

# | FRIEDEL SELLSCHOP |

## TOP THREE AWARDS

- Max Planck Award, 1992
- Institute of Physics (Gold), 1990
- Order of the Baobab (Gold), awarded posthumously, 2002

## WHAT PEOPLE DO NOT KNOW

Few people know that Sellschop loved classical music, and that he often sang arias from famous Italian operas.



## STUDYING MESSENGERS FROM THE DEEP

In 1965, a Nobel Prize winner in the making, and a young Professor from the University of the Witwatersrand (Wits) set up research equipment three kilometres below the surface of the earth in a mine in Boksburg. Their aim was to find, in nature, evidence of minuscule particles called neutrinos. They had been theorised, and the Nobel Prize winner (to be) had found artificially-made neutrinos from a nuclear reactor, but none had been located “in nature”, although millions of them pass through every human body every day. Their research was successful – a naturally occurring neutrino was observed, the theory verified, and their importance as a critical part of our understanding of the kind of processes that go on in the sun, and as important building blocks for the blueprint of nature became invaluable. What is rarely acknowledged about this unusual research is that the researchers also identified, at the time, traces of the W Boson – although the W and Z bosons were formally discovered in 1983 by physicists at the Super Proton Synchrotron at CERN, (a global research centre where Sellschop was also involved). The Z Boson is a neutral elementary particle, a kind of ‘heavy light’. The W boson is an electrically charged cousin of the Z boson. The both carry the weak force – and they both have notable connections to neutrinos.

The young Wits Professor critical to this work was Jacques Pierre Friedel Sellschop, almost always known as “Friedel”, and who was, at the time, a Cambridge PhD graduate and the Professor of Nuclear Physics and the Director of the Nuclear Physics Research Unit. His Professorship was the first ever of its kind in South Africa.

## EARLY YEARS

Sellschop was born in Lüderitz, Namibia – then an administered part of South Africa – and began his academic life as a school boy at the Christian Brothers College in Pretoria, leaving school with distinctions in mathematics and Latin. He enrolled as a student at the University of Pretoria where he completed a BSc degree *cum laude*, before going to Stellenbosch University to work towards an MSc degree, which was also awarded *cum laude*. Completing that research, Friedel left South Africa and embarked on his PhD research at Cambridge University. While at Cambridge, Sir Basil Schon-

land (a fellow South African) encouraged Sellschop to return to South Africa to seek out opportunities for research that were unique to South Africa. In this respect, Basil Schonland was probably one of the people who had the greatest impact on Sellschop's life.

He took Schonland's advice, returned to South Africa and, during that time, was appointed by Wits in 1956 and assumed his appointments as Professor of Nuclear Physics and the founding Director of the Nuclear Physics Research Unit in 1958 – both while he was still in his late 20s.

On subsequently taking up his positions, Sellschop set about turning the Department and the Centre into operational entities. The tasks he faced must have been daunting. Years later, an eminent physicist remarked, at a conference in Lüderitz, that a “true measure of Friedel's greatness was that he accomplished his ground-breaking research not in a super-duper laboratory with everything at his disposal. He accomplished what he did starting from scratch. Not only did he have to build the laboratory, but also a tradition of scientific research.” These observations are borne out in the reality of the time, as Sellschop was assigned the remnants of a disused mining and military hospital – and bare veld. In other words, he developed a world-class laboratory and research tradition by way of his own skills. It is appropriate that when the Centre was to be formally titled, it was aptly named after Basil Schonland who had encouraged Sellschop's return to South Africa and who had, previously, established the Bernard Price Institute, also at Wits.

It is important to bear in mind Sellschop's pioneering work since, during the challenges of developing the department and the unit, he continued and published his own research (including new work on the neutrino), laying the ground for a distinguished career in science.

While remarkably diverse, Sellschop's research focused on three major areas: neutrino research (particle physics), following on the 1965 discovery; diamond physics – across a wide spectrum of specific issues (and for which he was awarded the Max Planck Award); and geosciences, related to his diamond research, but studying diamonds as “messengers from the deep” containing elements of the earth's mantle, “well preserved in a chemical

and physical prison" the only way of gaining insights into the detailed nature of the mantle. These elements came from points 200 kilometres below the earth's surface, and were formed 2.5 billion years ago – where and when diamonds had their origins.

Sellschop's research in the area of diamonds brought him into contact with Dr Henry Dyer, then Managing Director of the De Beers Industrial Diamond Division. Their friendship and shared knowledge almost certainly made Dyer a second major influence in Sellschop's life and research.

