

Proceedings, Annual General Meeting, 1992

The 95th Annual General Meeting of the South African Institute of Mining and Metallurgy was held in the Gold Room of the Transvaal Automobile Club in Johannesburg on Wednesday, 12th August, 1992.

OBITUARIES

The President announced the deaths of the following members of the Institute during the past year:

Honorary Life Fellow: A. Louw

Life Fellow & Past

President 1954/55: Dr L.A. Bushell

Other Members:

K. Roodt, D.C.J. Squirrel, E.W. Thiel, G. Abdinor, R.S. Dubman, M.E.E. Douglas, R.J.J. Fourie, J.C. Fritz, D.L. Starkey, J.P.B. Stewart, R.W. Shapiro, M.H. Fennell, H. Lampert, J.C.B. Wilson, A.J. Abrahams.

As a mark of respect to the memory of the deceased and in sympathy with the bereaved, all rose and observed a moment of silence.

MINUTES

The minutes of the previous Annual General Meeting, which were published in the September 1991 issue of the *Journal*, were confirmed.

WELCOME

The President extended a hearty welcome to: Mr E. Pavitt, Mr J.B. Raath, (Government Mining Engineer), Mr C. MacMillan (President of AS&TS), Presidents or representatives of sister institutes and other associations, all the recipients of awards, senior members of industry, Honorary Life Fellows, Past Presidents, honoured Members, and other guests present.

HONORARY LIFE FELLOWSHIP

President: Honorary Life Fellowship is awarded by Council to Corporate Members of the Institute who have rendered outstanding service to the industry or to the Institute. It is my pleasure to announce that Council has agreed to confer Honorary Life Fellowship on Dr Joss Lurie.

Dr Lurie was educated as a geologist and joined what was then the Witwatersrand Technical College in 1963. While employed there, he was awarded a Ph.D. in 1974 and obtained the National Teachers' Diploma by correspondence in 1978. In 1980 he became Assistant Director at the Technikon, Witwatersrand, and the following year, Director. He has thus devoted the greater part of his life to the education of young men and women in the arts and science of mining and related disciplines. Many hundreds of students, the industry that they serve, and the Institute have cause to thank Joss for his devotion to the

school and to the maintenance and furtherance of the standards of its teaching. He was elected to Council in the 1981/82 year and has represented the Institute both on ASARET and SAARET. He has enthusiastically championed the cause of Non-corporate Members and welcomed with delight the opening, some six years ago, of Corporate Membership to suitably qualified technologists and technicians.



Mr R.D. Beck with Dr J. Lurie, recipient of Honorary Life Fellowship

BRIGADIER STOKES MEMORIAL AWARD

President: The Brigadier Stokes Memorial Award was instituted in 1980 to commemorate the outstanding contribution to the South African mining industry made by Brigadier R.S.G. Stokes, an Honorary Life Fellow and Past President of the Institute. The award is made to an individual for the very highest achievement in the South African mining and metallurgical industry. It gives me great pleasure to announce that the award for 1991 is to be made to Mr Ted Pavitt. A citation that goes with the award reads as follows:

'It has been said that someone who is destined to be the head of a large organization will reach that position regardless of the profession he originally followed.'

This is indeed the case with Edward Pavitt, who graduated as a mining engineer but went on to become the head of one of South Africa's major companies.

After graduating in 1940, Ted Pavitt joined the South African Engineering Corps. He served in North Africa and Italy with the 11th Field Company attached to the 8th Army. He was discharged from military service in 1946, having, at the age of 26, been appointed a major. He was awarded the Military Cross for outstanding courage and devotion to duty. His on-the-job mining career was started at East Geduld on the East Rand and continued at St. Helena in the Orange Free State Goldfields, where he solved many technical problems.

As Mine Manager, he brought Leslie Gold Mine in the Evander area into profitable production in record time. His

transfer to Union Corporation's Head Office in 1964 as Consulting Mining Engineer, and later Chief Consulting Engineer, set him on a path to greater achievements in the technical and administrative field, which in turn led to his becoming an astute businessman. He was determined that Union Corporation should become an outstanding mining and industrial company. From the time he became a Director, and subsequently Chairman and Chief Executive, of Union Corporation, he took the lead in opening new gold, platinum, base metal, and coal mines, as well as embarking on numerous new industrial ventures and expanding existing ones. These enterprises were located not only in South Africa but also in Britain, Spain, Australia, North America, and Brazil. During this period, one of his management directives was: 'A good manager must be a man with a sense of urgency, a demand for excellence, and a healthy discontent with the way things are. Each of us must be alert to the dangers of playing it safe. We must act courageously in what we believe is right.'

