Graduation Address at Wits University by Rodney Jones, 31 March 2017

Congratulations

Good morning to all of you – to the Acting Vice-Chancellor, the academic body, the graduating students, and the families and friends who are here to support you.

Congratulations to all of you who graduate today. This is a wonderful accomplishment, and I would like to acknowledge your hard work and the sacrifices made. I would also like to congratulate and acknowledge your families and communities that have enabled you to be here. You and they have made a very important investment in your future. Take time to enjoy your moment of celebration today.

Education

Nelson Mandela said that 'Education is the most powerful weapon which you can use to change the world'.
The Universal Declaration of Human Rights of 1948 says that 'Everyone has the right to education'.
It is remarkable that annual spending on education around the world exceeds five trillion US dollars, yet there are still around 800 million people who are unable to read or write. This is quite a challenge to overcome.

Many of you are engineers, as I am. As a young child in primary school, I can remember being asked what I wanted to be when I grew up, and I answered "an engineer". I have to admit that, at the time, I thought this was the person who rode behind train engines, and that sounded like fun to me. I clearly needed to learn more of what engineering was about, and there began an ongoing process of learning. I studied chemical engineering at Wits (finishing my first degree almost 35 years ago), and later specialised in pyrometallurgy, as my bursary placed me in the Pyrometallurgy Division at Mintek – a research organization based in Randburg. There I was able to indulge my passion for computer simulation (in an era when personal computers were still very rare) to develop software that was the first of its kind for modelling pyrometallurgical processes and was later used in 22 countries around the world.

My university final-year design project involved the design of equipment for the production of a chloro-fluorocarbon (CFC) refrigerant that was seen at the time as a safe, harmless substance – a marked improvement from the harmful gases that were previously used and that had killed numerous people. Only a few years later, it was seen as responsible for the destruction of part of the ozone layer that protects our world. Once again, the need for continuous learning became clear to me. At this point, I would like to relay a rather sad story told

by Bill Bryson, in his enlightening and otherwise entertaining book, *A Short History of Nearly Everything*. He tells the story of a hapless Ohio inventor called Thomas Midgely, Junior, who set out to create a gas that was stable, non-flammable, non-corrosive, and safe to breathe. The CFCs he invented went into rapid production in the 1930s and were used in numerous applications, from air-conditioners to deodorant sprays. It took half a century before it was noticed that these long-lived CFCs were destroying ozone at a prodigious rate, and they were subsequently banned. This same inventor had also earlier in the 1920s invented tetraethyl lead, an inexpensive compound that was effective at stopping car engines from knocking. Unfortunately, the widespread use of lead (a known neurotoxin) as a gasoline additive led to the death of numerous workers and to damaging the health of countless other people, despite the denials of harmfulness from the producers. What an unfortunate legacy! One of Midgely's other inventions led directly to his own death in 1944, when he was strangled in the cord of a device he had created for turning him and lifting him in bed (as he was disabled by polio).

Fortunately, there has also been some real positive technical progress in many other aspects of engineering. Continuous learning is imperative in order to keep up with it.

The world is changing, and you have to keep up

Konrad Lorenz said "Philosophers are people who know less and less about more and more, until they know nothing about everything. Scientists are people who know more and more about less and less, until they know everything about nothing." I would argue that, as an engineer, you should make it your business to learn as much as you can about as much as you can. You will need to learn a wide range of skills in order to manage the rapid changes that you will face in your lives.

The advent of the Internet, the World Wide Web, and search engines such as Google has made it easy to find information on almost any topic. This would have been almost unimaginable as little as twenty years ago. In your lifetimes, we have seen the mass popularization of the World Wide Web, which is arguably one of the world's greatest inventions since the wheel. It is hard to believe that it was only twenty years ago (in 1997) that the registration of the google.com domain name took place. That year was also when e-mail volume overtook postal mail volume. You can be sure that your working careers will look very different from those of the previous generation. In ten or twenty years from now, you will be surprised by how much has changed in your own working life.

