

# | PAUL CILLIERS |

## TOP THREE AWARDS

- Harry Oppenheimer Fellowship Award, 2006
- Rector's Award for Excellence in Research, Stellenbosch University, 1989
- National Research Foundation, A-rating, 2008

## DEFINING MOMENT

Cilliers discovered complexity theory while working as a senior researcher at the Institute for Maritime Technology in Simon's Town. His decision to move away from engineering and into philosophy was a defining moment in his career.

## WHAT PEOPLE DO NOT KNOW

Besides being a great cook, wine enthusiast, musician, and insatiable reader, he also had a Class V Scientific Diver licence to conduct scientific work as a SCUBA diver.



## UNDERSTANDING THE NATURE OF COMPLEXITY

Paul Cilliers passed away in 2011 leaving behind his family, friends and colleagues, and an impressive body of work on the topic of complexity.

It is hard to grasp his essence without the help of an interview, but the assistance of documents authored by Cilliers (and authored by others about Cilliers) allowed for a picture of him to emerge. His friend and colleague Jan-Hendrik Hofmeyr, also featured in this publication, provided insight for this profile, though Cilliers surely would have scoffed at any effort to reduce his life to a 2 000-word blurb as it goes against the fundamental principles of complexity.

Cilliers was born in Vereeniging in 1956. He was brought up in a household that encouraged critical thinking and social awareness. When he had completed his schooling at the Hoërskool Vryburger in Germiston, Cilliers moved to Stellenbosch to complete a Bachelor's degree in electrical engineering which he obtained in 1980. After two years of compulsory national service in the South African Navy as a senior researcher, he worked at the Institute for Maritime Technology in Simon's Town.

His primary role at the institute was to conduct research on pattern recognition, neural networks and artificial intelligence. He realised that his research involved complex systems and he began thinking about these systems in a philosophical way rather than a technical way.

As Hofmeyr puts it, "he wanted to explore the implications of acknowledging the complexity of the world in which we live". In order to pursue his interest in complexity, Cilliers started studying through the University of South Africa (Unisa) to complete his BA. He then did his Honours in political philosophy (*cum laude*, Stellenbosch University (SU), 1987). This was followed by his MA in philosophy in 1989 and his D Phil in 1994, all from SU. He was strongly influenced by his supervisor Johan Degenaar, the renowned Stellenbosch philosopher, and Mary Hesse, who is now an Emeritus Professor in philosophy of science at Cambridge University. All the while, he

continued working as a research engineer in Simon's Town, travelling the long distance to Stellenbosch for coursework, meetings and research. He was appointed as a lecturer in philosophy at SU in 1994 and became a full Professor within nine years.

Cilliers' dissertation, which became the book *Complexity and Postmodernism: Understanding Complex Systems* (1998), outlined complexity as Cilliers saw it. Hofmeyr was there to see him being "catapulted into the semi-stardom of complexity by his book". Cilliers' contribution towards thought, and especially scientific thought, was recognised with an A-rating the first time he applied to the NRF. "Unlike others who work up from a junior position," Hofmeyr explained, "Cilliers already had an excellent international reputation by the time he went in for his first rating". This recognition highlights Cilliers' significance as a researcher and also the importance of his subject material.

Science often studies systems in a reductionist way. Hofmeyr, who was intimately familiar with Cilliers' philosophy, described this as an isolation of parts. "The first thing you do with a living system is you kill it. You chop it up into bits and you study the bits, which is very important because otherwise you wouldn't know what's inside." However, studying the components of a system often ignores the interaction and relationships between those components. For example, if a disassembled machine is studied in terms of its parts alone, the function and purpose of the machine may be overlooked. In this way, complexity can be thought of in the Aristotelian sense of the whole being greater than the sum of its parts.

However, Hofmeyr was quick to point out that if this is the only way we think of a system, it is a gross simplification. He explained that, in a material sense, every system is the sum of its parts. Also in some sense, the system is larger than the sum of its parts, because once you put something together, the system has 'emergent properties' that you can't explain in terms of the properties of the parts. But the system can also be less than the sum of its parts. "What the system does is it constrains the behaviour of the parts. Your place in a society constrains your behaviour. You don't do all the things you could possibly do because of this constraint."

## THE IMPORTANCE OF COMPLEXITY THINKING

In many ways, complexity avoids description. Cilliers disliked describing his work in a simplified way, because he understood that reducing the notion of complexity to a simplified definition went against the very nature of complexity itself. Instead his reluctant attempts at defining it rather focused on what complexity is not; complex systems do not have linear interactions between components within the system and with other systems. Nonlinear interactions produce emergent properties which cannot be predicted from the properties of the individual components. Emergent properties will also be present in any general attempt to model complex systems, making it difficult to match the properties of the model to the properties of the system. Cilliers' most cited, and in some ways most profound, statement regarding complex systems is this: "A Boeing engine is complicated, but a good mayonnaise is complex".