When Union Corporation merged with General Mining in 1980, he took the role of Executive Vice Chairman of Gencor, becoming Executive Chairman in 1982, a position he held until his retirement in 1986.

In addition to his Gencor activities, Ted Pavitt served as a director of a bank, a building society, and a wide range of mining and industrial companies. Before and since his retirement, he has served on the councils of two universities, a technikon, the Urban Foundation, the SA Foundation, of which he was President in 1983/84, and as a trustee of numerous associations and trusts. He is currently Chairman of the University of the Witwatersrand Foundation, and has helped considerably with the development of the West Campus. In 1986 he was made a Freeman of Evander. He joined the Institute in 1941, and is thus a member of the Institute's prestigious 50-year Club.

Ted Pavitt is also very much a family man. He and his wife Elizabeth, known to her friends as Liz, are parents of three married daughters and have seven grandchildren. At the time of his retirement, one of his well-wishers said, 'Ted Pavitt's main goal is the pursuit of excellence in his work and that of those with whom he is associated. Through his entire career he has shown that he is a man of action, well able to meet situations head on. If there is going to be a collision, he is the kind of man who is prepared to go into battle and take the knocks. On the other hand, all those who have worked with or under him remember his great concern for their welfare.'

Ted Pavitt is a truly worthy recipient of the Brigadier Stokes Memorial Award.

Mr Pavitt: While I am getting my paper out, I think I should just cast aside the halo!

The mining factor, the dominant factor in the industrialization of South Africa, has maintained its eminence without challenge for over a century. The gold-mining sector is presently experiencing a decline, but do not be too hasty to write it off: it has come back strongly from setbacks in the past.

In contrast to primary mining of the 20th century, the 21st century holds promise for a new bonanza. It is in the form of the sophisticated field of beneficiation. This will

considerably enhance the value of the products and also most certainly be very helpful in exports. A new focus is on platinum-group metals in converters for internal combustion engines: the cheaper production of steel, stainless steel, aluminum, and petro-chemicals; the recovery of alumina, potash, magnesia from waste material; and, last but not least, the local manufacture of gold jewellery. Current indications are indeed bullish.

Recognition by the Institute of the endeavours of its Members to translate these dreams into reality and so earn foreign currency is certainly very meritorious. On behalf of a team of colleagues who always gave of their best over many years, I am honoured as their leader to join the august body of the recipients of the Brigadier Stokes Memorial Award.



Mr E. Pavitt, recipient of the Brigadier Stokes Memorial Award, and Mr R.D. Beck

PRESENTATION OF MEDALS AND CERTIFICATES

The President, who would be presenting the medals and certificates, asked John Cruise to announce them.

John Cruise: It gives me great pleasure to announce that the Gold Medal of this Institute is awarded to Dr H. Wagner for his paper entitled, 'Surface effects of total coal-seam extraction by underground mining methods', which was published in the July 1991 issue of the *Journal*. Mr E.H.R. Schumann is a co-author, and as a non-member receives a certificate.



The gold medal was awarded to Dr H. Wagner and a certificate to Mr E.H.R. Schumann

The Institute's Silver Medal is awarded to Dr R.G. Görtunca and D.J. Adams for their paper entitled, 'A rock-engineering monitoring programme at West Driefontein gold mine', which was published in the December 1991 issue of the *Journal*.

The Silver Medal is also awarded to Dr J.A.L. Napier for his papers entitled, 'Energy changes in a rockmass containing multiple discontinuities' and 'The effect of loading history on stress generation due to inelastic deformations around deep-level tabular stopes', which were published in the May and June 1991 issues of the *Journal*. J.S. Kuijpers was a co-author and, as a non-member, receives a certificate.

A Silver Medal is also awarded to Dr M.D. Adams for his paper entitled, 'The removal of cyanide from aqueous solution by the use of ferrous sulphate', which was published in the January 1992 issue of the *Journal*.

