Citation for Professor Jonathan Dorfan, Hon D.Sc. - University of Cape Town
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Jonathan Dorfan.

Anybody who has been even vaguely in touch with developments in Physics over the past forty years will know that far from having come to the end of the road with Einstein's theory of relativity, Heisenberg's uncertainty principle, or even mastering the secret of atomic power, the years since the mid-1960s have seen an astonishing burst of empirical and theoretical work which has taken humanity to depths of understanding previously undreamt of.

How has this come about? After all, way back in the 1950s, when Professor R.W. James, the chrystalographer, was giving his wonderful lectures on light to third year students here at UCT there was not much sense that there were a lot of new things still waiting to be discovered in the world of Physics.

In his book, *The Hunting of the Quark*, Michael Riordan - himself an experimental physicist - explains what happened.....

> "As much as anything else, it was the steady advance of experimental technique, the relentless pressure of technical improvements, that led us to 'discover' quarks. Before theorists could really think about Nature on such a tiny scale, new tools had to be developed to experience things there. One special 'tool' deserves particular attention: the Stanford Linear Accelerator. More than any other, this huge atom smasher was the knife that sliced open the sub-nuclear world and gave us our first real glimpse of quarks." [1]

And this is the world in which Professor Jonathan Dorfan who graduated with a B.Sc. in Physics at UCT in 1969 has been living ever since he left here with his young Cape Town bride, Renee, whom he married when he was 22. [By this time, I may say, he had also been the South African Junior Table Tennis Champion]. With an astonishing nose for where the action in Physics was going to be in his generation - and without even waiting to do an honours degree - he headed straight for California [to the University of California, Irvine] from which base he rapidly linked himself, as a summer Intern, to the great Physics laboratory in the area: The Stanford Linear Accelerator. [SLAC]. By 1976 he was a post-doc Research Associate and by 1978 had become a Staff Scientist at SLAC working under two of the great physicists there: Martin Perl and Burton Richter

It is a remarkable laboratory. Riordan reports that it took five years to negotiate "the proposed accelerator through the thickets and ambushes of Congress" and there was one particularly memorable exchange when the Stanford Project Director was asked **why** he wanted to build such a huge, huge machine (it is two miles long and the cost

[1] Michael Riordan, The Hunting of the Quark: A True Story of Modern Physics, Simon & Schuster, New York, 1987, p.13

estimate then was $114 million). "Senator, he snapped, if I knew the answer to that question, we would not be proposing to build it" ! The politicians must have been duly intimidated for Congress authorised the building of the National Laboratory and by 1967 it began full operation. The first major experiment involved a team of physicists from three collaborating institutions: SLAC; MIT & Caltech [where two of the century's great theoretical physicists Murray Gell-Mann & Richard Feynman were based]. Essentially they started off by firing electrons with very high energy into a liquid hydrogen target and detecting the particles that got scattered in the process. The energy of the electrons fired at SLAC 'allowed scientists to study features far smaller than a proton in diameter.'[2]

This is deep stuff - about 1000 times deeper (or smaller) than the level at which the early Nuclear physicists [e.g.Lord Rutherford @ the Cavendish Laboratory] were working. Far deeper than a mere orator can hope to lead you. So I appealed to the professor of Physics at UCT for help. Luckily David Aschman was in the matric class at SACS the very same year Jonny Dorfan was in the matric class - just behind his brother David also destined to become a professor of physics in the United States - at Rondebosch Boys High [being taught by the great Tickey de Jager]. They have known each other for years and Professor Aschman has come to our rescue with the following beautifully clear explanation as to just what Professor Dorfan has been up to in the world of sub-atomic physics.

> "Jonathan Dorfan has tried to find out what things are made of - he has tried to understand the smallest bits of nature. To do this he has had to develop particle detectors – often huge, sophisticated and expensive, for nature does not yield her secrets easily.
>
> At SLAC he build a detector to study what happens when matter and antimatter annihilate each other at high energy, and found that there were three families of fundamental particles each containing - to use the jargon - quarks and leptons. But no more than three. Why did nature choose three? We do not yet know. But it is crucial to the existence of our universe.
>
> He investigated the details of a particle in the third family, the tau lepton, to find out exactly how it changed into lighter particles. In many ways it is like the familiar electron of the first family, only heavier. Why did nature repeat itself ?
> To understand this Dorfan led a team that built a large accelerator, the PEP2 B-factory at SLAC. This provided clear experimental evidence that the laws of physics are not the same for matter and antimatter. This effect, which goes by the technical term, CP violation, is subtle, but crucial. If there were no such asymmetry between matter and antimatter, the matter would have annihilated

[2] Riordan, pp.128-129

> the antimatter, leaving a universe with only gamma rays, and no residual matter, and therefore no galaxies, stars, planets - NONE of us would be here! In fact, since Dorfan's machine contributed so strongly to the verification of CP violation, he will travel tonight to Sweden to be present when the Nobel prize is awarded (on Wednesday) to three Japanese theoretical physicists. Two of these, Kobayahsi and Maskawa, showed that CP violation would occur if there were three generations of fundamental particles."

But Jonathan Dorfan is much more than a brilliant experimental physicist. He is also a super-star manager or academic institutional leader. The Stanford Linear Accelerator is not, as we have seen above, a simple little laboratory with a few white-coated physicists counting electrons with a Geiger counter. It is a vast (and expensive) international collaborative venture into the unknown. "The laboratory - which is dedicated to photon science, particle physics and particle astrophysics - serves more than 3000 scientists world-wide" *[Stanford News Service, 14, March, 2007]*
And in 1999 Professor Dorfan was chosen, from the ranks, to lead the Laboratory into the 21st. Century as Director. His work here has been a triumph. When he stepped down in 2007 the President of Stanford had this to say:

> "Jonathan Dorfan's tenure at SLAC has been characterised by exceptional scientific vision and foresight He deserves our thanks---and those of the greater scientific community---for leading SLAC during a remarkable transition as it moved from being a single-purpose particle physics research centre to a multi-program laboratory serving scientists worldwide" *[ibid]*

These scientists, I may add, included those who used the resources of SLAC to illuminate & decipher the Archimedes palimpsest, or Codex, that took our knowledge of the history of mathematics back 2000 years. But that is another story.[3]

The Stanford Linear Accelerator has acquired an enviable reputation not only for the brilliance of its work, but also for its integrity, its openness, its capacity to collaborate world-wide, its care for staff at all levels and its democratic spirit. It is surely one of **the** models of how a research institute should be organised in the 21st. century. Jonathan Dorfan who was not only Director of SLAC for 8 years but served on many scientific advisory boards around the world - including the Max Planck Institute for Physics in Munich; the Institute for Accelerator Science in Oxford and the Plasma Physics Laboratory in Princeton - and chaired the International Committee for Future Accelerators is one of the great scientific statesmen of our time.

We at UCT are very proud to welcome him home.

[3] William Noel & Reviel Netz, The Archimedes Codex, Da Capo Press, 2007