

images of continuous trans-axial slices through the investigated object. Depending on temporal and spatial resolution, CT-based techniques can be used to image objects over a wide length scale. For example, a mouse or an entire liver can be imaged using mini-CT, while nano-CT can be used to image cellular organelles (less than 1  $\mu\text{m}$ ). Ritman has described various functional components of a typical CT scanner and also explained the rationale for use of small animal model. Importantly, this chapter also discusses various classes of micro-CT approaches, e.g. attenuation-based scanning, fluorescence-based scanning, scatter-based scanning and phase contrast scanning. Various examples are provided to explain how CT-based techniques can be effectively utilized to image the lung of a rabbit or the kidney of a rat.

The fundamental molecular biology aspect of various diseases is also discussed in this volume. Among various life-threatening diseases, cancer still remains one of the greatest challenges for mankind, despite several years of research on cancer drug molecules as well as various clinical diagnostic treatments. It has been widely recognized that a quantitative assessment of the initiation, progression and treatment of cancer is the need of the hour. After describing the cancer modelling on both biological timescale and length scale, the chapter by Deisbauck *et al.* describes various multi-scale modelling approaches of cancer. In particular, the discrete continuum as well as hybrid modelling methods are shown to describe various aspects, including ROS generation and its influence on the proliferative index of cancer cells as well as dose-dependant cell viability in various timescales. In an interesting chapter, LeDuc and co-workers describe how to experimentally probe the intercellular and extracellular microenvironments of the cell, as well as recent development in techniques to assess how a cell can respond to any changes in the external environment. Overall, the approaches described in this chapter are expected to be useful to reverse-engineer the cellular processes. In studying molecular biology aspects of various diseases, the function of various cellular organelles is strongly considered. Zwerger *et al.* have painstakingly described how the changes in structure and composition of a cell nucleus, which is tightly integrated to the surrounding cellular structure, can cause

many human diseases, such as cardiomyopathy and cancer. Hess has reported fundamental mechanobiological aspect of the functioning of molecular motors. The scaling laws to describe the motion of biomolecular motors are described and such analysis can be useful to design synthetic molecular motors.

The volume is appropriately indexed. It would be a valuable asset to institutions as well as researchers in the field of medical biotechnology, and bioengineering as well as clinicians. The volume is expected to leave an impact in the area of medical research.

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### Annual Review of Genetics, 2010.

Allan Campbell, Michael Lichten and Gertrud Schübach (eds). *Annual Reviews*, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 44. xii + 477 pp. Price: US\$ 84.

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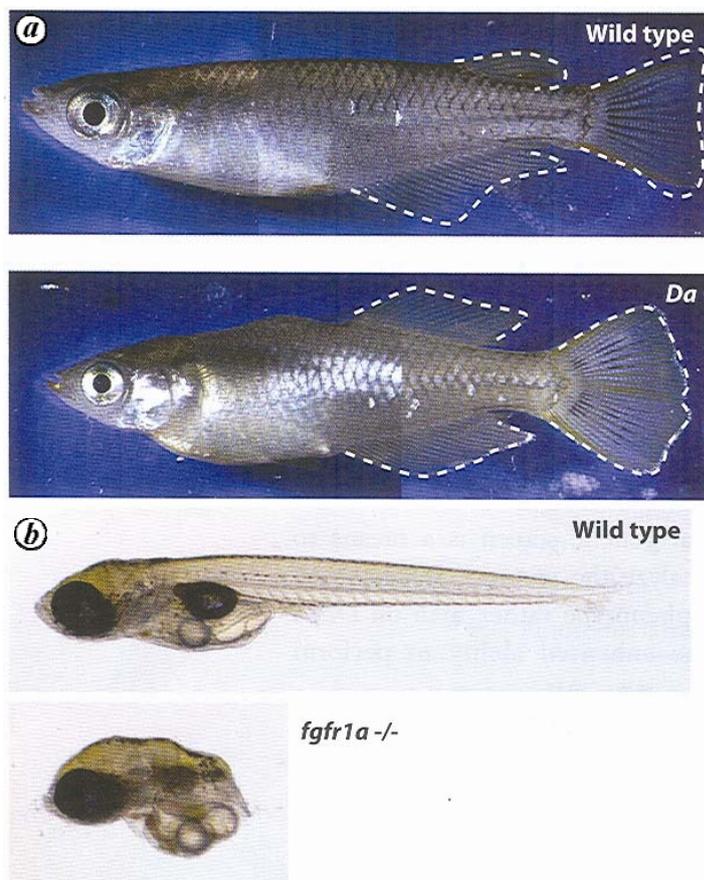
It is rare indeed to come across an *Annual Review of Genetics (ARG)*, where one could find so many articles of interest in a single volume. This volume is an exception. There are several articles of interest to the layman in modern molecular biology and quite a few articles are of direct relevance to my own field of specialization as well. Over the years, the reviews in *ARG* have become a pleasure to read since these are not mere catalogues of recent findings. The synthesis of concepts, enumeration of future directions and unanswered questions make the reading of these reviews a pleasure. The listing of future issues and research directions at the end of each article is of immense use to active researchers to ponder over the subject.

