

## FSPE Award: Dr F.G. Hill

The FSPE Award for Services to the Engineering Profession was awarded to Dr Francis George Hill at a ceremony held in January of this year by the Federation of Societies of Professional Engineers.

The following is an abridged version of the citation made by Professor A.N. Brown, President of FSPE, and of Dr Hill's reply.

### Achievements

It is indeed fitting that such a distinguished group of people have gathered on this special occasion to honour and pay tribute to Dr Pinky Hill.

He is an octogenerian who, since he retired almost 20 years ago, has remained active as a mining consultant. Behind him lies a career of distinction and of achievement. One has no difficulty in ranking him with the most distinguished mining engineers who have ever been engaged in the South African mining industry. This is a great accolade when one considers the stature of the South African mining industry and the vital and dominant role it plays in the economy and welfare of the country.

As a consequence of his illustrious career, Dr Hill has been singled out to receive the FSPE award for services as an engineer, mainly, but also as a scientist, researcher, innovator, manager, and leader of men.

But neither his achievements as an engineer nor his passion for scientific research obscure his humaneness and concern for the advancement of men's welfare. Concern for his fellow man lay at the heart of his research efforts relating to the problems of rockbursts, problems of heat and humidity, and of the dust that results in pneumoconiosis. Another problem area was the traditional dictatorial and conservative management style within the mining industry. The introduction of the principles of scientific personnel management has greatly improved the lot of people engaged in the industry. His contribution to the engineering profession and the country has been immense and immeasurable.

Dr Hill's value as a leader is evident from his career in the industry and his long association with Wits Univer-

sity, especially while serving as Chairman of Council. Through many difficult and trying periods of great stress, his calmness, unruffled demeanour, and understanding attitude were especially important. In his dealings with men, his behaviour has always been characterized by dignity, tact, charm, and courtesy.

It would be remiss not to mention the stalwart and whole-hearted support of his dear wife Dora, a gracious lady, whose contribution to his career cannot easily be estimated.

### Education

Francis George Hill was born in 1905 at Kroonstad, where he attended the local government school, and he then proceeded to Kingswood College, Grahamstown. In 1923, the year after the foundation of Wits University, he enrolled as a student in its 'mother' faculty of Mining Engineering. From then on, he had a meritorious academic career. On the strength of his first-year results, he was elected a Hennen Jennings Scholar. On completion of his studies at Wits, he was awarded the Chamber of Mines Research Scholarship and Gold Medal. His academic prowess and sporting ability resulted in his being awarded a Rhodes Scholarship, the first mining engineer to win that coveted award. It enabled him to read for the BCL degree in jurisprudence at Oxford. He then travelled in Europe and America, studying industrial psychology and scientific management. In 1932 he returned to South Africa to continue his mining career.

### Professional Career

Dr Hill's professional career, from 1932 until his retirement in 1969, spanned nearly forty years of conspicuous service, during which he attained the highest positions in his chosen profession. His whole career was spent with the Rand Mines Group.

His first senior appointment was in 1935 as Sectional Manager at New Modderfontein Gold Mine. From 1938 he spent 2 years in the Head Office as assistant to the consulting engineers, one of whom was Brigadier Stokes.



Prof. A.N. Brown (left) and Dr F.G. 'Pinky' Hill

For the 5-year duration of the Second World War, he was a Sectional Manager at ERPM. Then he was the General Manager of Durban Roodepoort Deep Gold Mine for two years before returning to the Head office.

For 11 years, from 1947 to 1958, Dr Hill served as a consulting engineer for the Rand Mines Group, and for the next 6 years he was their Chief Consulting Engineer. He was then elevated to the position of Manager—Technical Services. For the last three years before retirement, he was the Technical Adviser to Rand Mines Ltd. Since retiring, he has maintained his scientific interest in mining-engineering problems by practising as a private consultant. He has become an acknowledged authority on the surface subsidence of strata overlying shallow mined-out areas. Since 1983 he has also served as the Mining Adviser to the Government of Bophuthatswana.