Certificates go to C.J. van Niekerk and C.C. Begley for their papers, published in the July 1991 issue of the *Journal*, entitled, 'Zinc in South Africa'. A certificate is also awarded to Prof. Heckroodt for his paper, published in the October 1991 issue of the *Journal*, entitled, 'Clay and clay materials in South Africa'.



Mr Beck presenting a silver medal to Dr M.D. Adams



Mr D.J. Adams and Dr R.G. Görtunca, recipients of silver medals



Mr J.S. Kuijpers receiving a certificate and Dr J.A.L. Napier a silver medal from Mr Beck



Mr L. Esterhuizen (University of Pretoria) receiving his prize for his dissertation from Mr Beck

PRESENTATION OF STUDENT PRIZES

Prizes were awarded to the following students for the best student dissertations in part fulfilment of the B.Sc. Eng. degree.

- Mining:**
- L. Esterhuysen, University of Pretoria, for 'Sequential grid mining on Elandsrand gold mine'.
 - A. Poroulis, University of the Witwatersrand, for 'The installation, mechanics and optimization of the vacuum ore lifter at Consolidated Modderfontein Mines'.
- Extractive Metallurgy:**
- J.P. Oosthuizen, Potchefstroom University for Christian Higher Education, for 'Bepaling van 'n reaksie kinetika van Sishenerts in 'n reduserende CO atmosfeer'.
- Metals Technology:**
- A.M. Hayes, University of the Witwatersrand, for 'Double torsion testing of a soda lime silicate glass in PMMA'.



Mr J.P. Oosthuizen (PU for CHE) receiving his prize for his dissertation for Mr Beck

ANNUAL REPORT AND ACCOUNTS

The President presented the Annual report, highlighting a few events that he regarded as especially significant.

Mr Cruise then presented a summary of the financial status of the Institute.

This was followed by the adoption of the Annual Report and Accounts as given on pages 248 to 251 of this issue.

OFFICE BEARERS AND MEMBERS OF COUNCIL FOR 1991/92

President: I have pleasure in announcing that, in accordance with Clauses 3.2 and 3.3 of the Constitution, the retiring Council has elected the following Office Bearers for the ensuing year.

President:	Mr J.P. Hoffman
President Elect:	Dr H. Scott-Russell
Senior Vice President:	Mr J.A. Cruise
Junior Vice President:	Mr D.A. Ross-Watt
Immediate Past President:	Mr R.D. Beck
Honorary Treasurer:	Mr J.A. Cruise

In terms of the election of ordinary members of Council, there is a letter from the scrutineers stating, 'We have to report that we inspected the nomination papers for members of Council for the 1992/93 session and have found that the ballot papers sent out to Corporate Members of the Institute were in order. There was a return of 583 papers representing a return of 33,8 per cent. There were four spoilt papers. As a result of our scrutiny we find that the following members have been elected:

Dr N.A. Barcza, B.R. Broekman, G.A. Brown, P.M. Craven, Prof. R.J. Dippenaar, A.A.B. Douglas, B.R. Fleetwood, P.R. Janisch, R.P. Mohring, K.C. Owen, P.D.K. Robinson, K.A. van Gessel, D.J. van Niekerk, P.M.T. White. In addition, Mr P.J. Knottenbelt and Dr R.V.R. Handfield-Jones were elected unopposed to represent Non-corporate Members of Council.'

In terms of Clause 3.2.8 of the Constitution, the Chairmen of the Branches are as follows:

Johannesburg Branch, Mr G.S. Lee; Pretoria Branch, Professor R.F. Sandenberg; Orange Free State Branch, Mr B.J. Addison; Vaal Triangle Branch, Mr A.M.L. de

Sousa; Eastern Transvaal Branch, Mr M.H. Rogers; Western Cape Branch, Mr J.J. Cilliers; North Western Transvaal Branch, Mr J.B.D. MacLennan.

These Chairmen will also serve on Council.

The following Past Presidents have signified their willingness to serve on Council for the ensuing year:

P.W.J. van Rensburg, Prof. R.P. Plewman, Dr R.E. Robinson, Dr P.R. Jochens, G.Y. Nisbet, Prof. A.N. Brown, H.E. James, Dr H. Wagner, B.C. Alberts, C.E. Fivaz, Dr O.K.H. Steffen, H.J. Mosenthal.

