Professor Roger Smith remembers clearly the ‘Eureka’ moment when he realised there was a biological clock in the placenta which determined the length of human pregnancy.

“You don’t get many moments like that in science. I remember exactly where I was standing in my lab in 1994, when PhD student Mark McLean showed me the results and I realised what they meant,” recalls Smith.

A Professor of Endocrinology, Smith is the Co-Director of the University’s Priority Research Centre for Reproductive Science and Director of the Mothers and Babies Research Centre. He is also head of the Hunter Medical Research Institute’s Pregnancy and Reproduction Program.

Smith says an important aspect of being born healthy is being born at the right time. Discovering the biological clock put his team one step closer to understanding how the length of human pregnancy is controlled.

There are about 17,000 premature births in Australia each year, resulting in 1,300 deaths. For those babies who survive, there are significant ongoing health costs as well as increased risks of intellectual handicap, cerebral palsy, blindness and deafness.

“Premature birth is a challenge for medical science. Even if we could predict which woman would have a premature birth, we do not know what to do to change it. We cannot use animal models to understand human births because the processes are different, and of course we cannot experiment on pregnant women.”

“An important aspect of being born healthy is being born at the right time.”

“So the two major ways of trying to advance medical science are cut off to us and in the most important area of all – how we are born”

Smith and his internationally recognised mothers and babies research team have developed new ways to approach the problem.

He has joined with biomedical engineer Professor David Smith from the University of Melbourne to become the first medical team researching human birth using mathematics to map gene pathways and test theories.

The team is developing mathematical equations that describe how hormones in the blood change during pregnancy. They eventually hope to use these equations to develop computer software which will help predict which women will deliver prematurely.

“In the future, doctors may be able to use the program – a little bit like a Sony Playstation – to guide a woman through her pregnancy in the same way you can guide a car through a complicated path on a computer screen.”

Smith also hopes to use the software to identify where in the pathway would be best to target treatment to stop a preterm labour and allow the woman to go through to full-term.

With a medical degree and honours from the University of Sydney and a PhD in neuroendocrinology from the University of London, it was the birth of Smith’s own children 23 years ago that led him to first question human birth.

“I realised I did not understand much about what was going on in the process of childbirth,” explains Smith. “I wanted to know why a human pregnancy lasted nine months and not longer, and why the uterus started contracting when it did.”

Smith, a recipient of the Society of Endocrinology Medal and an Honorary Fellow of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, says he was surprised that such a fundamental part of human biology was completely unknown.

“To me that was exciting because it meant, maybe I can work on it, maybe I can try and sort out some of the hormonal and biological puzzle.”

Smith leads a team of obstetricians and midwives, as well as protein chemists, molecular biologists, mathematicians, engineers, psychologists and nutritionists.

“One of the great advantages of living in Newcastle is that we have been able to build a laboratory right next door to the labour ward, antenatal clinic and neo-natal intensive care units of Hunter New England Health’s John Hunter Hospital.

“I feel really privileged to have the stimulating life that I have in Newcastle. I am able to see patients and teach, as well as continue to lead research into the fundamental factors which determine the timing of birth.”

Smith has received generous support for this research from the Thyne Reid Trust, as well as grants to Hunter Medical Research Institute from the Macquarie Bank Foundation.