### **Fields of Interest**

Dr Hill had many interests. From his early exposure at ERPM as a Sectional Manager, it became apparent that two of the most intractable problems facing mines in the Rand Mines Group, and ERPM in particular, were those of high rock stress and heat. Another of his special interests was the problem of dust control and pneumoconiosis.

#### *High Rock Stress*

From 1943 onwards, detailed records were kept at ERPM of rockbursts and other manifestations of high rock stress. Many changes were effected in mining practice and technique as the result of the knowledge gained.

In 1950, it seemed that research work by engineers alone was meeting with diminishing returns, and it was decided to engage scientists from the CSIR to assist the ERPM staff. Thereafter, an increasing amount of time and effort were devoted to rock mechanics by the staff of the CSIR, the Chamber of Mines (where a rock mechanics unit was started), Wits University, the BPI, and various mining groups. South African today enjoys a high reputation for having developed sophisticated equipment and techniques for dealing with problems of rock stress.

Mention should also be made of the electrical analogue, a concept once widely employed by deep-level mines when designing mining programmes (now done by computers) and seismic networks on several large mines for recording seismic events and releases of energy. Dr Hill's contribution to these initiatives was considerable.

#### *Heat*

Mining at great depth brings with it the disability of hot, humid working conditions. At ERPM, large-scale investigations were started and changes in practice improved the working environments considerably.

Despite large sums of money spent on ventilation and refrigeration, conditions in many deep mines were such that the acclimitizing of men had still to be done on a large scale. In 1952, Dr G.H. Wyndham was engaged by Rand Mines to study the question in detail. This work led to the establishment of the Human Sciences Laboratory of the Chamber of Mines—a laboratory that has gained an international reputation.

#### *Pneumoconiosis*

The pneumoconiosis-induced disability among gold miners was such that reducing the rate has been an ongoing challenge to mining engineers. Dr Hill's interest was exemplified by the fact that he was Chairman of the Government's Pneumoconiosis Research Unit for many years, and by his writings on the subject.

#### *General*

Dr Hill was responsible for the establishment of the Corner House Laboratories at Richmond, where much successful work was done on ventilation and dust control.

While he was Manager of Durban Roodepoort Deep Mine, he addressed the problem of shaft-pillar extraction. At no. 6 shaft, the pillar was successfully extracted at the beginning of the shaft's life—the first time that it has ever been done. The practice was repeated under his guidance at the Harmony Ventilation Shaft in the OFS Goldfields.

Dr Hill always displayed a keen interest in scientific and personnel management and was instrumental in introducing personnel departments on the mines in his Group. During his years at Wits, he played a leading role in the establishment of the Wits Business School, which continues to grow in stature.

With a fellow pioneer, Dr William Bleloch, he ultimately persuaded Rand Mines, after many years of frustration, to institute the development of a ferrochromium industry. Under their leadership, Rand Mines became the first company to produce ferrochromium from chemical-grade chromium ore. They prepared the way for the production of stainless steel in this country.

### **Professional and Educational Bodies**

Dr Hill's contribution to the mineral industry and the community in general can be gauged from his prodigious involvement in professional, technical, scientific, and educational bodies. It was here that his qualities of leadership and ability to work with people were outstanding characteristics. He is an Honorary Life Fellow of The South African Institute of Mining and Metallurgy and was President of that Institute in 1948/49. He is a Member of The Institution of Mining and Metallurgy, London. He served on the Council of the Associated Scientific and Technical Societies for many years and was President in 1953/54. He is an Honorary Life Fellow of the South African Institute of Personnel Management and was President of the Institute in 1959. He has also been a Member of the South African Association for the Advancement of Science for many years, and is a Member of the Institute of Mechanical Engineers and of the Engineers' Association of South Africa.

Dr Hill served on the Prime Minister's Scientific Advisory Council for 10 years and on the CSIR for 17 years. He was a Board Member of the Pneumoconiosis Research Unit and was also its Chairman. He has had a long association with the University of the Witwatersrand, having been elected to the University Council in 1944 and serving on that body for 42 years. He was Chairman of Council for 6 years and was also Chairman of the important Finance Committee. During that time, Dr Hill was Chairman of the Bernard Price Institute for Geophysical Research and also of the University's Research Committee. In addition, he served as Chairman of the Nuclear Physics Research Unit.