Professional societies

I think you can tell by now that I care strongly about continuous education throughout one's life. When you register as a professional engineer, which I encourage you to do, one of the requirements is continuing professional development. An effective way of supporting the growth of competence and skill in your daily work (i.e., professionalism) is by joining a professional society. In my field, the appropriate society is the Southern African Institute of Mining and Metallurgy. Other disciplines of science and engineering have similar societies or voluntary associations.

The origins of the SAIMM can be traced back to a meeting of fourteen chemists and metallurgists that took place around this time of year about one hundred and twenty years ago, on 24 March 1894, at the North-Western Hotel, 21 Pritchard Street, Johannesburg. Among the past presidents of SAIMM are William Cullen (1905) and Fred Wartenweiler (1921), whose names you will no doubt recognise from the university libraries named after them. They clearly believed in supporting learning. There are also many other past presidents with strong links to Wits University.

Learned societies nowadays exist to promote an academic discipline or profession, and are mostly not-for-profit organizations. They typically hold conferences for the presentation and discussion of new research results, and publish or sponsor academic journals in their discipline.

Scientific publishing of journal papers has been in existence for just over 350 years. The world's oldest and longest-running scientific journal, the Philosophical Transactions of the Royal Society, was first published in March 1665, in London. The motto of the Royal Society is '*Nullius in verba*' – Latin for 'take nobody's word for it'. Currently, more than 2 million scientific journal papers are published annually, worldwide.

Ethics

Apart from supporting continuing education through journals and conferences, one of the characteristic features of a professional society is that its members are governed by a code of professional ethics. The term 'ethics' is derived from the Greek word ethos, meaning 'character'.

An often-quoted example in the field of law illustrates how professional ethics might apparently conflict with personal morals. A lawyer's morals may tell him/her that murder is reprehensible and that murderers should be punished, but professional ethics require a lawyer to defend a client to the best of his/her abilities, even if the client is guilty. There are good reasons for this ethical requirement, as it helps to build a fair society.

The author G.K. Chesterton explained that ‘The word “good” has many meanings. For example, if a man were to shoot his grandmother at a range of five hundred yards, I should call him a good shot, but not necessarily a good man.’

In South African society in 2017, we are acutely aware of the prevalence of dishonesty and corrupt business dealings around us. The need for integrity in business and politics has never been greater. However, it needs to be said that our country is much better off overall than it was when I was a student in the 1970s and 1980s. Freedom of speech, movement, and association are not to be taken for granted. We all need to work towards a more just society where we care for people and not only about our own careers.

From the examples mentioned earlier, we can see that the socio-economic, health, and environmental aspects of engineering work are sometimes even more important than the technical advances. According to Aristotle, ‘Educating the mind without educating the heart is no education at all.’

In essence, the code of professional conduct requires people to avoid fraudulent or dishonest practices, not to conceal unethical acts, and to avoid working with others who behave unprofessionally. A professional should work to the highest possible standards, stay up-to-date with their field, and should undertake only work that he or she is trained for. Conflicts of interest should be avoided, and financial dealings should be open and fair, with no bribery. Honesty, and confidentiality of proprietary information are expected.

A useful guideline is to ‘Live so that when your children think of fairness and integrity, they think of you’, according to H. Jackson Brown, Jr.

Last year, I was fortunate enough to hear Bill Gates give the Annual Nelson Mandela Lecture, in Mamelodi, where he spoke about the philanthropic work being undertaken by the Bill and Melinda Gates Foundation. In another talk at Harvard University in 2007, he said that he had one big regret from his time at university. "I left Harvard with no real awareness of the awful inequities in the world, the appalling disparities of health and wealth, and opportunity, that condemn millions of people to lives of despair."

You are graduating at a time of great difficulty in the world and in our country – a time of economic hardship and high unemployment. The challenge to your generation is to work to the best of your abilities to enable a world where we all work towards the welfare, safety, and health of all people, and care for our

environment. Your success is determined not by the wealth you accumulate, or the position you achieve, but by how well you live your life.

Summary
My message to you today can be summed up as "learn continuously, and care about others in our world".

Once again, congratulations to all of you, and I wish you everything of the best as you begin your professional lives.