerigte benadering" — Prof P J Potgieter
99. "Inligtingsbestuur" — Prof C W I Pistorius
100. "Is die bewaring van ons erfenis ekonomies te regverdig?" — Dr Anton Rupert
101. "Kaak-, Gesigs- en Mondchirurgie — Verlede, Hede en Toekoms" — Prof J G Duvenage
102. "Keel-, Neus- en Oorheelkunde — Hede en Toekoms" — Prof H Hammersma
103. Dosentesimposia 1975
104. "Die Taak van die Verpleegonderwys" — Prof W J Kotzé
105. "Quo Vadis, Waterboukunde?" — Prof J P Kriel
106. "Geregtelike Geneeskunde: Die Multidissiplinêre Benadering" — Prof J D Loubser
107. "Huishoudkunde — Waarheen?" — Prof E Boshoff
108. Dosentekursus 1976 — Referate gelewer tydens die Dosentekursus 29 Januarie — 4 Februarie 1976
109. Tweede H F Verwoerd-gedenklesing gehou deur die Eerste Minister Sy Edele B J Vorster
110. Titels van proefskrifte en verhandelings ingedien gedurende 1972/73; 1973/74 en 1974/75 en wetenskaplike publikasies van personeellede vir die twaalf maande eindigende op 15 November 1975
111. "Ortodonsie — 'n Oorsig en waardebepaling" — Prof S T Zietsman
112. "Rede gelewer by die ingebruikneming van die Nuwe Kompleks vir die Tuberkulosenavorsingseenheid van die MNR" — Prof H W Snyman
113. "Die gebruik van Proefdiere in Biomediese Navorsing, met Spesiale Verwysing na Eksperimentele Chirurgie" — Prof D G Steyn
114. "Die Toekoms van die Mynboubedryf in Suid-Afrika" — Prof F O P Leiding
115. "Van Krag tot Krag" — Dr Anton Rupert
116. "Carnot, Adieu!" — Prof J P Botha
117. "'n Departement van Hematologie — Mode of Noodsaak" — Prof K Stevens
118. "Farmaka en Farmakologie: Verlede, Hede en Toekoms" — Prof De K Sommers
119. "Opleiding in Elektrotegniese Ingenieurswese — Deurbraak of Dwaling?" — Prof L van Biljon
120. "Die Röntgendiagnostiek voor 'n Nuwe Uitdaging — die Toegepaste Fisiologie" — Prof J M van Niekerk

121. "Die Algemene Sisteemteorie as Uitgangspunt by die Beplanning van 'n Basiese Biblioteek- en Inligtingkundige Opleidingsprogram" — Prof M C Boshoff
122. Dosentekursus: 1977
123. "Hulpverlening aan kinders met leerprobleme" — Prof P A van Niekerk
124. "Tuinboukunde Quo Vadis" — Prof L C Holtzhausen
125. "Die plek en toekomstaak van 'n Departement Huisartskunde in 'n Fakulteit van Geneeskunde" — Prof A D P van den Berg
126. "Titels van proefskrifte en verhandelings ingedien gedurende 1975/76 en wetenskaplike publikasies van personeellede vir die twaalf maande eindigende op 15 November 1976
127. "Landbouvoorligting by die kruisad — Uitdagings vir Agrariese Voorligting as Universiteitsdepartement" — Prof G H Düvel
128. "Die ontplooiing van Rekenaarwetenskap as 'n funksie van evolusie op Rekenaargebied" — Prof R J van den Heever
129. "Die rol van navorsing in die opleiding en ontwikkeling van die akademiese chrirug" — Prof C J Mieny
130. "Sport and Somatology in Ischaemic Heart Disease" — Prof P J Smit
131. Dosentekursus 1978
132. "'n Beter Toekoms" — Dr Anton Rupert
133. Toespraak gelewer by geleentheid van die Lentepromosieplegtigheid van die Universiteit van Pretoria op 8 September 1978 — Mnr J A Stegmann, Besturende Direkteur van Sasol
134. Geologie in 'n toekoms van Beperkte Hulpbronne" — Prof G von Gruenewaldt
135. Titels van proefskrifte en verhandelings ingedien gedurende 1976/77 en wetenskaplike publikasies van personeellede vir die twaalf maande eindigend op 15 November 1977
136. "Die Kind met Spesifieke Leergestremdhede" — Proff P A van Niekerk en M C H Sonnekus
137. "Sensore en Tensore" — Prof N Maree
138. "Die Godsdienswetenskappe en die Teologie" — Prof P J van der Merwe
139. "Dierefisiologiese navorsing aan die Universiteit van Pretoria (1928—1978)" — Prof J F W Grosskopf
140. Titels van proefskrifte en verhandelings ingedien gedurende 1977/78 en wetenskaplike publikasies van personeellede vir die twaalf maande eindigende op 15 November 1978
141. "Behoeftebepaling en doelformulering in die Opvoeding, Onderwys en Opleiding" — Prof E J Potgieter
142. "Klein sake is 'Grootsake'" — Dr Anton Rupert
143. "Die Pad Vorentoe" — Prof W E G Louw
144. Referate gelewer tydens die jubileumjaarviering — Prof P S Dreyer
145. "Die gebruikmaking van Kies-en-keur en invulvraestelle" — lesing gelewer tydens 'n kursus vir dosente op 19 en 20 April 1979 en 22 en 23 Oktober 1979
146. "Survey of Disease Patterns in Transkei and the Ciskei" — E Rose, W G Daynes en P J Kloppers
147. Die Ortopedagogiek as Praktykgerigte Pedagogiekperspektief" — Prof P A van Niekerk
148. "Die rol van Kernkrag gesien teen die agtergrond van die energietekort in die wêreld" — Dr A J A Roux
149. "Exchange lists for selected Protein Diets" — Medv J M Crous
150. "Die Universiteit van Pretoria se bydrae tot die Dierefisiologiese Vakliteratuur (1930—1980)" — J F W Grosskopf, J D Skinner en S Christa Daffüe
151. "Professors' Dilemma. Problems, Polemics and Politics in University Departments of English" — Prof P J H Titlestad
152. "Ortopedie, Die Ortopeed en die mens" — Prof R P Gräbe
153. "Die rol van Fisika in die moderne gemeenskap" — Prof E K H Friedland
154. "Interne Geneeskunde: Wetenskap en Kuns" — Prof G P Human
155. "Die opleiding van Chemiese Ingenieurs in Suid-Afrika" — Prof U Grimsehl
156. "Doelwitte vir Musiekopleiding" — Prof S Paxinos