## Publications

During his career, Dr Hill was involved with more than one hundred scientific papers, addresses, and contributions to papers to both local and overseas societies, institutes, and congresses.

From his wide field of interest, his publications dealt mainly with the problems of rockbursts and strata control in deep mines, ventilation of deep mine workings, mining methods, dust sampling, dust control in preventing pneumoconiosis, personnel management, management in industry, productivity in the gold-mining industry, scientific and technical communication, deep-level mining practice, the exploitation of ultra-deep gold deposits and, latterly, the stability of strata overlying mined-out areas.

## Honours Received

During his distinguished career, many honours were conferred on Dr Hill. The South African Institute of Mining and Metallurgy awarded him its Gold Medal on two occasions, first for a paper dealing with ventilation in deep-level mining and, secondly, for a paper dealing with the approach and analysis of the rockburst problem in deep mines. The Institution of Mining and Metallurgy, London, awarded Dr Hill its Gold Medal in 1963—'In recognition of his contribution to underground research', thus recognizing the value of his work over many years. The South African Institute of Personnel Management conferred Honorary Life Fellowship on him for his services, as did The South African Institute of Mining and Metallurgy in recognition of his outstanding services. Later, the latter institute selected Dr Hill to receive its premier award, The Brigadier Stokes Memorial Award, for the highest achievement and contribution by an individual in the field of mining and metallurgy in South Africa. The University of Port Elizabeth conferred the degree of Ph.D. (*Honoris Causa*) on Dr Hill in recognition of his contribution to the advancement of science in South Africa. In 1978, the University of the Witwatersrand conferred the honorary degree of Doctor of Laws in public acknowledgement of its regard for him and in recognition of his long, dedicated, and exceptionally meritorious service.

## Dr Hill's Reply

I thank the Society for the signal honour conferred on me today—an honour that I appreciate greatly—and the President for his far too flattering references to my career. In regard to the latter, I could not help reflecting on the fact that, had I been born three months later, I would not have become a mining engineer, and I would not be standing here today to receive this award—and this for the following reasons.

## Mining Career or Not

During the 1914–1918 War I was an avid follower of naval battles; I was given a copy of 'Britain's Fighting Ships', and whenever a destroyer, cruiser, or other naval vessel was sunk, I would sadly cross it out. I had indeed become so thrilled by stories of naval battles that, not long after the end of the war, I persuaded by parents to send in my name to Dartmouth Naval College for enrolment as a cadet. I was distressed by the reply—the upper

age for enrolment was thirteen years and nine months—and I had just turned fourteen.

The years went by and, just before I matriculated, my sister, who was studying in London, got engaged to a mining engineer from Camborne School of Mines, who said he might be emigrating to South Africa to work at Pilgrims Rest. So out of interest, I read a book dealing with prospecting and mining ventures in that part of the world, and thought 'That is a fine open-air life, panning for gold in the streams and riding to open-cast workings on horse-back'. So, having matriculated, I enrolled at Wits as a mining student; at the end of the first year, I worked in the SAR workshop at Kroonstad—my hometown—and at the end of my second year went to work at the Robinson Deep Mine, which was then 7000–8000 feet deep.

My first job as a learner was in the sampling department. When I told my instructor that I was a mining student at Wits, he said 'You must have your head read; go to Springkell Sanatorium and see ex-miners suffering from miners' phthisis and you will soon change your mind'. So, late that afternoon—down in the dumps—I went and sat on a mine-dump and considered my future and decided not to change—a decision I have never regretted because a mining engineer's life can be interesting, challenging, and rewarding—and at times full of drama.

## Mining Problems

There is not time, and it would be out of place, to describe the role of the mining engineer in South Africa, and I propose to give only a short account of some of the problems that came my way.

My first five years at the New Modder Mine passed smoothly; from there I went to ERPM as a Sectional Manager and was shaken by the tough underground conditions—heat and rockbursts.

