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Interpreting biomedical science: Experiment, evidence, and belief, Ülo Maiväli (Academic Press, Elsevier Inc., USA) 2015. 416 pages. Price: Not mentioned.

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This book attempts to have an interdisciplinary look including philosophical, biological and statistical aspects of evidence in biomedical research. In the first part (chapters 1-2) the author raises a question whether we need a science of sciences and goes on to defend that we need one such science. How some factors can endanger the quality of medical evidence, the hierarchy of the clinical evidence are also described. In chapter 2, the causality and truth are discussed along with the strengths and weaknesses of deductive and inductive principles. The philosophical perspectives of these and the solutions proposed by different philosophers are described. The role of correlation, concordance and regression techniques in establishing the causality in biomedical research is discussed with the pitfalls associated with such analyses.

The part II of the book (chapters 3-5) deals with study designs and their respective strengths and weaknesses, the concepts of population, sample, regression to mean phenomenon, *etc.* Chapter 3 concludes with suggestions on how to design an experiment. Chapter 4 dwells on the data and the evidence thereof with explanation of the various aspects of statistical testing; the P value, its interpretation and misinterpretations; the confidence intervals; and the likelihood. The ideologies behind

the frequentist and Bayesian philosophies are also comprehensively summarized. Chapter 5 deals with the details of Bayesian paradigm in statistical testing and concludes that the outcomes of research experiments depend on the quality of the methodological inputs, measurement errors, *etc.*

Part III (chapters 6-8) what the author calls as “The Big Picture” deals with the interpretation of results, highlighting the fluctuations of results from small sized studies; suggestions on how to win fame and influence people; seven commandments for the ‘unscrupulous’; looks at science as a social enterprise discussing the three perspectives from history, philosophy and sociology of science; role of bibliometrics in quantifying science, the most important prerequisite for a scientific career; and finally what can be done to fix the problems with science.

Though the book tries to cover varied aspects of science and scientific research, each briefly, it does not address the core issue of interpreting the biomedical experimental evidence adequately so as to have suggestions/ guidelines in simple words to a naïve biomedical scientist/research worker. In bio-medicine, there are different types of causal associations, namely, necessary, sufficient, risk factors. The author has put all types of evidences in one basket and put them against various arguments expounded by various philosophers. But these philosophical arguments are not equally applicable for these three types of causal associations. The aspects of scientific evidence and their limitations/ strengths are not new and have been very well described and articulated in clinical/medical and other circles. David Sackett, considered as the father of evidence-based medicine discussed and described various aspects of clinical research methodology highlighting the importance of clinical epidemiology which he called as a basic science for clinical medicine. Though these issues are equally applicable for any biomedical research, these have received no reference in this book.

Though the author does not address a particular reader group to whom the book would be useful, one would be disappointed if we consider the utility of the book for a practicing biomedical researcher, as many specific details of limitations/pitfalls of research methodological issues and the solutions thereof such as controlling of confounding, minimizing biases, *etc.*, are not addressed adequately. Too much emphasis is given on the role of chance alone. As many statisticians argue, the problem with P value lies in

how investigators interpret it rather than in P itself. There are many comprehensive resources available on all aspects of research methodologies for a learning researcher.

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