

Mathematical Luck

Andrew Aberdein

Humanities and Communication,
 Florida Institute of Technology,
 150 West University Blvd,
 Melbourne, Florida 32901-6975, U.S.A.
 my.fit.edu/~aberdein
 aberdein@fit.edu

Florida Philosophical Association Conference
 Daytona Beach, November 15th 2008

- (L1) If an event is lucky, then it is an event that **occurs in the actual world but which does not occur in a wide class of the nearest possible worlds** where the relevant initial conditions for that event are the same as in the actual world.
- (L2) If an event is lucky, then it is an event that is **significant to the agent concerned** (or would be significant, were the agent to be availed of the relevant facts).

Duncan Pritchard, 2005, *Epistemic Luck*, pp. 128; 132.

Varieties of Luck

Capacity Epistemic Luck It is lucky that the agent is capable of knowledge.

Evidential Epistemic Luck It is lucky that the agent acquires the evidence she has in favour of her belief.

Doxastic Epistemic Luck It is lucky that the agent believes the proposition.

Content Epistemic Luck It is lucky that the proposition is true.

Veritic Epistemic Luck It is a matter of luck that the agent's belief is true.

Reflective Epistemic Luck Given only what the agent is able to know by reflection alone, it is a matter of luck that her belief is true.

Duncan Pritchard, 2005, *Epistemic Luck*, pp. 134; 136; 138; 134; 146; 175.

Evidential Mathematical Luck?

The problem I chose for a ^{14}C tracer experiment was a Friedel-Crafts reaction that German chemists reported in 1892. Based on modern interpretations of Friedel-Crafts reactions, their results appeared to be questionable, and the experimental evidence was less than convincing. I saw a chance to confirm or deny their results using modern experimental techniques. Two such techniques were infrared analysis and gas chromatographic analysis; either of these would have given a dependable answer to the problem, and both were inherently simpler than ^{14}C radiochemical analysis. However, because of my interest in the new (to me) radiochemical ^{14}C technique, I decided to use this test of the old work. . . . If we had used infrared or gas chromatographic analysis of the experiment, we would have found that the original work was correct, as far as it went. However, using the ^{14}C technique, we discovered an unrecognized molecular rearrangement.

R. M. Roberts, 1989, *Serendipity: Accidental Discoveries in Science*, pp. 99 f.

Evidential Mathematical Luck?

Roughly speaking, group theory is to topologists what X-rays, or any type of radiation with a similar function, are to doctors. The body to be analyzed is of course a category of topological spaces, e.g., the category of simplicial spaces or the category of compact Hausdorff spaces, or what have you. The X-rays are in fact the analog of the type of functors whose domain is the category under investigation. The codomain category, e.g., the category of groups or of abelian groups, is the analog of the photographic plate. The image of the functor or functors is what topologists are interested in. . . . For instance, the homology functors H_n could be said to provide 'structural pictures' or 'projections' of a space in various dimensions: they tell us "how many" holes a space has in each spatial dimension.

J.-P. Marquis, 1998, 'Epistemological aspects of the application of mathematics to itself,' *Philosophy and the Many Faces of Science*, p. 188.

Andrew Aberdein

Mathematical Luck

Doxastic Mathematical Luck?

At that time, all my thoughts, like many other analysts', were concentrated on one question, the proof of the celebrated "Picard's theorem." Now, that formula **most obviously** gave one of the chief results which I found four years later by a much more complicated way: a thing which **I was never aware of until four years after**, when Jensen published that formula and noted, as an evident consequence, the results which, happily for my self-esteem, I had obtained in the meanwhile.

J. Hadamard, 1945, *An Essay on the Psychology of Invention in the Mathematical Field*, pp. 50 f.

Andrew Aberdein

Mathematical Luck

Content or Veritic Mathematical Luck?

History can vindicate one's logic, just as it can vindicate one's morality. At some point, **people just commit to patterns of reasoning**, and hope for the best. Georg Cantor had difficulty publishing his ground-breaking diagonal argument demonstrating that there are more real numbers than natural numbers. This pattern of reasoning bears a worrisome resemblance to the Liar paradox. Editors were concerned that the unorthodox argument was somehow fallacious. Cantor's diagonal argument eventually became an entrenched landmark of mathematical reasoning. **But it is not as if Cantor was in a position to predict that his argument would pass the test of time.**

Roy Sorensen, 1998, 'Logical luck,' *The Philosophical Quarterly*, 48, p. 332.

Andrew Aberdein

Mathematical Luck

Reflective Mathematical Luck?

The subjective experience of the qualities of proof as arising from meanings is similar to the ordinary speaker-hearer's impression that the grammar of his sentences turns on rules of thumb that he's (roughly) aware of. . . . **I've become convinced that this can't work.**

Jody Azzouni, 'Why do informal proofs conform to formal norms?' *Foundations of Science*, forthcoming.

Andrew Aberdein

Mathematical Luck