JUDITH BISHOP – DISTINGUISHED WOMAN IN SCIENCE, 2005

The Innovate editorial team interviewed Professor Judith Bishop of the University of Pretoria's Department of Computer Science in the

School of Information Technology.

→ *Professor Judith Bishop after being honoured as Distinguished Woman Scientist of 2005, here seen with (left to right) Dr Mohammed Jeenah (Director of Research Development, UP), Prof. Roelf Sandenbergh (Dean of the UP Faculty of Engineering, Built Environment and Information Technology), Prof. Robin Crewe (Deputy Vice Chancellor, UP), and Michael Bishop recent LLB graduate at UP and younger son of Prof. Judith Bishop.*

Innovate: What was the prestigious award you won in 2005?

Bishop: The award was the Distinguished Woman Scientist 2005 – for Innovation. The award is made annually by the Department of Science and Technology, and carried a substantial prize, a trophy and a beautiful pearl and gold necklace.

Innovate: So, what have been your recent innovations?

Bishop: For the past eight years I have been working on frameworks for distributed systems that prolong the lifetime of highly expensive software by enabling machine-dependent components to be monitored, identified and exchanged. Two of these systems have proved very successful. The Algon framework enables complex distributed algorithms for mutual exclusion and deadlock detection to be changed to suit an application. My students and I have been working with a local company, extending Algon to work with parallel algorithms that solve problems related to supply chain optimisation.

The other system was born of collaboration with Microsoft Research, UK, to promote their Rotor version of the .NET Framework. Unlike the normal .NET, Rotor can run on other operating systems such as Unix and Macs, but it lacks some functionality, especially for graphical user interfaces. Together with a colleague in Canada, I developed the Views system that filled the gap. Last year, my students and I invented an innovative re-targeting methodology that could move Views to other systems such as Linux. The next step is the most exciting: to apply the re-targeting idea to other machine dependent libraries, such as for speech recognition, wearable computing devices and mobile applications. This Mirrors system also won an award in 2005 from Microsoft South Africa.

Innovate: And what have been your contributions to science over your career?

Bishop: It seems that I have been innovating ever since I started in computer science thirty-five years ago. When I was a student at Rhodes, I wrote the first BASIC compiler for ICL1900 computers. That computer had 16K of memory, a 256K hard drive, and a teletypewriter. That was the computer for the whole university. Then I moved to Natal, and was much influenced by the vision of Lee Nattrass, Professor of Light Current Electrical Engineering, who had introduced HP minicomputers to the department. Together, we hitched up an HP3000 to a huge Burroughs 5700 and made them talk to each other so that users of the Burroughs could do plots and read tape via the HP. I was pleased when returning to Natal five years later to see my software still very much in use.

At Southampton University, I was privileged to work with Professor David Barron on Pascal compiler technology, and was involved in the first Pascal compiler for ICL 2900 computers. When I returned to Southampton in 1988, I spearheaded the distributed Ada initiative, and ran an international conference on the subject that was very influential in getting new features into that language. We were working with Inmos transputers that were chips with memory and four communication channels that could be connected together. That work was done with Professor Tony Hey, who is now a Vice-President of Microsoft. Fifteen years later, I find myself with a project that is using these selfsame ideas on a grand scale across the country, using grid computing.

Innovate: How did this work feed into the teaching side of being an academic?

Bishop: Very early on, I started writing textbooks on languages, first on Pascal, then Ada, then Java and C#. These books became very popular around the world and have been translated into German, Spanish, Italian, Russian and Polish. I think they were popular because they were innovative – they took new approaches to the languages. In all of the books, I advocated re-use of libraries, and the importance of short modular programs, which can be more easily created correctly. At the postgraduate level, my research equipped me to start new courses, such as the High-Performance Computing module that we offer to honours now. UP is the only university in the country that takes a practical view of HPC, and includes experience with grid computing for the students.

Innovate: What is the most rewarding aspect of your job?

Bishop: Freedom. Academics de facto have the privilege and responsibility to set their own agendas, and I have always grasped this freedom. What I enjoy most is the international collaborations I have, and the opportunity to travel and experience other cultures and peoples. Memorable visits have been to Milan recently when I went to the opening night of the opera at La Scala, and walked the city through the Christmas Markets, and then in 1981, when our working group excursion was down into the seabed of the Oosterscheldedam in the southwest of the Netherlands, as the world's largest tidal river barrier was being built. I have returned to Holland on many occasions and always remember the wonder of seeing that engineering feat close-up. I cannot count the countries I have been to, but I have lectured on six continents, which is quite a feat in itself.

At the same time, I use every opportunity to bring my colleagues to our beautiful country, and we have just had a very successful Summer School in January, where eight overseas speakers lectured to 110 students and industry people on software engineering. The mix of people was just right, and the contacts made were of lasting value.

Innovate: What has been the greatest challenge you faced in your career?

Bishop: There is no doubt that the apartheid boycott hurt scientists in this country. Throughout the 1980s it was very difficult to travel to conferences, and when there, one was constantly questioned and held accountable for the ills of one's country. It was also hard to get the right computer equipment, and scientific endeavour suffered. But challenges have always spurred me on, and it was probably the Apple withdrawal from South Africa in the 1980s that made me determined to stick with Apple computers. This I have done, and I think using them has kept my mind agile and ahead of the pack. There is nothing wrong with Windows and Linux, but Apple has style.

Innovate: What do you think of the state of computer science in South Africa today?

Bishop: One of my services to community is to sit on grant awarding panels, and from that perspective, I can say that there is a real problem for computer science in that there are simply not enough researchers. From MSc level, they dissipate into industry or overseas, and we do not have a solid cadre of qualified and active research academics yet. Compared to other disciplines such as physics, or to computer science in other small countries such as Sweden (where I also sit on grant panels), we have one-tenth of the numbers. With so few, it is hard to accomplish enough to make a large enough impact in the public eye. That is why it was so wonderful for computer science that I was chosen for this award. There is no doubt that the people who are here are excellent – we just need more of them.

Innovate: What are you planning to do now?

Bishop: As seniority hits one, so does the way one leads in science change. I have over the past years been on seven or so international programme committees a year, and now I am starting to be the chair of some of them. This gives me the opportunity to shape the way a conference goes, to invite keynote speakers – and to be invited as one. I am also working actively in the international computing federation – IFIP – and encouraging our young people to travel and to be academics. I am also working on a new book – Design Patterns in C# - and hoping to have meaningful talks with our engineers about upgrading their programming courses from C to C#. And I have three new research grants on the go with new industrial partners, and an inter-governmental collaboration with Italy, so there is always work to do.

Innovate: Do you have any advice for young woman scientists?

Bishop: For young scientists, yes: get your education and postgraduate training before anything else, while your mind is sharp and you are not shackled by family and work responsibilities. Being a postgraduate student is one of the finest times of one's life. It is in those years that you make your lifelong friends and companions, and have the freedom to talk, explore and expand your mind. For women, all I can say is: don't believe you are different, and no one else will either, but when men open doors for you, go through with grace and gratitude. ❷

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