Selections From, Olsson, K. *The Weil Conjectures: On the pursuit of math and the unknown.* New York, NY Farrar Straus Giroux. 2019.

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The word conjecture derives from a root notion of throwing or casting things together, and over the centuries it has referred to prophecies as well as to reasoned judgments, tentative conclusions, whole-cloth inventions, and wild guesses. “Since I have mingled celestial physics with astronomy in this work, no one should be surprised at a certain amount of conjecture,” wrote Johannes Kepler in *his Astronomia* Nova of 1609.”This is the nature of physics, of medicine, and all the sciences which make use of other axioms beside the most certain evidence of the eyes.” Here conjecture allows him to press past the visible, to sacrifice the certainty of witnessing for the depth and predictive power of theory. There’s another definition of conjecture that means something inferred from signs or omens (for example, from a Renaissance work on occult philosophy: “Whence did Melampus, the Augur, conjecture at the slaughter of the Greeks by the flight of little birds…”).

Elsewhere it’s hokum, claptrap, bull: “Conjecture, which is only a feeble supposition, counterfeits faith; as a flatterer counterfeits a friend, and the wolf the dog” wrote one early Christian theologian. So it’s a word with contradictory meanings since at times conjecture carries the weight of reasoning behind it, and at other times it’s a wild statement, an unfounded claim. Good thinking or bad, clever speculation or a reckless mental leap.

In contemporary mathematics, conjectures present blue-prints for theorems, ideas that have taken on weight but haven’t been proved. Couched in the conditional, they establish a provisional communication between what can be firmly established and might turn out to be the case. More than a guess, conjecture in this sense is a reasoned wager about what’s true.

A rough draft. A trial balloon. It seems to me laced with optimism, a bullishness about what could, in the future, come more fully to sight.

P 54

Strategies for tackling problems, from Polya’s *How to Solve it*: Do you know a related problem. Look at the unknown! Here is a problem related to yours and solved before. Could you use it?

But what about the problem of too many related problems? My weakness for juxtaposition: I’ll sense that one thing might be illuminated by another thing and go chasing the other thing. …For better or worse, a light paranoia goads me along. Maybe it’s all connected! This and this and this and – look, over there – that. There’s the bringing together of disparate elements that informs a conjecture, and then there’s the mental nausea brought on by the fact that there’s too much out there to know. Not grasping but googling. I can’t always tell one from the other.

Pp 95-6

At last Andre goes on the offensive,, that is to say, he answers Simone’s repeated requests with a long, technical description of some of this mathematical work, a treatise in the form of a letter. …He knows full well that she won’t understand these ‘thoughts”, as he calls the: “ I decided to write them down, even if for the most part they are incomprehensible to you. He plunges into a density of terms shouldn’t know, with only minimal efforts to say what he means by quadratic residues, nth roots of unity, extension fields, elliptical functions.

In the first have of his letter he sketches a historical context for his work, starting with the 109th century watershed in algebra, that leap by which mathematicians inverted the problem of solving equations within given domains by construing domains in which given equations had solutions. He alludes to a time when questions about numbers began to rub up against questions about equations or functions in new ways. “Around 1820, mathematicians (Gauss, Abel, Galois, Jacobi) permitted themselves, with anguish and delight, to be guided by the analogy between the division of the circle … and the division of elliptical functions,” he writes.

Anguish and delight! As he’s laying out his none too explanatory explanation of his research, Andre emphasizes the role of analogy in mathematics—which his sister might appreciate even if the rest of it flies right over her head. Here, analogy is not merely cerebral. The hunch of a connection between two different theories is something felt, a shiver of intuition. For as long as the connection is suspected but not entirely clear, the two theories engage in a kind of passionate courtship, characterized by “their conflicts and their delicious reciprocal reflections, their furtive caresses, their inexplicable quarrels,” he writes. “Nothing is more fecund than these slightly adulterous relationships.”

Analogy becomes a version of *eros*, a glimpse that sparks desire. “Intuition makes much of it; I mean by this the faculty of seeing a connection between things that in appearance are completely different; it does not fail to lead us astray quite often.” This, of course, describes more than mathematics; it expresses an aspect of thinking itself -- how creative thought rests on the making of unlikely connections. The flash of insight, how often it leads us off course, and still we chase after it.

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