

Why History?

Actually, the title should be “Why should a mathematician or a student of mathematics care about the history of mathematics since history doesn’t prove theorems and anyway Henry Ford said ‘History is bunk,’ so the history of mathematics doesn’t matter, right?” But thirty-seven word titles, however descriptive, are not customary. Nevertheless, the question is there: why bother with the history of mathematics?

The answer is *not* the terrific usefulness of history. That saying about those who do not know history being doomed to repeat it is correct enough, but it does not have much content since it is also correct that those who *do* know history are doomed to repeat it. Whether we know history or not, we make the same mistakes over and over again, as individuals, groups, and nations, from $\int \sin x \, dx = \cos x + C$ all the way on up. Do not look to history to increase your paycheck or happiness or decrease the number of your errors. It won’t.

However, there are other answers. One is that some mathematicians have had interesting lives, and it is good to know interesting things. Think of Galois! A genius, a revolutionary embroiled in politics, his paper lost by Fourier, his work not understood—Poisson said that one paper duplicated in parts some results of Abel and that the rest was incomprehensible—and dead at the age of twenty years and seven months from wounds received in a duel. The only

UNDERWOOD DUDLEY is professor of mathematics at DePauw University and is the author of the bestseller *Mathematical Cranks*.

reason that there has been no blockbuster movie about Galois is that solvable polynomial equations lack visual appeal. Besides Galois, there is Gerbert, the only mathematician ever to become Pope (Sylvester II). And Sophie Germain, who, when circulating her mathematical results, did not let on that she was a woman, one reason for that being how Gauss’ attitude toward her changed when he found out. And Gerhard Gentzen, starved to death by the Russians in Prague after the end of World War II. And Kurt Gödel, so shy that he delivered his lectures to the blackboard. And those are only among the Gs! Going back to the As, there is Abel’s pathetic search for a job, and

It is good to know about mathematical objects, but it is better to know where they came from and why they are studied.

Archimedes running down the street naked, yelling “Eureka!” (The point of that anecdote, by the way, is not that Archimedes was *naked*—male nudity was no big thing for the ancient Greeks—but that he, the dignified and renowned sage, was *running and yelling*.) There is the witch of Maria Agnesi, which is not a witch at all. And so on, all the way to the Zs—Zolotarev fell under a train, with fatal results. People are fascinating, and mathematicians are people.

You may dismiss all that as mere gossip, unworthy of serious attention. You would be wrong to do that, but even if you do there are other reasons for finding out about the history of mathematics. One is that it reminds us of something that many people ought to be reminded of, namely that mathematics is a human activity, done by people, and not something that was engraved

on stone tablets by some deity and handed down once and for all. God did not decree that the ratio of the circumference of a circle to its diameter be denoted by π . It was not until 1706 that William Jones thought of using that symbol. Similarly the square root of a number n has not always been designated by \sqrt{n} . Irrational and imaginary numbers have not always been as natural as they seem to us—their names show how disagreeable they were once found. Mathematics looks very smooth in the textbooks but that smoothness came only with a struggle, and with a lot of human effort put into ironing out the rough spots. Calculus has not always been universally accepted as incontrovertible truth. Bishop Berkeley said that derivatives were not to be trusted, being made up of “the ghosts of departed quantities.” Mathematics has changed and evolved. Quaternions were once hailed as a revolutionary advance, but it is now possible to get a degree in mathematics and know nothing at all about them. As we struggle with mathematics, and change as a result, we are in a sense recapitulating the history of the subject. We are at the end of the long chain of humans who have made mathematics what it is, and mathematics will not be finished with us. It is nice to realize that we are part of history.

Another advantage of knowing that history exists is the chance it gives to read the masters of the past. To see Euclid explain the Euclidean algorithm all in terms of line segments, with not an x or a y in sight (Book VII, Proposition 2) will, if nothing else, add to your admiration of Euclid. For another example, in his *Elements of Algebra*, Euler writes (part II, chapter 5, section 64)

The formula cz^2 can become a square only when c is a square; for the quotient arising from the division of a square by another square being likewise a square, the quantity cz^2 cannot be a square, unless cz^2/z^2 , that is to say, c , be one. So that when c is not a square, the formula cz^2 can by no means become a square; and, on the contrary, if c be itself a square, cz^2 will also be a square, whatever number be assumed for z .



Illustration by Gregory Nemeč

“Yes, yes, Leonhard,” you think, “that’s all quite clear, you don’t have to beat it to death.” But then, only four pages further on, without having encountered anything less clear, you find that you have shown that $5t^2 + (5n+2)u^2$ is never a square for any n . Euler has carried you along, so effortlessly that you are tempted to think that this must be really easy stuff, but the temptation should be resisted. What is actually the case is that Euler was a master at exposition. It can be instructive to see a master at work. Further examples could be given—those were taken just from the *Es*.

The reason for bothering with history that includes all the others is that you will live in a larger world. It is acceptable to think, as I am afraid many people unconsciously do, that mathematics has always been the way it is today, and that everyone has always studied groups and rings and ideals. But it is better to know that ideals originally were ideal numbers, devised by Kummer so that unique factorization would hold and progress could be made on Fermat’s Last Theorem. It is good to know about mathematical objects, but it is better to know where they came from and why they are studied.

It is better, by far, but it is not *necessary*. Squirrels don’t know history and squirrels, if asked, would probably say that, on the whole, they had fine lives. But—observe squirrels closely. Twitch! Jump! Scurry! Squirrels live in a world of random potential disasters. Squirrels are constantly in a state of panic. *Everything* comes as a surprise to a squirrel. The reason is that squirrels do not know history. They live in the present, they live in a small world. When they dash for the nearest tree when there is a clap of thunder they do not know that their hysteria is unnecessary because in the entire history of squirrels, not one squirrel has ever been injured by thunder. I’m glad that I’m not a squirrel. I’m glad that I know a little about the panorama and people of mathematics. I like living in a large world, one that extends into the past.

But, as I said, knowing about the history of mathematics is not necessary. You can ignore it if you want to and no one will mind, or even notice. Your career will be unaffected. The number of theorems you prove will probably be the same. You won’t even

know that you’re missing anything. If you want to be a squirrel all your life, go right ahead. ■

FURTHER READING: When a book reaches its sixth edition, it must have something going for it. *An Introduction to the History of Mathematics*, by Howard Eves (6th ed., 1990, Saunders College Publishing) is a fine introduction, filled with good things. For all its flaws, *Men of Mathematics* by E. T. Bell (1986, Simon and Schuster), remains intensely readable. It was first published in 1937 (when its title was more natural) and a book that stays in print for more than fifty years also must have something good about it. William Dunham’s *Journey through Genius* (1990, Wiley; 1991, Viking Penguin), presenting episodes in the history of mathematics, has been a critical and popular success. *Whom the Gods Love*, by Leopold Infeld (1948; reprinted in 1978 by the National Council of Teachers of Mathematics), the story of Galois, is one of the few historical novels written about a mathematician. The only other one I know of is Charles Kingsley’s *Hypatia*, but it is no longer in print and no longer readable. Euler’s *Elements of Algebra*, translated into English by John Hewlett and published in 1840 was reprinted by Springer-Verlag in 1984. Finally, browsing through a library in the vicinity of the QA21s can do no harm and may do some good.