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If Only Singaporeans Stopped to Think

Pause, engage brain, attain enlightenment

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Saturday, 26 September 2015

Sydney Brenner: Mentor to a nation's science ambitions

Sydney Brenner, who played a critical role in building Singapore into a scientific powerhouse, is here for an exhibition in his honour next week. The molecular biology pioneer, who won the Nobel Prize in physiology or medicine in 2002, was instrumental in setting up the Institute of Molecular and Cell Biology and helping shape research efforts here. Carolyn Khew looks at his life in science.

By Carolyn Khew, The Straits Times, 25 Sep 2015

Here are excerpts from *A Heroic Voyage: Sydney Brenner's Life In Science*, a companion booklet published by the Agency for Science, Technology and Research and Cold Spring Harbour Laboratory in conjunction with the 2015 Sydney Brenner Scientific Symposium and exhibition.

The excerpts include a foreword by Professor James Watson and other details about Dr Brenner's early life and scientific career.



Deputy Prime Minister Teo Chee Hean with Dr Sydney Brenner at the Institute of Molecular and Cell Biology's 30th anniversary dinner in May. PHOTO: INSTITUTE OF MOLECULAR AND CELL BIOLOGY

AN EXCELLENT TRAVEL COMPANION, Message by James Watson, Chancellor Emeritus, Cold Spring Harbour Laboratory

Over the course of my career, I've had the privilege of tackling some of the most fundamental questions in biology, working alongside some of the finest minds in science to solve them. In this six-decade-long quest, Sydney Brenner has been an invaluable colleague and personal friend.

My first encounter with Sydney was in April 1953, in the heady days just after our discovery of the structure of DNA. Sydney had driven from Oxford to Cambridge that cold, spring morning - just to be among the first to look at our model. We went for a long walk that day - six hours as I recall, and the first of many over the years - because there was so much to talk about.

As important as it was, the structure of DNA was just one part of the puzzle; we still needed to figure out how the RNA transcribed from DNA could be "read" into proteins. Twenty of us, led by George Gamow, formed the RNA Tie Club, to share ideas on molecular biology... And it was Sydney who eventually worked out that the genetic code was non-overlapping and degenerate, and discovered what messenger RNA and ribosomes were really doing. As if all that wasn't enough, he followed it up by establishing an entirely different kind of model system - the nematode worm - so wonderfully complex and simple at the same time.

Then there were the exciting, frenetic years of the Human Genome Project. We kept up our exchanges, with him in the UK and me in the US, doing as much science as possible while being responsible for entire research institutes.

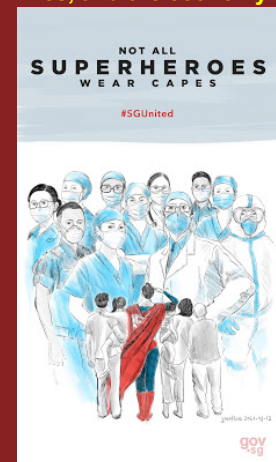
Genomics owes a great deal to him and his ideas; not just for the worm, which is what his Nobel Prize was for, but also technologies like massively parallel signature sequencing, which allowed gene expression to be analysed on a scale few could have imagined earlier.

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We both embarked on our careers in an extremely exciting time for molecular biology and have enjoyed front-row seats. In 1954, Sydney and I actually drove through the eye of a hurricane while on a road trip across the US to Caltech. Then as now, I'm glad to have had such an excellent travel companion for the journey.

AN EARLY START

If you happened to be in the centre of the small town of Germiston in South Africa in 1939, you may have come across a stocky, 12-year-old boy coming out of the public library with a book that he had been allowed to borrow from the adults' section. You might have also seen him about a mile away down the main street, looking for frogs in the small stream that ran between his house and the starch factory; or in his garage extracting pigments from flowers.

