Chancellor, I have the honour to present, for the award of the degree of Doctor of Science in Medicine, honoris causa, Rodney James Douglas.

How do you think about your brain? If you lived in 17th century Europe, it was fashionable to describe the brain in terms of piping and water reticulation, like the water features at Versailles; in the 19th century, you might have used the telephone exchange as the metaphor; in the 20th and 21st we have chosen the computer as our analogy[1], with the brain crunching its way through billions of inputs each second, memory as RAM and the mind as the software.

This is the area of research of Rodney Douglas, UCT BSc Med, MBChB and PhD graduate.

If the brain was like a computer, then, for our 86 billion neurons[2] to function, this human brain computer would need megawatts (like a power station's worth) of power, it would need zettabyte[3] quantities of data (that's about a billion downloaded movies), and would not be able to function if any of the internal hardware (like a transistor, for example) failed.

We can keep on creating fabulous analogies, but what interests Rodney Douglas is that our real brains use hardly any power at all (about 20W – so an ordinary 100W globe could power five brains). Brains are based on only about a gigabyte (that's one movie) of information, lose neurons all the time but still continue to function, can programme themselves and, most of all, have creative intelligence.

Rodney Douglas has been at the forefront of transforming the scientific understanding of the mysteries of brain function. His leanings were obvious early on, when he set up an isolated heart experiment as a school biology project [4], but he rapidly moved from amateur cardiology through UCT's Department of Physiology to the Directorship of the Institute of Neuroinformatics in Zurich, and a radical approach to neuroscience. There he employs doctors, biologists, physicists, mathematicians, computer scientists and engineers, all applying their minds to exploring this intriguing problem.

Douglas' most significant contribution, and the one that he is proudest of [5], is the development of something that he called the "canonical microcircuit [6]. His "canonical microcircuit" suggests that function of great complexity can rest in startling simplicity. Eighteen years later, his theory was experimentally verified in three papers that came out in Nature Neuroscience in 2013.

Not that the research stopped whilst waiting for verification – in that time Douglas published nearly 200 scientific papers, supervised 46 PhD graduates and initiated a number of international workshops, including the Power Point-free CapoCaccia Neuromorphic Engineering Workshop.

In the last 10 years, Douglas and his team in Zurich have challenged the thinking and challenged the science of the field. They work in the brand new disciplines of "computational neuroscience", and "neuromorphic engineering" (something that even a spellchecker doesn't know), they have experimentalists who build brain-like hardware, biologist-engineers who measure neurons down to the last dendrite-width[4] and computational-neuroscientists who take these measurements and reconstruct the neuron in 3D – all with the idea that, if we can move beyond the water pipe, the telephone exchange and the computer, we can glimpse brain function and thus discover how a brain built of neurons actually has real intelligence.[7]

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1. McCrone, J., 1997. *Wild Minds.* New Scientist, **13 December 1997**.
2. Pearn, J. (2014). "Artificial Brains: The quest to build sentient machines." Retrieved 14 November 2014, from http://www.artificialbrains.com.
3. Douglas, R. *Principles of neocortical self-construction*. in *Neuroinformatics 2014*. 2014. Leiden University, Leiden, the Netherlands: INCF
4. Kellaway, L., *Personal Communication,* 10 November 2014
5. Douglas, R., *Personal Communication,* 9 November 2014
6. Douglas, R.J., K.A. Martin, and D. Whitteridge, 1989. *A canonical microcircuit for neocortex.* Neural computation, **1**(4): p. 480-488.
7. Douglas, R. and K.C. Martin, 2011. *What's Black and White About the Grey Matter?* Neuroinformatics, **9**(2-3): p. 167-179.

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