

Annual Review of Cell and Developmental Biology, 2022. Ruth Lehmann, Jennifer Lippincott-Schwartz and Alexander F. Schier (eds). Annual Reviews, 1875 S. Grant Street, Suite 700, San Mateo, California, 94402, USA. Vol. 38. x + 493 pages. Price: US\$ 118.

The editorial in the Annual Review of Cell and Developmental Biology (ARDCB), Volume 38, is interestingly titled 'ARDCB Goes Open!' The editor, Ruth Lehmann, outlines the philosophy of ARDCB becoming open access from volume 39. She mentions that the authors were invited to write the reviews in 2000 during the pandemic times and appreciates the authors for composing the reviews in trying times. Lehmann points out that while specialists write the reviews, they would be relevant to a wide spectrum of researchers, including students and teachers. This is reflected in the average half-life of an ARDCB article, which is more than 10 years, unlike a scientific paper that is significantly shorter. Lehmann has summarized the contents of the review in a manner that gives an excellent overview of the articles.

Protein-protein interactions involving structural biology, bacterial lipid structure, circular RNAs, senescence, homeostasis, newer imaging techniques and principles of physics are emphasized in the reviews.

The following nine reviews emphasize the importance of protein-protein interactions in cell and developmental biology.

The role of microtubule (MT) cytoskeleton in cell biology has been extensively investigated. The observation of branching MT nucleation in yeast has led to detailed investigations in animals and plants. Branching MT nucleation during animal cell division is the focus of the review by Travis *et al.* entitled 'How microtubules build the spindle branch by branch'. Branching MT nucleation is summarized in figure 1, and interaction maps with different protein partners are summarized in figure 2. In 'The plant anaphase-promoting complex/cyclosome' (APC/C), Willems and De Veylder detail how APC/C, a multi-subunit E-3 ubiquitin ligase complex, plays an important role in plant development. Details of the components, sub-units and target proteins are summarized in figure 1 and tables. Each section has excellent illustrations showing phenotypes of various mutants. Hopefully, molecular details of the structures will emerge in the coming years. The action of the molecular motors-kinesins,

dyneins and myosins are crucial for mitosis and ciliogenesis. Ou and Scholey discuss in 'Motor cooperation during mitosis and ciliogenesis' various aspects of mitotic and ciliary motors, particularly cooperation. While the review is detailed, there are only two illustrations. Howard-Till *et al.*, in 'Recent advances in ciliate biology', makes a strong case for studying ciliates. The authors give a YouTube link stating 'extolling the virtues of ciliates for research and teaching'. The review extensively discusses cryo-electron microscopy (EM) and tomography (ET) derived structures of *Tetrahymena* derived complexes. Advances in membrane trafficking, membrane dynamics and channels in ciliates are addressed in detail. The review shows how structural biology has provided important insights into various aspects of ciliate developmental biology. The title of the review 'Structural biology of cilia and intraflagellar transport' by Klena and Pigino is clearly reflected in the contents. The terms used in structural biology and the abbreviations that may not be familiar to cell biologists are summarized at the beginning of the review. The illustrations give an excellent perspective of the organization of microtubules, F-actin and dyneins in the dynamics and trafficking in cilia that are microtubule-based eukaryotic organelles. In hitchhiking mode of transport, cargoes attach to an already-motile cargo rather than associating with a motor protein. This mode of transport in fungal, animal and plant cells is reviewed by Christensen and Reck-Peterson in 'Hitchhiking across kingdoms: cotransport of cargoes in fungal, animal, and plant cells'. The focus is on mRNA and cargo hitchhiking. Interactions involving proteins in vesicle transport, kinesins, microtubules, myosin and actin filaments are presented with excellent illustrations. 'Mitochondria as cellular and organismal signalling Hubs' by Shen *et al.* describes various aspects of proteins involved in mitochondrial signalling, such as stress responses, protein homeostasis, mitochondria-regulated inter-tissue, and inter-organ signalling. Detailed illustrations indicate intricate protein-protein interactions in the different aspects of mitochondrial communication. McShane and Selbach describe in 'Physiological functions of intracellular protein degradation' the diverse roles of cellular protein degradation in homeostasis, regulation, quality control, stoichiometry control, proteome remodelling, immune surveillance and baseline turnover. While the first two figures provide a detailed his-