The budding scientist, Sydney Brenner, was no ordinary teenager. As a child, he had not only read *The Young Chemist* - F. Sherwood Taylor's book for amateur chemists - but had already performed many of its experiments using small quantities of chemicals purchased from a pharmacy. His main interest, however, was in biology; plants and animals remained a source of fascination throughout his life. He also discovered early on that his "teachers did not know very much", and that many things could be learnt by reading and doing...

Sydney Brenner was born on Jan 13, 1927 in Germiston to Jewish immigrants from Russia. The family lived in a few rooms at the back of his father's cobbler shop.

When he was five, one of his father's customers - a certain "Miss Walkinshaw" - found him reading a newspaper. Impressed, she found him a place, with fees waived, at a private church school. At age six, he entered the local primary school two years ahead of his contemporaries, and completed the first three years of primary school in one year. Brenner began at the local high school when he was 11, and graduated just before he turned 14...

By the time he finished school, he knew he wanted to become a scientist, but his family was too poor to afford a university education for him. He won a bursary from the Town Council to study medicine and began a six-year medical course in early 1942 at the University of Witwatersrand - also known as Wits University. There, the 15-year-old studied physics, chemistry, botany and zoology, commuting by bicycle and train with packed sandwiches for lunch...

Two years into the six-year medical degree, Brenner was advised to take an extra gap year as he was too young to qualify for the practice of medicine...

Brenner spent a "heavenly" gap year in a medical Bachelor of Science course in anatomy and physiology. He was part of a group of about a dozen medical students, who worked closely with more advanced researchers in a small room in the department of anatomy...

Brenner once said that he was "the only medical student to graduate from Wits without ever laying hands on a patient until the actual final examination". His interest lay in scientific research and, specifically, molecular biology - "which, of course, did not exist at the time", as he later mused...

In the 1950s, Sydney Brenner's career progressed rapidly from the relative isolation of South Africa to Oxford University and the top scientific institutions in the US.

GENES, GENES AND MORE GENES

Molecular biology's golden age in the 1950s gave rise to a new era of developmental genetics in the 1960s...

Although Dr Brenner continued to work in what would be called classical molecular biology, by 1962, he was focusing on a small nematode worm, *Caenorhabditis elegans* (*C. elegans*)...

He chose a small nematode with a life cycle of five days and with a fixed number of cells. His goal was to find the lineage of every cell and in particular, to determine the structure of the nervous system with electron microscopy. He also needed an organism on which he could perform genetic experiments and easily keep in a laboratory...

His *C. elegans* research had begun to attract attention and from the mid-1970s, an increasing number of young scientists came to Cambridge to join him. Many were postdoctoral fellows who, upon their return to the US, established their own laboratories doing research on *C. elegans*,

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In 2002, Brenner and two of his former postdoctoral fellows, John Sulston and Bob Horvitz, were jointly awarded the Nobel Prize in Physiology or Medicine for their pioneering use of the nematode worm as a model for understanding human biology.

The title of Brenner's Nobel lecture in December 2002, "Nature's Gift to Science", was a homage to this modest nematode...

Brenner is nicknamed the "father of the worm"...

MENTORING A YOUNG NATION

In 1984, Sydney Brenner visited a tiny island in South-east Asia for the first time. Since then, his enduring guidance and influence have indelibly shaped the course of Singapore's biomedical science and industry.

It all began in 1981, when Brenner started consulting for British financier Victor Rothschild's Biotechnology Investments. It was Rothschild who recommended Brenner to the Singapore Government, which was eager to diversify the country's economy away from low-cost manufacturing to other industries, such as biotechnology.

Brenner came to a meeting in Singapore in 1984. He later discovered that this invitation had come from Dr Goh Keng Swee, then Deputy Prime Minister.

During this visit, Brenner met Mr Lee Kuan Yew, then Prime Minister of Singapore, and wrote a short proposal to set up a research institute in molecular and cell biology to train Singaporeans at the PhD level, who could then provide the country with the necessary biotechnology infrastructure. When Mr Lee remarked that Singapore was a nation of technicians and not scientists, Brenner candidly replied: "Prime Minister, if you don't do something like this, you will remain a nation of technicians." A decision was made in 1985 to create the Institute of Molecular and Cell Biology - a name Brenner had suggested...