The article on the genomic enzymology of antibiotic resistance is a fresh attempt to rejuvenate the old field of drug discovery. The authors apply the concept of genomic enzymology to 'antibiotic resistome' and explain the plasticity of antibiotic resistance in bacterial systems. The idea that antibiotics are in fact not

antibiotics at all in the concentrations produced in the environment, but rather signalling molecules, and the observation that there is a vast reservoir of antibiotic resistance genes in the non-pathogens that can contribute to antibiotic resistance in pathogens, make this field an important area of future research. The origin of antibiotic resistance as an auto-immune mechanism to resist the toxic metabolites produced by the host organism gains additional insight from these new concepts on antibiotic resistance.

The article on biofuel production by recombinant *Escherichia coli* brings out the usefulness of the bacteria in pathway engineering. The atom efficiency of the ethanol-producing, engineered *E. coli* is rather impressive. The state-of-the-art strain producing 46 g l<sup>-1</sup> ethanol over 72 h in minimal medium containing a mixture of C5 sugars and betaine, is as good as any ethanol producer as of now. The recombinant *E. coli* carrying 2-ketacid decarboxylase and an alcohol dehydrogenase produces a variety of short-chain alcohols from fermentable sugars. The review on bacterial contact-dependent delivery secretion system is stimulating. The authors review the current literature on T4 injection mechanism that delivers DNA into the bacterial cell also. This type-VI secretion system brings back the classical studies of the phage biologists, who shaped the modern molecular biology using incredibly simple experiments. Unlike type-V secretion systems, types III, IV and VI deliver the molecules using a complex organelle that spans the membrane of the target cells. The protein-protein communication at the tip off the needle and the host cell is an active area of research, and will be interesting to explore. The article on homologous recombination in eukaryotes is well organized, and focuses on post-translational modifications and their role in the modulation of interaction of proteins in the recombinosome. Another aspect that has emerged recently is the reversible nature of recombination intermediates, which is responsible for the flexibility of the pathway. The role of anti-recombination mechanisms modulated by motor proteins providing flexibility to the process is examined in detail.

Integrins are genetic elements that accumulate antibiotic resistance elements by sequential capture. The activation of these elements is regulated by SOS response implying a direct role of stress in



Medaka developmental mutants. **a**, Wild-type and homozygous *Da* (double anal fin) mutant adults. Structures such as the dorsal fin and the dorsal half of the caudal fin are ventralized. **b**, Wild-type and *fgfr1a*<sup>-/-</sup> medaka larva. The latter totally lacks the trunk tail structures. Note that a mutation of *fgfr1a* in zebrafish causes impaired scale development.

the evolution of phenotypes such as antibiotic resistance. In this context, the *lexA* gene, which negatively controls SOS response by inhibition of *recA* gene expression, could be an excellent target to develop as an anti-SOS mechanism and pathogenesis. This article is a good example of lucid description of an emerging field. The article on bacterial antisense RNAs examines the role of RNA-mediated regulation of gene expression in bacteria and phages. RNA-mediated transcriptional regulation was discovered in the phages several years ago, and this article on bacterial antisense RNAs reviews succinctly the mechanisms of RNA interference in bacterial systems. The application of this mechanism in biotechnology is evolving at present.

The article by Susan Lindquist and co-workers on protein homeostasis and the phenotypic manifestation of genetic

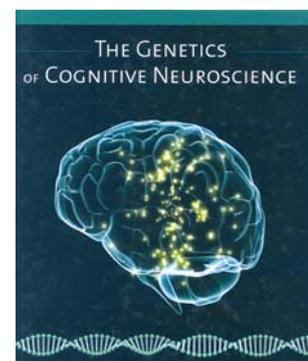
diversity is timely. The stress proteins in general and heat shock proteins in particular are involved in several functions, in addition to their chaperone activity. Hsp90 could potentiate the newly formed mutations by stabilizing the altered protein product of a mutated gene, and helps in the functioning of altered protein which otherwise will fold incorrectly and become nonfunctional. Therefore, in the absence of potentiating Hsp90, the mutant phenotype is not expressed. Hsp90 also could act as a capacitor for latent mutations by buffering the effect of mutations. In this case, the phenotypic effect of a mutation appears only when the quantity of Hsp90 is reduced. This type of canalization, insensitivity of phenotypic trait to mutations and environmental factors have been demonstrated in *Drosophila* and other systems. Therefore, the role of Hsp90 is emerging as an important driver of evolution. This

review brings out succinctly the true nature of protein homeostasis in shaping evolution.

All in all, this edition of *ARG* is a treat for every biologist. There are other equally interesting articles on various aspects which are of high standard. Anyone interested in modern molecular biology should make it a point to read this volume.

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**The Genetics of Cognitive Neuroscience.** T. E. Goldberg and D. R. Weinberger. The MIT Press, 55 Hayward Street, Cambridge, MA 02142, USA, 2009. xii + 297 pp. Price not mentioned.

The book under review is a concise and lucid introduction to the field of genetics of cognition. Animal models, imaging studies and clinical studies are used to illustrate the foundations and findings in this new field of neuroscience. The emphasis of the book is on genetics. How genetic inheritance and gene expression can modify behaviour is the chief message. The editors state in the preface that the aim of the book is to help the reader understand the effect of genetic variants on cognition, affective regulation, personality and CNS disorders. They have set out with two goals. The first is to provide an understanding of basic principles to enable the reader to critically evaluate recent studies. The second is to