157. "Die stand van die Beeldende Kuns in Suid-Afrika" — Prof N O Roos
158. "Op die spoor van die Onsigbare Lig" — Prof S F Prinsloo
159. "Beroepsoriënteringspedagogiek gereël deur die Fakulteit Opvoedkunde van die Universiteit van Pretoria as deel van die Halfeeufeesviering 12 tot 14 Augustus 1980 — Onder redaksie van Prof C J Joubert
160. "Die selfbeeld van die Sosiologie en Sosioloë" — Prof J S Oosthuizen
161. "Onderwysopleiding — 'n Didakties-Pedagogiese en Vakdidaktiese beskouing" — Prof W J Louw
162. "Die teenwoordigheid van Christus in die Erediens" — Prof A C Barnard
163. "Die Stand en taak van Geesteswetenskaplike Navorsing in die RSA" — Prof J G Garbers
164. "Die betekenis van die Regsfilosofie vir Regsnavorsing en Regspleging" — Prof J V van der Westhuizen
165. Titels van proefskrifte en verhandelings ingedien gedurende 1978—1979 en wetenskaplike publikasies van personeellede vir die 12 maande eindigende op 15 November 1979
166. "Die verskynsel van Spesialisering by insekte en entomoloë" — Prof E Holm
167. "Fiftieth Anniversary Lectures": University of Pretoria — August — September 1980 — George D Yonge
168. "Kindergeneeskunde in die jaar 2000" — Prof R E Cronje
169. "Praktiese Regsopleiding in die Akademie" — Prof C F Eckard
170. "Proceedings of the Symposium on Controversies in Surgery" — Edited by Prof C J Mieny
171. "The Psychic Life of the Child with Specific Learning disabilities" — Prof M C H Sonnekus
172. "B F Nel Herdenkingsrede — Universiteit van Pretoria" 12 Augustus 1981 — Prof E A van Trotzenburg
173. "Statistiek en die statistikus in diens van die gemeenskap" — Prof H S Schoeman
174. "Menslike Anatomie — basiese geneeskundige vak" — Prof I J M van Niekerk
175. "Môre se uitdaging vir die Suid-Afrikaanse Mynboubedryf" — Prof A N Brown
176. Titels van proefskrifte en verhandelings ingedien gedurende 1979/80 en wetenskaplike publikasies van personeellede vir die 12 maande eindigende op 15/11/1980
177. "Leiding aan Magister en Doktorale studente" — Prof W A Landman
178. "Steekproefneming in die Praktyk" — Prof D G Stoker
179. "Bestuur — Wetenskap of Kultuur?" — Dr A Rupert
180. "Uitdagings wat nuwere tendense aan die Universiteitsbiblioteekwese stel" — Die departement Biblioteek- en Inligtingkunde en die Biblioteekdiens van die Universiteit van Pretoria
181. "Liggaamsbeweging en die Mens in Wording" — "Physical movement and the Becoming of Man" — Onder redaksie van/edited by Prof J L Botha en/and Prof P J Smit
182. "Kriminologie 2000" — Prof D G Steyn
183. "A Horse! A Horse' My Kingdom for a Horse!" — Prof M M S Smuts
184. "Die bydrae van Mondpatologie tot die Geneeskunde" — Prof A J Ligthelm
185. "Lectures on Philosophical Hermeneutics" — Prof Dr Hans-Georg Gadamer
186. "Inhuldigingsrede van Vise-Kanselier en Rektor" — Prof D M Joubert
187. "Uitdagings vir 'n Ginekologie en Obstetrie Departement in die ruimte-eeu" — Prof J V van der Merwe
188. Die uitdaging van Elektriese Ingenieurswese in Suid-Afrika" — Prof N Wessels
189. "Titels van proefskrifte en verhandelinge ingedien gedurende 1980/81 en wetenskaplike publikasies van personeellede vir die twaalf maande eindigende op 15 November 1981"
190. "Die belangrikheid van Periodonsie en Mondgeneeskunde in Tandheelkunde" — Prof J A Pretorius
191. "Strategieeë vir die implementering van navorsingsbevindinge in die Geesteswetenskapope" — Dr J G Garbers

