

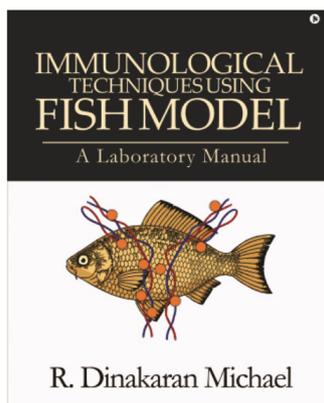
was ...confirmed by Madam Wu...all the three shared the Nobel prize in 1957...' (p. 119). (Only Yang and Lee got the prize.) In the discussion of fermions and bosons (p. 86), it was disappointing to see no mention of either spin (bosons having integral spins and fermions having half-integral spins), or of Satyendra Nath Bose, the originator of Bose–Einstein statistics.

The book ends on the last page 261, celebrating the BICEPS claim of the discovery of gravitational fluctuations on 17 March 2014. Unfortunately, as mentioned above, BICEPS discovery was not confirmed by data from Planck satellite². The book is published in 2017 and probably completed in 2016. But it has missed out on this important fact. It can be updated in the next edition, especially if gravitational fluctuations are seen by then. By that time it may have been decided if 'Inflationary Cosmology is theory or phenomenology'.

1. [https://en.wikipedia.org/wiki/inflation_\(cosmology\)](https://en.wikipedia.org/wiki/inflation_(cosmology)) (accessed on 12 December 2018).
2. Cowen, R., *Nature*, 2015, 16830; doi:10.1038. See also Keating, B., *Losing the Nobel Prize: A Story of Cosmology, Ambition, and the Perils of Science's Highest Honour*, W.W. Norton, 2018.
3. Dirac Medal of Salam ICTP (2002), Breakthrough Prize (2012), Kavli Prize (2014). See also ref. 1.
4. Steinhart, P. J., *Sci. Am.*; Guth, A., *Sci. Am.*, 2017; <https://physicstoday.scitation.org/doi/10.1063/PT.6.3.20170605a/full> (accessed on 12 December 2018).

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Immunological Techniques using Fish Model: A Laboratory Manual. R. Dinakaran Michael. Notion Press, 38/6, Mc Nichols Road, Chetpet, Chennai 600 031. 2018. xvi + 120 pages. Price: Rs 250 (student version – B/W); Rs 350 (Institutional Version – Colour).

This laboratory manual on immunology for teaching undergraduate and postgraduate life sciences, veterinary and fisheries courses has come at a time when there are restrictions on using several laboratory animal (mammalian) models and when no worthy immunology laboratory classes are conducted for lack of appropriate guidance and approved animal houses in most of the institutions in India.

The author Dinakaran Michael, trained as a fish immunologist by the doyen of immunology in the country, V. R. Muthukkaruppan (Madurai Kamaraj University) pioneered teaching and research in immunology, and developed and implemented the fish model for laboratory exercises. The manual fills the vacuum in teaching laboratory immunology in India. It is similar to Western efforts such as Nuffield curriculum, but this fish model is thoroughly indigenous, non-controversial for animal activists and enables students to perform experiments and learn by themselves. The experiments are compact, comprehensive and well-laid, covering the whole gamut of immunology starting from basic to applied. The manual is structured in 11 chapters and 120 pages covering basic phagocytosis, innate immunity, vaccination, agglutination, precipitation, CMI, immunochemistry and also DNA tech-

niques such as identification of PCR genes and quantifying the gene expressions, i.e. expression profiling. The manual teaches step by step the preparation of solutions, experimentation and observing the results with suitable illustrations and references at the end of each chapter. It provides appropriate further readings (chapter 12), how to maintain fish in the laboratory, prepare the feed, procure the fish, preparation of solutions (chapter 13), and also a list of consultants and expertise from various parts of India trained by the author in these fish immunological techniques over a period of time, along with their postal address, e-mail and telephone/mobile numbers. The listing other experts is a rare gesture of a good teacher indeed. Should this be exercised in every field of the teaching and learning process, India would continue as a haven of knowledge.

The fish model is simple and easy to maintain in the laboratory by the students themselves, requiring less space. Also, it is easily available throughout the year and cheaper than maintaining an approved animal house. Michael has succeeded well in designing, experimenting and applying his ideas in teaching programmes. This manual is an outcome of his vast research experience in fish immunology. It is a handy, quality print with colour and B/W illustrations, affordably priced and also available through online resources though the price may be on the higher side for an average Indian science student. Video documentation of the procedures and making them available on YouTube will help teachers and students further in their teaching and learning process. I recommend that various universities and colleges in India and other developing countries make use of this manual in imparting hands-on training to students of immunology. Finally, I thank Michael for having written this useful manual for the teachers and students, and the future generations.

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