tory and overview of the theme, the rest of the review lacks detailed illustrations, that would help better appreciate the theme. Differential adhesion to differential interfacial tension modulated by cadherins, catenins, F-actin, myosin and nectins are reviewed in 'Adhesion-based self-organization in tissue patterning' by Tsai *et al.* While figures 1–3 provide a good introduction, no further illustrations exist. More figures would have helped in appreciating the complex processes involved.

Molecular details of lipid organization in Gram-positive and Gram-negative bacterial membranes are discussed by Giacometti *et al.* in 'Lipid transport across bacterial membranes', a very useful compilation of lipid components of bacteria is given in a figure. This is followed by details of proteins involved in transporting lipid molecules and polysaccharides. How various transporters function is illustrated well and summarized in a table that gives information about substrates, function and proposed mechanism. The review would be of interest to microbiologists interested in bacterial physiology.

Two reviews are on senescence with different emphases. Olan and Narita discuss gene regulation and chromatin structure changes with respect to cellular senescence in 'Senescence: an identity crisis originating from deep within the nucleus'. The illustrations, though few, clearly summarize the behaviour of chromatin during senescence. In 'Eukaryotic cell size control and its relation to biosynthesis and senescence', Xie *et al.* discuss molecular mechanisms regulating eukaryotic cell size, including algae, yeast, mammalian and plant cells. Scaling macromolecular concentrations with cell size and proteins involved differential scaling of individual transcripts and proteomic components, as summarized in the figures. The authors also describe emerging relationships between senescence and large cell size.

Circular RNAs take center stage in 'Biogenesis and regulatory roles of circular RNAs' by Yang *et al.* A table summarizes the details of RNA discovery. Topics reviewed are genome-wide profiling of cRNAs, regulation of their production, conformation and turnover, their regulatory roles and mode of action. The figures are instructive and would help appreciate cRNAs.

Spatial and temporal patterns in cells and tissues from a mechano-chemical framework are discussed by Bailles *et al.* in 'Mechanochemical principles of spatial and temporal patterns in cells and tissues'. Turing patterns and spatial mechanochemical patterns

in biological systems are discussed in detail. While patterns observed in biological systems are due to complex processes of molecular sorting, flux and segregation, the authors outline how these can be described by principles of physics. Illustrations convey the essence of the review.

Bagnat *et al.* describe how generated hydrostatic pressure can act as a morphogenetic force in 'Morphogenetic roles of hydrostatic pressure in animal development'. Physical principles of fluid transport in epithelial tubes and control of fluid secretion are discussed. Mathematical models of lumen formation with figures explaining the models should help cell biologists appreciate the approach. Clearly, there is an increasing interest in explaining events in cell and developmental biology using principles of physics.

Tissue homeostasis is the subject of two reviews but with different emphases. In 'Tissue homeostasis and non-homeostasis: from cell lifecycles to organ states', O'Brien, with an emphasis on epithelial organs, covers different aspects of cell cycle life. While the sub-headings in sections are informative, only two figures appear in the introduction. More illustrations would have benefitted the readers, considering the complexity of the topic. The review by Scott-Solomon and Hsu entitled 'Neurobiology, stem cell biology and immunology: an emerging triad or understanding tissue homeostasis and repair' is on understanding tissue homeostasis and repair via neurobiology, stem cell biology and immunology. Figure 1 and table 1 give excellent overviews of the crosstalk between components of the 'triad'. The illustrations essentially summarize the contents of the review.

