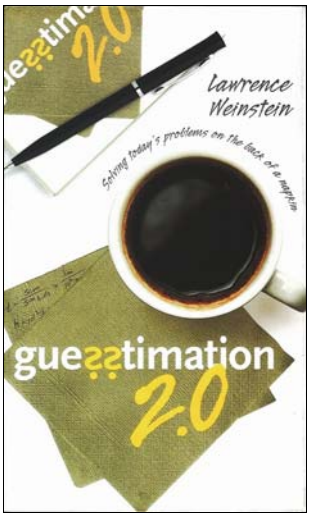

Guesstimation 2.0: Solving Today's Problems on the Back of a Napkin. Lawrence Weinstein. Princeton University Press, 6 Oxford Street, Woodstock, Oxfordshire OX 20. 359 pp. Price: US$ 19.

How many thoughts does a person generate in a lifetime? What is the wealth of my city? How happy will our country be in 2020? What will be our carbon footprint if we use solar power instead of fossil fuels? How many research papers are published per capita per hectare? Finally, how do you put the putative answers in perspective? Such questions have bothered me in my studies and teaching.

If such questions have bothered you, then you must read this book, a sequel to an earlier book by the author (L. Weinstein) and J. Adam with almost the same title. The napkin used in this book title is more general than the cocktail napkin of the earlier book.

The book is an innovative approach that guides you through the process of grappling with facts and figures. Challenges that arise in obtaining reasonable quantitative estimates have to do with insufficient input information, non-availability of direct models and absence of baseline reference models. Weinstein takes one through all these hurdles with the panache of a gifted science teacher. He takes one through the rough terrains of making informed guesses, counting things in more than one way, setting up verifiable model formulae and computing with paper and pencil plausible estimates. He achieves these via a set of example problems from the physical world around us, including on the one hand familiar societal scenarios and on the other hand, stellar objects. He acknowledges that some of the questions have been posed by students and colleagues. He provides a short list of generic references.

Weinstein categorizes the problems into topics ranging from frivolous generalia, recycling of physical resources, sensory perception, energy and transportation, planetary objects, strength of materials and electromagnetic radiation. At the very beginning, he sets right our notion of the average value by introducing the use of the geometric mean rather than the arithmetic mean. He shows the repeated use of the geometric mean value when we have reasonable estimates of the minimum and the maximum values.

The simultaneous quirkiness and seriousness of a university don shows up in the selection of problems and the lighthearted pedagogic style of exposition. Methodological rigour is never compromised, although some of the problems themselves may be construed as out-of-the-world. But such problems backed by results based on quantitative analysis, as shown by the author, help a great deal in defogging many of our perceptions.

Locavores claim to environmental sustainability is controversial. This is also typical of many contentious technological and societal issues. Through simple calculations he shows that per year 10 gallons to transport food pales in comparison with 500 gallons for sight-seeing. Can cooking oil, coffee grounds substitute for fueling our cars? He develops the sobering guesstimate that the bio-diesel equivalent of 10 ml of the first or 3 ml of the second source should be seen against the 2–4 l of diesel fuel consumed per capita.

There is a strong bias toward the application of basic physical laws. But that is in the nature of quantitative estimation through application of mathematical formulae capturing structural principles and properties of matter. It is quite easy to estimate (p. 30) that the height of a stack of a trillion one-dollar bills would occupy about a million cubic metres and weigh about a million tonnes. But one needs the application of certain basic laws of physics concerning force, energy, momentum and motion to get to heady questions on the vagaries and idiosyncrasies of planetary bodies. The author takes one through such excursions in a series of essays.

For example, could a meteorite have destroyed the dinosaurs? The answer is a negative surprise, as must have been for the dinosaurs – their day may have been prolonged by 0.01 sec. The environmental impact of profligacy of certain cultures on the issue of toilet tissue is not well-founded. This is quantitatively estimated. The last word on this problem, to put the result in perspective, is the author's whimsical take on the corresponding impact of the daily newspapers! That stars do not hold our destiny is well brought out in the short quantitative essay on computing the planetary tidal forces. That even our home planet cannot differentiate (or integrate (sic)) our destinies is another nugget of an observation by the author.

An interesting aspect of this book of many little bites is the tongue-in-cheek humour. The book is peppered with many evidences of this in the form of parenthetical comments, footnotes and punch-lines.

I have often found it useful to describe the large number computations of my research in relation to a tangible real-world scenario. One of my examples is the use of what I term the 'a desk-top PC year' for describing the work-factor of about 2^{56} machine clock cycles or instructions. The two appendices tell you how to cope with large numbers and how to get numbers in perspective, in a most delightful manner. The mass range of 10^{-30} to 10^{15} kg of the 24 descriptors, in Appendix B, invented by the author is indeed useful 'pegs to hang things on' (in the words of the author). A handful of typos (p. 4 simplity; p. 30 obsoelete) mar slightly the elegant publication and get-up of the book.

This is a delightful addition to the book-shelf of an eclectic. It is also a rejuvenating read for curious young minds. It is most welcome in this age of electronic contraptions that tend to diminish the human skills of guesstimation. The book would also be a refreshing shot in the arm for the STEM-challenged.

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