His research in the field of diamond physics was broad and (by now) internationally well known and respected thus having him participating in the CERN NA43 and NA59 collaborative research. In this role, he worked on experiments that used the perfect and very rigid "diamond lattice" of diamonds to produce and to study the highest energy, near monochromatic (single frequency) photons – photons being the smallest possible packet of light at a given wavelength. Diamond is a sufficiently perfect gem of a target that coherent effects are maximised at the expense of the incoherent.

Sellschop also undertook research – in the field of material science studies – that contributed significantly to the use of diamonds as 21<sup>st</sup> century "high tech" materials – taking their value way beyond the hard tips of drills. In this regard, he also studied ion-implantation of diamonds and was a pioneer of diamonds as an ideal material for hosting electrical and optical applications.

Despite becoming the Dean of the Faculty of Science at Wits in 1979, and the Deputy Vice-Chancellor for Research in the university in 1984 (a post he held for 13 years) Sellschop's research continued so that, when he retired, he was immediately awarded the Schonland Honorary Professorial Research Fellowship, and in 1998 became a Professor Emeritus of the university.

## TIRELESS WORKER

Sellschop was a tireless worker, no matter in which field, or on what task, he was working. He had two desks in his study at home – one for sitting

and the other for standing. When, in the early hours of the morning he felt himself falling asleep, he would move to his "standing desk" until, when even that failed, he would take a quick, cold swim, and return to work. In addition to being a tireless researcher, Sellschop was (unlike his Cambridge supervisor, whom he met twice) an assiduous supervisor, who met with his doctoral students at 09:00 each Saturday morning to review their progress and discuss their work.

In recognition of his exceptional contributions to a broad range of topics in physics, several fellowships were awarded to Sellschop. In 2000, in honour of his 70<sup>th</sup> birthday, the International Conference on Fundamental and Applied Aspects of Modern Physics was held in Lüderitz, Namibia – his home town. So widely international and respected was the conference that the entire town of Lüderitz participated in, and contributed to, the success of the conference.

In addition to being a special advisor to the Ministry of Arts, Culture, Science and Technology for five years, he was a member or fellow of 11 South African and four international professional bodies, and served as a committee or council member on all of them. These included, among others, the South African Institute of Physics; the Joint Council of Scientific Societies (of which he served as Vice-President, and twice as President); the Council for the Natural and Scientific Professions; and the Royal Society of South Africa (where he also served a term as President); and on the Commission on Nuclear Physics of the International Union of Pure and Applied Physics.

Wits donated the Schonland Research Institute for Nuclear Sciences to the National Research Foundation (NRF) in 2004, and it then became one of the two sites of the NRF's iThemba Laboratory for Accelerator-Based Sciences, or iThemba LABS. At that time, Simon Connell, one of Sellschop's doctoral students and now a professor of physics at the University of Johannesburg, and Friedel's widow, Sue, decided that Friedel's role in initiating the original centre, and in its growth and development over many years, should not be forgotten. To this end, they secured space in one of the Johannesburg buildings of iThemba LABS and succeeded in having it named the Sellschop Room. In the room, they assembled many of his books (not just on physics, but covering an entire range of his areas of in-

terest), work by his students, photographs, and memorabilia. The Sellschop Room is a tribute to a great researcher – and an invaluable resource for anyone wishing to know more about his work and life.

### MODERN-DAY RENAISSANCE MAN

Few people know that Sellschop loved classical music, and that he often sang arias from famous Italian operas (mainly to himself) in the evenings – and that, as a young man, he played the bagpipes and never lost his love for bagpipe music. What is more, despite the substantial time he spent undertaking his research, and the considerable demands made on him by his professional work and public life, he was, at heart, a deeply committed family man – and one whose research work was sustained as much by his sense of enchantment as by the hard-science research and its outcomes. Against this remarkable background, it is not difficult to think of Sellschop as a modern-day Renaissance man: an internationally respected and highly honoured physicist, a geo-scientist, an avid reader of the classics (which

he frequently quoted) and of autobiographies; an engaged follower of palaeontology, a budding musician and lover of a wide range of musical traditions (especially opera, including Gilbert and Sullivan).

How better, though, to know this remarkable man, than through this simple message (type-written on an official university letterhead from his professional office):

*Dear Barry  
Please excuse for the delay in replying. I'm thinking.  
Kind regards  
Friedel*

*The writer wishes to acknowledge the considerable help given, and information shared, by Professor Simon H Connell, who provided information about, and insights into, the life and work of Professor Friedel Sellschop.*