Two reviews discuss how imaging techniques are used to essentially 'see' development. In 'Organoid imaging: seeing development and function', Keshara *et al.* outline how organoids are generated, followed by a section describing imaging methods used in organoid research. However, there is only one figure that shows examples of images from different techniques and, in the end, a figure that shows how different types of microscopes can be used for various organoid studies. Since the area is relatively new, more illustrations in the various sections, at least one in each section, would have helped in appreciating the power of imaging techniques in organoid research. Mihlan *et al.* discuss in 'Surprises from intravital imaging of the innate immune response' dynamic immune cell behaviour obtained from modern intravital

microscopy (IVT). The techniques described encompass two-photon laser scanning and spin-disc confocal microscopy combined with fluorescent reporter animals. The authors focus on the innate immune cell types: macrophages, microglia, neutrophils, dendritic and mast cells in mice. The overview of cellular dynamics revealed by IVT is summarized for each of the five cell types with schematic illustrations. Some images obtained by IVT would have helped non-specialists appreciate the power of IVT.

In summary, while the reviews give a wealth of information, some have very few figures or summary tables, particularly as one of the objectives of ARDCB is to cater to non-specialists, students and teachers.

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Annual Review of Phytopathology, 2022. Steven E. Lindow and John M. McDowell (eds). Annual Reviews, 1875 S. Grant Street, Suite 700, San Mateo, California 94402, USA. Vol. 60. x + 409 pages. Price: US\$ 118.

This year's *Annual Review of Phytopathology (ARP)* provides a comprehensive overview of the latest research and developments in the field of plant pathology, including nematodes, covering a wide range of topics that are critical to understanding and managing plant diseases. It consists of 17 articles, and each one maintains the pace with constantly evolving technology and stays up-to-date with the latest research. This *ARP* consists of research and developments in the field of host-pathogen interactions, genetic resistance, climate change and integrated pest management. The review is essential for researchers and students in plant pathology, plant science, agriculture and related disciplines. It provides a broad overview of the state of the art in phytopathology and highlights the latest advances in understanding plant diseases and their control.

It is believed that in the absence of a resistance host, early pathogen detection and

disease diagnosis in the field could be an invaluable asset for disease management programmes, which will help reduce crop losses worldwide. Although several diagnostic approaches are developed and handed over to the public, it is imperative to consider that any laboratory protocol would be performed in the field by non-scientists who have to perform nucleic acid extraction and amplification together.

The review by Botella encompasses a detailed coverage of the latest research on plant disease diagnostics, including the development of new molecular techniques for detecting and identifying plant pathogens. The review also covers some challenges and opportunities for deploying these diagnostic tools in the field, including the need for effective training and capacity building. The review suggests a hand-held DC-powered loop-mediated isothermal amplification (LAMP) protocol in which dipsticks-based purification of the nucleic acid and Arduino-based platform 'Diagnostic droid' are used to incubate and monitor LAMP amplification reactions.

Studying history enables us to develop a better understanding of the world in which we live, and it is always fascinating to know about the plant-microbe interactions, as plants are deeply connected not only to rich microbial environments in the soil but also to endophytic microbes within their tissues and epiphytic microbial community. The insight into this area unravels the impact of agriculture development mainly due to changes in agricultural practices and other environmental shifts, including climate change, on the spread of plant diseases. Malmstrom *et al.* thoroughly discuss the methodology for examining past plant-pathogen interactions using herbarium samples and indicate that a potential solution can be designed for reducing pathogen impact in agriculture. The information also improves our ability to predict and prevent plant diseases and enhances our knowledge of the photodiode and its importance in plant-microbe interactions.

Virus-based biological control agents (BCAs) offer a safer and more sustainable disease management strategy by lowering the virulence of fungal pathogens and also enhancing the hosts' resistance to fungal diseases. In this review, Wagemans *et al.* have detailed the use of virus-based BCAs against the population of major pests like fungi, bacteria, viruses and insects. The classic example of the success and failure of mycovirus-based management of chestnut blight in Europe and the United States