EDITORIAL

Cell Division: Go Forth and Multiply

The dynamics of how a cell duplicates and splits itself into two have long allured biologists. Not only is cell division a hallmark of normal growth and development, but uncontrolled or aberrant divisions can lead to diseases such as cancer. The biology of cell division thus continues to attract many workers and, in this issue of *Australian Biochemist*, we showcase some of the exciting cell division research that is being carried out in Australia.

We are familiar with the idea that mitosis and cytokinesis are centred on tubulin and actin – elements of the cytoskeleton, a superstructure of proteins that was once thought to be the privileged possession of the eukaryotes. But recent work tells us what, in hindsight, seems obvious – that the prokaryotes, too, have a well-developed cytoskeleton. In fact, this is probably where the eukaryotes got their cytoskeleton from in the first place. Margaret Migocki and Liz Harry bring us up to speed on the enormous advances that have been made in the past decade on how bacteria divide – a process centred, driven or directed by this newly recognised cytoskeleton. Margaret and Liz highlight their work on the regulation and placement of the bacterial cell division ring, the Z (FtsZ)-ring, in *Bacillus subtilis*. Liz is well known for her pioneering work developing immunofluorescence microscopy in bacteria (truly a Eureka moment for Liz, see *Australian Biochemist* issue of December 2002); this technique has been crucial in opening up the field of the bacterial cytoskeleton.

Our focus then shifts to the eukaryotes themselves and the field of organelle division, where Paul Gilson and I describe how the Z-ring still operates to divide certain, perhaps ancient, mitochondria in concert with other rings that may truly have arisen in the eukaryotes. Gary Hime and colleagues then discuss the importance of asymmetric cell divisions, and how they are regulated to give rise to different progeny cells. With the recent debate on human stem cell technology, it is of interest to be reminded by that *Drosophila* can be a useful tool for the analysis of stem cell divisions. Finally, Bill Warren looks at the straitjackets that keep chromosomes together until they are ready to separate. The cohesion of sister chromatids is vital for the proper segregation of genetic material to progeny cells.

I hope this collection of vignettes on key aspects of cell division gives some idea of the excitement that continues to course through the field. This Showcase collection also reveals the huge potential there is for many further important discoveries.

Peter Beech

Centre for Cellular and Molecular Biology, School of Biological and Chemical Sciences, Deakin University, VIC 3125

Cover Illustration –

Localisation of a bacterial division protein to the midcell division site in Bacillus subtilis *using immunofluorescence microscopy.*

In the original image of the central graphic, green shows the location of the division protein and the cytoplasm of the cell is stained red with propidium iodide, which stains both RNA and DNA. Graphics have been used to modify the original 2-dimensional image so that the division protein forms a ring, rather than a band and the red stain highlights only the circumference of the cell.

The images lined up in the background are B. subtilis *cells that simultaneously show chromosomes stained with DAPI and the cellular localisation of a membrane bound division protein. This division protein is recruited to the division site, between two segregated chromosomes. Both aspects are artificially coloured differently in the various cells.*

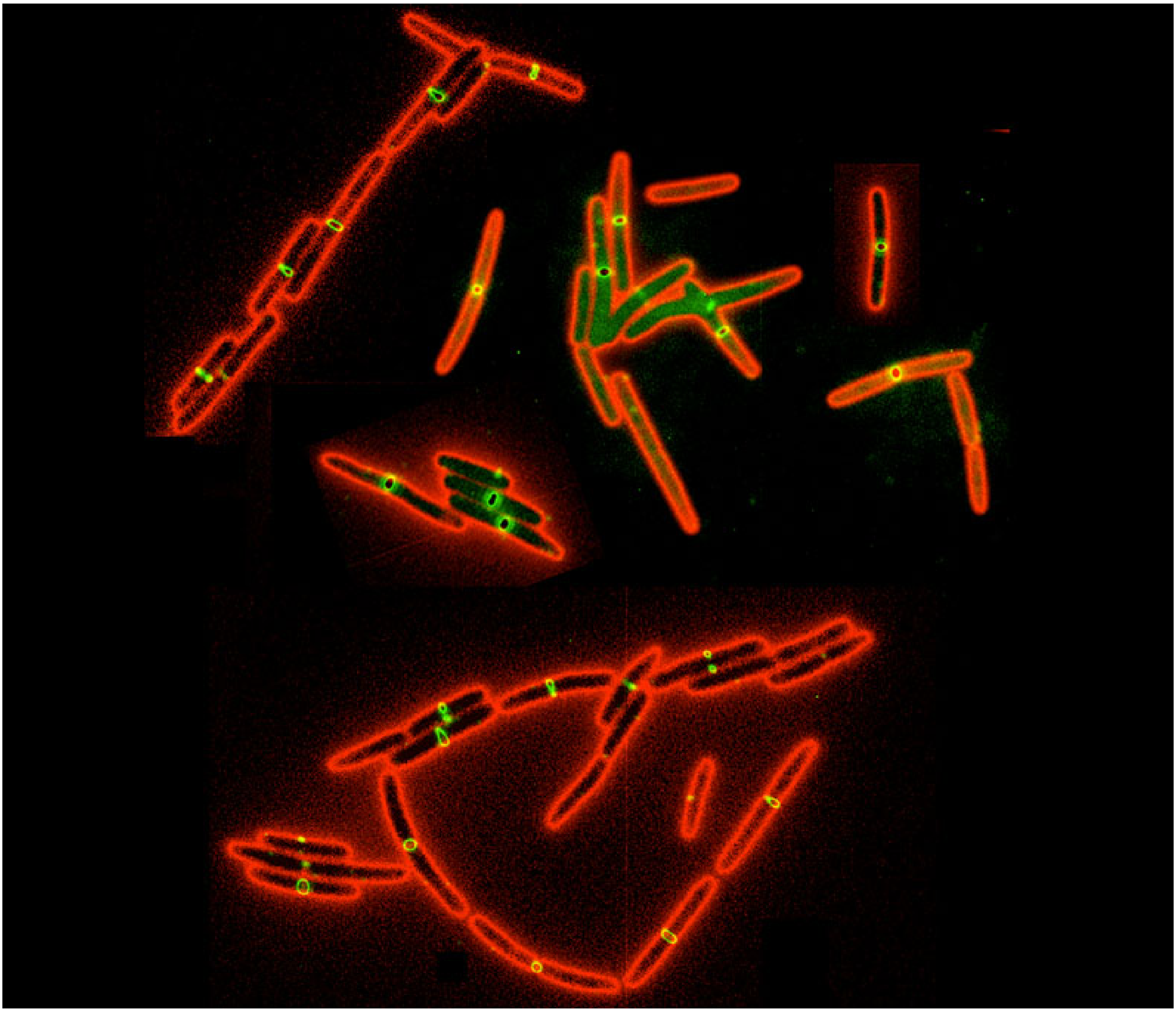
Graphics supplied by Elizabeth Harry, University of Sydney.

Cell Division: Go Forth and Multiply

Guest Editor: Peter Beech

In the Next Issue…

In August, a special New Zealand Showcase on Research will be on **Microbial Virulence –** *Guest Editor: Ted Baker*



Front Cover Image