Professor James Watson, Dr Francis Crick and Professor Maurice Wilkins won the 1962 Nobel Prize for their discovery of the double-helix structure of DNA.

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 **Agency for Science, Technology and Research (A*STAR)** 

about 5 years ago

Dr Sydney Brenner, Nobel Laureate, distinguished himself in his long scientific career with his pioneering work on deciphering the human genetic code and programmed cell death. The techniques he came up with to investigate molecular and developmental biology changed the face of biology research.

In Singapore, Dr Brenner played a formative role in the development of biomedical research in Singapore, starting with his suggestion to set up the Institute of Molecular and Cell Bio... [See More](#)




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Teo Chee Hean
about 5 years ago

Friends and colleagues of Nobel Laureate Sydney Brenner, including fellow Nobel prize winner James Watson, shared fond memories of working with him at Friday's SB Symposium.

Sydney - thanks for inspiring us to aim high in the search for knowledge, encouraging us to set up the Institute of Molecular and Cell Biology, and working with us to make it happen.



448 Comment 20

Nobel laureates to speak at event

By Carolyn Khew, The Straits Times, 25 Sep 2015

Dr Sydney Brenner, born in South Africa in 1927, established the roundworm *C. elegans* as a model for studying developmental biology, now used as a standard research model by biologists worldwide.

Dr Brenner is a senior fellow at the Agency for Science, Technology and Research (A*Star), and a senior fellow at the Janelia Farm Research Campus, Howard Hughes Medical Institute in the United States.

He will be in Singapore to deliver a talk at a **Nobel Laureate Public Lecture** alongside two other Nobel prize winners, Professor James Watson and Professor Sir Richard Roberts, on Oct 1. Registration for the lecture is closed.

Distinguished speakers including Nobel laureates and other renowned biologists and physicists who have worked with Dr Brenner will also be giving presentations at The Sydney Brenner Scientific Symposium on Oct 2.

The exhibition on Dr Brenner's life in science entitled "**A Heroic Voyage** " will be open to the public from Oct 5 to Nov 3 from 9am to 5pm, Monday to Friday. Admission is free and it will be held at The Brenner Library, Level 5, Matrix, Biopolis. The booklet, "A Heroic Voyage: Sydney Brenner's Life in Science" will be given out to those who attend the public lecture, and scientific symposium on Oct 1-2.

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BY SISSI LIN ON OCTOBER 12, 2015 • (LEAVE A COMMENT)

[Media Coverage] The Heroic Voyage of Sydney Brenner-Singapore celebrates Sydney's legacy

The best way to prepare for a heroic voyage in science is to start. - Sydney Brenner



Dr. Sydney Brenner Credit: NTU

Last week, Singapore was privileged to host a two-day event in honor of Nobel Prize winner Dr. Sydney Brenner. The event consisted of Nobel Laureate public lectures featuring Nobel Prize winners Dr. James Watson, Sir Richard Roberts and Sydney himself, the Sydney Brenner Scientific Symposium and a dinner banquet. The event was jointly organized by the Agency for Science, Technology and Research (A*STAR), National University of Singapore (NUS),

About 1,300 guests attended the Nobel Laureate Public Lecture held on October 1st. Dr. James Watson, spoke on “Stopping Incurable Cancers through Eliminating their Anti-Oxidative Defenses”, Sir Richard Roberts on “A Crime Against Humanity” and Dr. Sydney Brenner on “Homo Sapiens, a Unique Animal”. On October 2nd, 17 distinguished speakers who are Sydney’s contemporaries and his former graduate students/postdoctoral fellows, gave talks at the scientific symposium. They also joined 400 other members of the local scientific community to witness the inauguration of an exhibition on Sydney’s life in science titled “A Heroic Voyage”. The exhibition, now located at Biopolis-Sydney Brenner Library, will make an appearance at NUS and NTU in the coming months.