In many ways, complexity goes against the current scientific paradigm of linear cause and effect. However, Cilliers argued that to acknowledge complexity is not to be anti-scientific. He stated in his book that complexity in systems is rather an "argument against a particular scientific strategy that assumes complexity can be reduced to specific features and then represented in a machine... it is an argument for the appreciation of the nature of complexity, something that can perhaps be 'repeated' in a ma-

chine, should the machine itself be complex enough to cope with the distributed character of complexity".

Cilliers found that being a philosopher was a far more practical contribution to society than being an engineer. He was an excellent lecturer and introduced his students to a wide range of topics ranging from complexity theory to ethics, deconstruction to cultural philosophy. He built the Centre for Studies in Complexity with Hofmeyr, which allowed them to bring together their disparate fields, humanities and science, to create courses that bridged the gap between the fields and introduced complexity to a multitude of disciplines. Cilliers was also part of the Fellowship and Programme Committee of the Stellenbosch Institute for Advanced Study (STIAS) and is remembered for his immense contribution to the development of the Fellows programme.

The contributions by Cilliers and others in his field have allowed for researchers to apply complexity theory in ways that directly help society. For example, Dave Snowden (a Welsh researcher, academic, and consultant) developed a framework that allows those in a leadership or management position to understand complex situations and make decisions that acknowledge the complexity of the organisation or situation that they manage. This framework has been used by companies and governments alike to manage tough situations, engage with the public, and ultimately under-



stand how their decisions may lead to unexpected outcomes. Snowden's acknowledgement of Cilliers' influence on the design of his framework reinforces Cilliers' valuable contribution in philosophy.

It may be hard for scientists to see how philosophy could have a direct benefit to society. However, Hofmeyr is very convincing of its merit. "As I see things now, the greatest contribution from complexity lies not in its technological promise, but in the way in which it is influencing our understanding of the world. We should promote what can be called 'complexity thinking', a style of thinking which is critical of claims based on reductionist thinking, yet at the same time be mindful of its limits." In this way, any attempt that gets us to think harder and reflect on our practices will benefit society, as we, researchers and individuals, will be able to build better selves and better research by being more mindful and more critical thinkers.

Cilliers built his philosophy and arguments with a broad base of evidence in a way that allows his audience to come to conclusions on their own. In an essay he wrote called *On the Importance of a Certain Slowness*, he advocated for change at a speed that allows for reflection. He drew examples from history, technology, literature and philosophy and tied these examples carefully together with threads of inescapable persuasion. His language is direct and his arguments are so well-constructed that they are hard to refute. Not that his 'arguments' are about refuting. He makes no demands. He insists on nothing other than our acknowledgement that slowness has value. He reminds us of how work time and leisure time have been collapsed and how technology has assisted with the collapse. "Reflection involves delay," he wrote, "and in a cult of speed, delay is unacceptable." By giving us a space to reflect on time and slowness, he liberates a part of our perception and enables us to consider an alternative that we did not know was there before.

## DECISIONS SHOULD NOT TRAP

Hofmeyr believes that the most important contribution Cilliers made was unfortunately towards the end of his career and was never fully realised.

Cilliers was influenced by Edgar Morin and used Morin's ideas as the foundation for developing his thoughts around the complexity of ethics, which was taken further by Rika Preiser, Cilliers' PhD student. Hofmeyr described Cilliers' approach to ethics as follows. "Never make a decision in such a way that you can never reverse it. You must always be flexible, and you must never paint yourself into a corner in a way that you can never escape from it again." This is incredibly important to remember in the current turbulent political climate in South Africa. The South African government, and also institutions of higher education, have big decisions to make. Cilliers' would have advised that changes be made in a way that doesn't trap us or bind us to those decisions. Because all systems have emergent properties, changes to a system will always have unintended consequences, outcomes that may not be predicted simply by examining the system in terms of a linear equation. Hofmeyr suspects that Cilliers would have advised us to try to understand the system and make small nudges of change. "See what the effect is. Do experiments that are safe to fail." Hofmeyr laughed and added, "Of course one seldom does that".

Cilliers' interests extended well beyond philosophy and complexity. In reading about him, it became clear that he was a well-rounded person who enjoyed many aspects of life. Cilliers loved his wife, Sandra, and his children, Ilana and Cornel. He also loved music and played the French horn in symphonic and chamber ensembles. He read as much literature as he could and regularly reviewed new novels. He was also an enthusiastic cook and very knowledgeable about wine, which could in part be attributed to his two-year Diploma from the Cape Wine Academy.

Cilliers is still very much alive in the minds and hearts of his colleagues, friends and family. "Once you've gone through Paul Cilliers," said Hofmeyr, "he's there for life. He makes you think differently about things." Hofmeyr still teaches about complexity, and Cilliers' examples and the way he described things are very much a part of the lectures. "He made a big difference in many people's lives. He was a very caring person and a wonderful friend to many." Although Cilliers is no longer with us, there is still the opportunity to meet him on paper and see how he brought complexity to life. Paul Cilliers, your community thanks you.

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A. Academy of Science of South Africa (ASSAf) Publications

C. ASSAf Policymakers' Booklets

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# Legends of South African Science

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