I thank our Past Presidents for their continued support. I congratulate all those elected and thank all those who have agreed to serve another term of office.

INDUCTION OF PRESIDENT

President: It is now my pleasant duty to introduce your new President, Mr Hannes Hoffman.

Mr Johannes Hoffman (known as Hannes or Hoffie) was born in Knights, Germiston, on 9th March, 1933. He obtained a first class matriculation at Voortrekker Hoërskool (Boksburg) in 1950, and joined Amcor in Vereeniging in 1951 as a laboratory assistant. He was later transferred to Kookfontein where, with one other assistant, he was the first to work in the quality-control laboratory. In October 1952, he joined Vecor as a junior metallurgist and worked in the metallurgical laboratories and foundry.

In March 1953, Hannes was appointed as one of the first group of technical cadets at Iscor. The next four years were spent working in the metallurgical section of Iscor's blast furnaces, coke ovens, and steelplant. During that time (in 1956), through extramural studies, he obtained a B.Sc. degree (*cum laude*), majoring in chemistry and iron and steel technology at the University of Pretoria. At the same time, he passed all the subjects needed for the national diploma in metallurgical technology at the Pretoria Technical College. He was subsequently appointed Production Assistant, Coke Ovens and Byproducts, and, later, Senior Production Assistant, a post he held until 1961, when he left Iscor to become the first lecturer in metallurgy and metallurgical engineering at Pretoria University's newly founded department of the same name. He later became the first Senior Lecturer in that department.

Through part-time study, he obtained the degrees of B.Sc. (Hons.) in 1961, M.Sc. (Metallurgy) in 1968, and M.B.A. in 1972—all at the University of Pretoria. During his years at university, he enrolled for a number of engineering subjects in metallurgical engineering and economic geology to broaden his base in engineering and geology.

In December 1973, Hannes left the academic world to become Smelter Metallurgist with O'okiep Copper Company in Nababeep. In October 1974, he joined Southern Cross Steel as Head of Metallurgy, with the function of quality control and product development. The main purpose was the development of a cheap corrosion-resisting steel for the mining and sugar industries. In 1977, 3CR12 was born, and Hannes and his team played a leading part in its development. From 1981 to 1988, as Manager, Materials Science, he initiated research into a number of chromium-containing alloys. He is now Manager, New Process Development, with Columbus Joint

Venture (formerly Middelburg Steel & Alloys), and is responsible for research into the development of new stainless-steel making processes and iron and steel pyrometallurgical processes in general.

At one stage in his career, he was Chairman of the Technical Subcommittee of the Ferro Alloy Producers' Association, a member of the Char Committee, and a member of the Council of the Technical College of Middelburg. He is a member of the Iron and Steel Society of America and has been a Fellow of The South African Institute of Mining and Metallurgy since 1968. He is registered as a Professional Engineer.

Several papers and publications have appeared under his name as author and co-author.

Hannes has tried his hand (and foot) at many kinds of sport, including rugby, tennis, wrestling, weightlifting, athletics, fencing, mountain hiking, and combat shooting. However, he never excelled in any sport. Recently, he tried his hand at bowling. He is also a keen swimmer and swims for exercise.

Hannes is married to Hanneke, who holds a B.A. degree in anthropology and communications, and they have been married for 32 years. They have 3 sons: Paul (M.Com.), married with two children; Jan (B.Sc. Chem.Eng.), married; and Chris (B.Com.). Hannes enjoys being a grandfather.

His hobbies include bird watching—he is a 'twitcher'—philately, reading, palaeontology, and mineralogy, and he is a lover of good wine.

I wish him and Hanneke a most successful year, and hope they enjoy it as much as my wife and I have.

Incoming President: Thank you for that introduction. It is a great honour for me to lead this Institute as President for the 92/93 year of this Institute.

Richard, you have led us confidently and wisely during your year in office. A number of issues progressed very well, and I think you would like to see them finalized during this coming year. Also, in a supporting role is a very competent group of Office Bearers, and it gives me great pleasure to welcome Don Ross-Watt as Junior Vice President and to invite him to join us on the rostrum.