“The great thing about science is that you can actually solve a problem”, he says. Sydney believes in science, and has been using it to solve a life-long question-how does biological evolution happen? When he saw the DNA helix structure built by Francis Crick and James Watson in 1953 he instantly realized it would be the key to solve the evolution problem. Over the 1960s, Sydney’s work with Crick elucidated the triplet code of protein translation and alongside with Francois Jacob and Matthew Meselson, made another key discovery-messenger RNA (mRNA).

In the mid-1960s, Sydney worked on *Caenorhabditis elegans* (*C. elegans*), a tiny transparent nematode which became his experimental model to study the genetic regulation in organ development and programmed cell death. His research turned the humble nematode into a powerful research tool for developmental biology, for which he along with John Sulston and Bob Horvitz, were awarded the Nobel Prize in Physiology or Medicine in 2002. *C. elegans* became the first multi-cellular organism to have its genome completely sequenced.

Sydney’s work on comparative genomics continued with fugu fish, whose genome is among the smallest vertebrate genomes and about one-eighth the size of the human genome. The successful sequencing of the fugu genome provided a useful “reference genome” for annotating the human genome.



Dr. Brenner captivating the audience with his inspiring talk

At age of 88, Sydney continues his pursuit in science with a heightened level of curiosity. In his amusing and captivating talk on “Homo Sapien, a Unique Animal”, he recounted various highlights of his scientific journey, but mostly he expressed his current views on biology. He emphasized the importance of choosing the right models, like he using *C.elegans* for mutation study and fugu fish for comparative genomics.

Saying “the time now is to work on people”, he encouraged scientists to focus on human model and described the people who would venture into the new human sciences as “*anthropreneurs*”. Actually, he himself is leading a team of scientists on induced pluripotent stem cell models at Molecular Engineering Laboratory (MEL) of A*STAR. He also pointed out the problem that, what makes Human beings unique is still unsolved.

One of his current projects is about using bioinformatics to decipher the mystery among animal DNAs. He mentioned, as we now have a huge database of DNA sequences from various animals, we shall be able to look at the sequences, and find out the actual code of a unique animal. He continued to impress the audience and mentioned that anyone without grants or even students can work on this problem.

While considered a pioneer of molecular genetics and one of the greatest biologists of the 20th century, Sydney firmly believes that “a scientist should be judged by the quality of the people he has helped to produce and not by prizes or other honors bestowed on him”. Sydney mentored and inspired many young scientists in doing great research and enjoying great science (five of his postdocs won Nobel Prize).

Sydney's mentorship has helped Singapore become one of the best biomedical hubs in Asia. As A*STAR chairman Lim Chuan Poh stated in the opening address of the event, Sydney has helped to establish the country's first scientific

...entirely in getting them PhD degrees from prestigious universities, and the creation of Biopolis research hub.



Prof Tan (right) at the dinner banquet with Dr Brenner Credit: NUS

At the closing dinner banquet, NUS President Professor Tan Chorh Chuan recounted (<http://news.nus.edu.sg/highlights/9489-celebrating-sydney-brenner-s-legacy>) the ways Dr Brenner had left his mark on Singapore. The first was the concept of a pot of money to fund “risky” ideas without trying to predefine what the deliverables should be. The Singapore Cancer Syndicate emerged out of this line of thinking. The second was the value of irreverence, which Prof Tan said “is very useful for us in Singapore to have Sydney provide well-considered contrarian views”. Thirdly, was Dr Brenner’s belief in young people, which has led to the formation of new laboratories to attract and train bright scientists and clinicians at NUS, National University Hospital and A*STAR.

Sydney has great expectations from the future. As he put it “every 15 years there would be a breakthrough”. He also believes that there would be breakthrough in the next few years. He said, “The journey will continue, I hope, after I’m gone. I’ve often asked one request, which is in 2053, on the anniversary of the DNA publication, that I will be allowed to come back here, one day. I don’t care where I am, whether I come down or come up, just to see what’s happened to the world.”





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