Before telling you of the way in which these hazards were tackled, I must tell you of an amusing incident that befell my wife and myself. We had taken our son to the local hospital for treatment. The receptionist put my name on a card and asked me what I did on the mine. I told her that I was a Sectional Manager. When we handed the card to the doctor, he started laughing and said, 'You will be interested to hear that you are recorded as a sexual manager, and, strangely enough, only a week later *The Sunday Times*, reporting on a visit of a group of tourists to the reduction works at the mine, said that the party had been shown around by the seduction officer.

To turn first to the problem of pressure bursts. To illustrate how these were eased, we may consider the changes that took place at the Hercules Section of the mine during the years 1940–1943. The main change was from 'block' stoping to 'longwall' stoping: block stoping resulted from dividing the reef body into blocks by raises and dives and stoping each block individually—a process that led to the formation of remnants of unmined ground, which were the main sources of rockbursts; longwall stoping eliminated the formation of remnants, and this led to dramatic improvements in working conditions and efficiencies, among them the elimination of heat-stroke collapses.

An additional reason for the elimination of heat stroke cases was the testing procedure developed by Dr C.H. Wyndham. These tests showed whether or not an individual was heat-tolerant; if not, he was debarred from working in hot areas of the mine.

### *The Drama of Mining*

It was mentioned earlier that mining could produce drama; only one example will be given. While I was at ERPM, a fire broke out in the stopes on the western side of the mine; it arose near a sub-incline shaft, and the depth was about 6000 feet. A fire-fighting office was established at the top of the shaft. The whole area was ventilated by a large fan situated at the foot of a nearby vertical shaft. Tackling the fire were Proto teams on each level; while these efforts were being made, the main ventilating fan cut out, and the downcast current reversed and smoke started pouring into the incline shaft. Fortunately, an electrician realized what had happened, raced along the haulage, and restarted the nearby fan; the current was reversed, the smoke and gas cleared, and the danger of gassing the workers at the top of the incline shaft had passed.

An amusing incident occurred shortly after the fire broke out. The eastern flank of the fire area was being patrolled by two men carrying a canary in a cage—to detect the presence or otherwise of carbon monoxide. One of the men obviously did not know why they were carrying the canary because, when it dropped off its perch, he said, 'Say mate, they've given us a sick canary'.

### *Human Problems*

However, it is not only technical problems that spice a mining engineer's life—human problems too come his way. One example only will be quoted. When I became General Manager of the Durban Deep Mine, I was distressed to find that the annual labour turnover among the White underground personnel was about 75 per cent.

There was no such person as a personnel officer to report and advise on this problem, but where to find a man with the requisite training and human qualities? We found a man whom we thought had the qualities (he is with us today), sent him on a Personnel Management course to Rhodes University, and on his return established a Personnel Department—I believe the first on a gold mine on the Reef.

The White labour turnover problem was then studied in earnest; everyone who resigned or was dismissed was interviewed before leaving by the Chief Personnel Officer. At the end of each month, the reasons for people leaving were debated, requisite changes were made, and within two years the turnover rate had halved. Other advantages followed: whereas previously would-be new employees were interviewed by the heads-of-departments concerned, this was now done in conjunction with the Personnel Officer, but only after the vacant position had been well-advertised. Another function of the Personnel Officer developed as the personnel office became better known and accepted; employees with personal problems began to discuss these with the Personnel Officer, who could be relied upon to give the employee wise counsel.

### *Mining Research*

Time does not permit me to say much more. When appointed to Rand Mines as a Consulting Engineer, I became a member of the Technical Advisory Committee of the Chamber of Mines. Some of us felt that the research programme of the Chamber was inadequate, and persuaded the Controlling Committee to invite Brigadier Schonland, an international figure in research, to recommend on how best to augment the industry's research programme, i.e. on an industry basis, as distinct from the research work being done by individual mines. He recommended the formation of a Research Advisory Committee and the appointment of a Director of Research. These recommendations were accepted, and from then onwards research at Chamber level went from strength to strength.