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Coincidence, Chaos and All That Math Jazz

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Coincidence, Chaos and All That Math Jazz presents selected mathematical concepts in an appealing, non-intimidating and amusing manner. Its aim is not mathematical entertainment, but rather to show math at its counter-intuitive best and to vanquish math anxiety. It addresses the ubiquity of mathematics in our everyday world – a subject much talked about, and recently discussed in Turin in an aptly-named and well-attended lecture by Alberto Conte, “The Explosion of Mathematics.” Mathematics is present where we expect it and can see it – cryptology, computer technology, in art and architecture – and where we don’t expect it and can’t see it: in the advanced technology of cell phones, in traffic control, in genetics. Mathematicians are delighted, and justly so, by the attention given to mathematics and mathematicians in the popular media, reflecting the “sex appeal” of mathematics as presented in movies such as “Good Will Hunting” and “A Beautiful Mind” and in books such as *The Da Vinci Code*. *Coincidence, Chaos and All That Math Jazz* is similar in concept to *Math and the Mona Lisa*, reviewed in vol. 7 no. 2 of the *Nexus Network Journal*, in that it provides a look inside ideas that have been superficially and therefore perhaps misleadingly treated in other popular contexts. Books such as these are relevant for the *Nexus* reader mainly because they almost invariably discuss the Golden Section, whose accuracies and inaccuracies of application are ever the source of debate. In this case, the discussion of the Golden Mean is an interesting case study.

The discussion starts with asserting the visual beauty of the golden rectangle, then goes into the Fibonacci series, discussed in the previous chapter, then finds a golden rectangle in the Parthenon and in a Grecian eyecup. Alarms started going off in my head already when I saw the figure of the Parthenon, and became louder at the figure of the eyecup, where the key points for the proportions of ϕ had nothing to do whatsoever with how the artisan crafted the object. On the very next page, however, the authors make good, by pointing out the subjectivity of the coincidences of the sides of the determining rectangle with significant elements of the Parthenon (for instance, their rectangle rests on the second step of the base; had it rested on the top step, of course, it wouldn’t have fit. The authors might have done well to point out that any number of rectangles could be drawn relative to the Parthenon in a variety of scales, and then refer to Chapter One, their own chapter on randomness, to state that if enough rectangles are generated, some of them will certainly be Golden Rectangles. As Livio Volpi Ghirardini and Marco Frascari pointed out in their presentation at *Nexus* 1998, this is all the proof that ϕ -lovers need; it’s only a problem for those of us who remain sceptical. Having raised a red flag as to the subjectivity of

finding the Golden Section, the authors then leave it up to the reader to decide whether or not there are Golden Rectangles in paintings by Seurat, Mondrian and Leonardo. I thought they somehow shirked their responsibility here.

The presence or not of the Golden Mean in music is also discussed, but pretty unconvincingly: “The length of the entire prelude is 129 seconds, and the length of time between the beginning of the piece and that fantastic fortissimo at bar 70 is 81 seconds. Dividing those two quantities yields 1.592..., which is impressively close to the Golden Ratio of 1.618...” (p. 130). But is it indeed impressively close? It is a 1.6% error; in such a small measure as 129, 80 would have been a closer approximation than 81. The 1.592 value argues more strongly for the ratio of 5:8 than it does for the Golden Section. We have heard this kind of argument many a time in the analysis of architectural monuments; it simply points to the relative impossibility of affirming the intentional use of the Golden Mean as a design or compositional tool, unless, of course, the architect or composer is living and can state his intentions.

It’s those *formulae* that are so off-putting in mathematics, isn’t it? If we could just get rid of the formulae, math would be ever so much more appealing. I discussed this in my review of *Math and the Mona Lisa*, where the formulae were relegated to the appendix in order not to bore or intimidate the lay reader. Here authors Burger and Starbird have tried very hard – and have almost entirely succeeded – to eliminate formulae. This leads to some paragraphs of this type: “First we note that 3 squared is 9, minus 2 yields 7. Next 7 squared is 49, minus 2 is 47.” Is that really easier and less intimidating than “ $3^2-2=7$, and $7^2-2=47$ ”?

In my mind both the treatment of the Golden Section and the attempt to eradicate formulae raise the question of rigor. In order to make the mathematical concepts clear, rigor is often sacrificed (if there is anything besides a formula to turn off the layman’s interest, it is a proof). But to mathematicians, it is precisely the rigor that leads to beauty in mathematics. It could perhaps be explained to the layman as similar to listening to Ella Fitzgerald sing scat: as long as she starts out slow, most of us can hum or sing along, but when she really gets going, very very few can keep up. But that doesn’t mean that Ella’s music isn’t incredibly beautiful: you wouldn’t want her to limit herself to singing just the easy parts so that we mortals can do it too.

One last disappointment is there are no indications as to further reading on the topics presented. A bibliography would have been very useful.

In spite of my reservations, however, there is plenty of interesting material here, and it is entertainingly presented. What comes across very clearly is that mathematics is not as mysterious and forbidding as it seems: it is rather based on very clear thinking. Those who strive valiantly to make math interesting to indifferent students will find inspiration in this book; it would be very well recommended to students who ask, “Why would I want to learn mathematics?” Many of the topics presented are relevant to Nexus themes: the Fibonacci series, continued fractions, tiling of the plane, fractals, topology, the fourth dimension.... themes that we always try to approach with scientific rigor, and/or searching for the right balance between rigor and popularization when didactics is concerned.

About the reviewer

Kim Williams is editor-in-chief of the *Nexus Network Journal*.