192. "Gesprekke oor die Wiskunde" — Onder redaksie van Prof P J Zietsman
193. "Gemeenskapsgesondheid: 'n Nuwe Naam en 'n Nuwe Benadering" — Prof A M Coetzee
194. "Vrees dat die Wonderboom sal ... (val)?" (J C Steyn) — Prof Réna Pretorius
195. "Evaluering van die hedendaagse beroepsoriënteringsteorie en -praktyk" — Prof C J Joubert
196. Magskonsentrasie: Voor- en Nadele" — Dr A E Rupert
197. "Waarom Chemie?" — Prof A Wiechers
198. "Biblioteek- en Inligtingkunde: Quo Vadis" — Prof J A Boon
199. "B.F. Nel-Gedenklesing" — Prof F van der Stoep
200. "Die opleiding van navorsers in die Geesteswetenskappe" — Dr J G Garbers
201. "'n Konteks vir die Argitektuur" — Onder redaksie van Prof D Holm
202. "Wiskunde in diens van die gemeenskap" — Prof J Swart
203. "Die moderne staatkunde in die Republiek van Suid-Afrika" — Prof F L Ackron
204. "Wetmatigheid en Meganiese Ingenieurswese" — Prof P C Haarhoff
205. "Gesoek: Die nuwe Entrepreneur" — Dr R E Rupert
206. "Kernreaksies van 'n ander aard" — Prof L Visser
207. "Lifestyle and disease". Symposium of the Hans Snyckers Institute
208. "Verpleegkunde in perspektief: Graadopleiding aan die Universiteit van Pretoria" — Prof J G P van Niekerk
209. "Onderwysvernuwing: 'n Onvermybare Opgaaf" — Prof M J Bondesio
210. "Die Siviele Ingenieursdosent in diens van ..." — Prof A W Rohde
211. "Kontemporêre uitdagings aan Universiteite in die akademiese voorbereiding van openbare Administrateurs" — Prof P S Botes
212. "Historia Augusta. Knolskrywer(s) ... of knollesers ... of knolle vir lesers" — Prof J Scholtemeijer.
213. "Kennis — Graaf en Swaard" — Prof P A Fourie.
214. "Die kreatiewe aanwending van Volksmusiek" — Prof C E Lamprecht.
215. "Die noutetiese beraad: Bybels of Biblisisties" — Prof T F J Dreyer.
216. "Ortodonsie: 'n Oorsig" — Prof J J G G de Mûelenaere.
217. "Inhuldigingsrede van Kanselier" — Sy Edele A L Schlebusch.
218. "Kaak-, Gesigs- en Mondchirurgie en Gesplete Gesigsdeformiteite in Perspektief" — Prof Kurt-W Bütow.
219. "Ewewig: SLtilte en Storm" — Prof J G Swart.
220. "Departement Geneeskunde — die verlede — die hede en die toekoms" — Prof P Bland-Van den Berg.
221. "Die Deurbreking van Isolasie tussen Wetenskapkulture" — Dr J G Garbers.
222. "Van die RGN-Onderwysondersoek tot witskrif en wetgewing — Navorsingsoorwegings" Dr J G Garbers
223. "Diagnostiek en Röntgenologie — 'n uitdaging" — Prof J E Seeliger
224. "Geweld in die samelewing" — Prof S I du Toit



Universiteit van Pretoria

UNIVERSITEIT VAN PRETORIA
Nuwe Reeks Nr 225 — 1986
ISBN 0 87979 412 4
Prys: R3,78

Hierdie publikasie en die publikasies wat hierin vermeld word, is verkrygbaar van:

VAN SCHAIK'S BOEKHANDEL (EDMS) BPK
BURNETTSTRAAT 1096
HATFIELD
0083

V&R Pta