Mr J.P. Hoffman receiving the President's plaque from Mr R.D. Beck

APPOINTMENT OF AUDITORS AND HONORARY LEGAL ADVISERS

Incoming President: I propose that Messrs Aiken & Peat be re-appointed as auditors for the coming year, and that Messrs Van Hulsteyn, Duthie & Saner be re-appointed as Honorary Legal Advisors. *Agreed.*

GENERAL

The Incoming President invited those present to ask any questions or make any comments about matters requiring clarification. None being forthcoming, he read something that he had happened to pick up from a very old publication, too late to present in the form of a slide with his Address.

'The Transvaal is rich in minerals, which, as the country develops, will require the aid of science to extract and render marketable their valuable contents. Much labour, disappointment and financial disaster may be avoided if members of a scientific community like ours prove they are capable and willing to offer sound practical advice to financiers who would be willing to act on it and who are disposed to embark their fortunes on new ventures.'

This was said by Mr William Bethal in May 1894 during his inaugural address as the first President of the Chemical and Metallurgical Society—the forerunner of our Institute. I think that is still relevant and applicable even today.

PRESIDENTIAL ADDRESS

The President Elect took the Chair and Mr Hoffman delivered his Presidential Address entitled 'Oxygen-coal in-bath smelting reduction—a future process for the production of iron and stainless steel?', which is reproduced on pages 249 to 273 of this issue.

President Elect: It is a great honour for me to be the first person to congratulate the President on a very informative and interesting talk. To pay full justice to your address, I invite Professor Hans van Vuuren to propose a vote of thanks.

Prof. Van Vuuren: Hannes, ek wil wegspring met 'n faks wat ons gekry het van Ben Alberts: 'Ek wil graag verskoning aanteken dat ek nie vanjaar se vergadering kan bywoon nie. Ek wil jou graag sterkte toewens met jou Presidentsrede en verder ook baie sterkte vir jou Presidentsjaar. Dieselfde geld ook vir jou vrou. Ek sal dit waardeer as jy my verskoning wil aanteken.' Ben was self 'n vorige President.

Deur die jare het ons aanvaar dat die Presidentsrede van die Instituut 'n gebeurtenis van betekenis is. Vanjaar was geen teleurstelling, en baie geluk Hannes vir 'n puik stuk werk. Die ledetal van die Instituut is oorwegend mynbou gerig en so ook dan die Raad, met die gevolg dus dat dit selde gebeur dat 'n metallurg as President optree; daarom nog 'n gelukwensing aan Hannes as 'n metallurg.

Die voordrag self was goed opgestel met gesonde en genoeg teorie om die afleidings 'n wetenskaplike basis te gee sonder om die leser/toehoorder totaal in fisiese formules te verstrengel. Ek het die hele stuk baie goed deurgewerk en ek kan u verseker dat in die verkorte weergawe wat Hannes vir u aangebied het, het hy feitlik al

die teorie wat formulegewys uitgestip is, weggelaat, maar dit is so beskikbaar en sal so gepubliseer word. Tog bied dit 'n oorsig en 'n toekoms vooruitskouing wat self deur 'n akademiese student benut kan word, en ook is dit so interessant geskryf en van tydige belang in ons omstandighede, dat buitestaanders dit net daarvoor selfs kan lees. Dit is 'n werk van besondere belang sowel as van algemene belang. Voorwaar 'n sukses. Interessant om te noem dat 'n aantal van die geleerde verwysings uit ons eie *Joernaal* kom en dit spreek ook al van self.

Die staalbedryf het oor die laaste twintig jaar drasties verander wat produktiwiteit en produkkwaliteit betref. Produktiwiteitgewys kan genoem word dat opbrengs vanaf 73 persent in die vroeë sewentigs tot byna 88 persent in 1991 gestyg het—byna 'n 20 persent verbetering. Staalproduksie oor dieselfde periode het met soveel as 'n half persent per jaar gestyg. As ons die twee faktore saam beskou dan sien ons dat hoewel staalproduksievolume nie baie gestyg het nie, het die eindproduk 'n baie goeie groei gewys. As ons verder in ag neem dat die eindprodukte deurgaans ligter is met 'n faktor van sowat 30 persent en 'n langer lewensduur het met 'n faktor van 200 persent, dan kom die relatiewe potensiaal as 'n waarde element regtig na vore. Hoe was dit moontlik om sulke fenomenale verbeteringe te behaal en nogtans prysmededingend te bly?

The answer lies in the various breakthroughs achieved and fully implemented in steelmaking technology over the same period. In his Address, Mr Hoffman gives a lucid overview of some of the major technological improvements achieved in iron- and steel-making technology. He skilfully leads the reader through the innovations, following a specific technological thread: the move from very indirect roots to direct steelmaking technologies. He traces the slow evolution from traditional coke ovens, blast furnaces, open-hearth, conventional inlet casting to the latest technological trials aimed at direct steelmaking from ore fines and non-coking coal. This is an ideal that has been foremost in the thoughts of every commercial steelmaker in the world. Imagine what we traditionally do. We use the iron ore, break it up, then screen out the best fractions, and discard the fines or beneficiate this at high cost. The ore contains a fair amount of oxygen in the form of oxides. We now use expensive coking coal to form coke to get the oxygen out by putting carbon in, in the stage called reduction, to give us the liquid iron. Then we use oxygen to blow out the same carbon that we put in, to give us liquid steel. Surely, the ideal would be to use the iron ore, all fractions, as this is the cheap way to do it, with a cheap non-coking coal, and produce steel directly. The theory is brilliant, innovative, and presents a short non-polluting solution. Sounds ideal. But it is not so easy. You can hear the devil laughing.

Mr Hoffman looks at the various processes that are under development at present, compares the kinetic, thermodynamic, and commercial factors, and deduces a most probable scenario. Along the way, practical

considerations and limitations deduced by the shortfall of certain peripheral technologies, most important of them refractories, are noted and commented on, showing a close realization of the importance that acceptable practice has on theoretical applications. You remember, theory—practice, hand-in-hand. He comes to the conclusion that directly produced steel from iron ore and coal is possible. Commercialization of the process is still some 5 to 10 years in the distance. This even more so in the case of stainless steel.

Then he takes this big step forward; can this technology be applied in the RSA context to give us a competitive edge? More so, can it be used to produce stainless steel directly from chromide ores? In this regard, it is most noteworthy that Mr Hoffman was himself closely associated with the application of the Krupp rotary-type kiln, the CODIR process of MS&A (Middelburg Steel & Alloys) to produce directly reduced chromium from chromite fines. This was an excellent learning experience for the final production of stainless steel direct from chromite ore, and he *has* heard the devil laugh. He draws some interesting conclusions. It is indeed possible to produce stainless steel direct from ore and coal. He highlights specific areas that need further study to bring this possibility to commercial success, pinpointing some interesting areas for further academic work and developmental research.

I am happy to see so many academics here. The rising impact of environmental dictates is fully realized and specific areas of possible high effect are nominated for further study. You will no doubt have taken note that a Green Party has just been formed and started in South Africa. Mr Hoffman specifically points out that technology holds the possibility of meaningfully exploiting RSA resources to establish a competitive advantage in producing stainless steel on an international scale.

Last thing, the unique position of the RSA (to wit, chromite ore in plentiful amounts and cheap coal, although we lack coking coal) will probably define that the first breakthrough, like the Corex process, will occur in stainless steel in South Africa.

I found the paper timeous, stimulating, factual, and most interesting. Thank you for adding a most meaningful piece of work to our Institute's library.

Baie geluk—ook aan Hanneke. Ek weet nie of sy besef wat vir haar voorlê vir die jaar nie, maar sy het seker net so hard gewerk gedurende hierdie periode as jy om hierdie ding voor te berei, en geluk ook aan u seuns. Baie geluk, Hannes.

CLOSURE

President Elect: Thank you very much Professor van Vuuren. I now declare this meeting closed, and ask you to join the Office Bearers and Council for refreshments.

At the cocktail party



Mrs P. van der Vyver, Mr J. van der Vyver, and Mrs H. Hoffman



Mr A.M.L. de Sousa (acting Chairman, Vaal Triangle Branch), and Miss Caroline Jansen (Membership Secretary, SAIMM)



Dr H. Scott-Russell, Mr R. Barnes, Mrs D. Fleetwood, and Mr B.R. Fleetwood



Mr A.M.P. Henderson, Mr D. Smit, and J. Tarboton



Dr P.J.D. Lloyd, Dr H. Wagner, Prof. R.P. Plewman, and Ms J. Knox



Prof. S.W. Vorster (PU for CHE) and Mr J.P. Oosthuizen