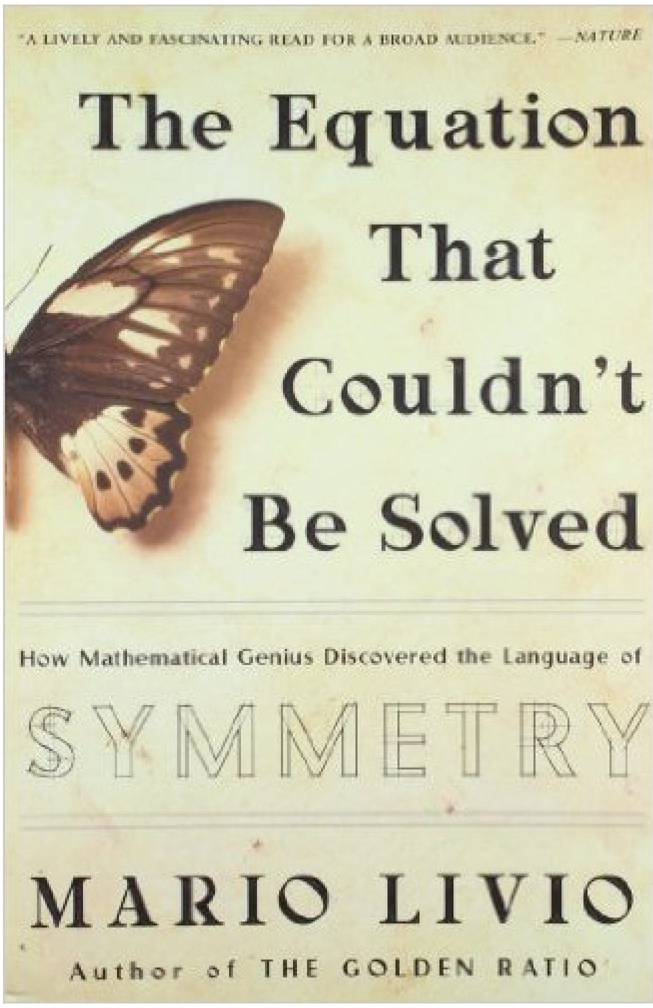
# The Equation That Couldn't Be Solved: How Mathematical Genius Discovered The Language Of Symmetry



## Synopsis

What do Bach's compositions, Rubik's Cube, the way we choose our mates, and the physics of subatomic particles have in common? All are governed by the laws of symmetry, which elegantly unify scientific and artistic principles. Yet the mathematical language of symmetry-known as group theory-did not emerge from the study of symmetry at all, but from an equation that couldn't be solved. For thousands of years mathematicians solved progressively more difficult algebraic equations, until they encountered the quintic equation, which resisted solution for three centuries. Working independently, two great prodigies ultimately proved that the quintic cannot be solved by a simple formula. These geniuses, a Norwegian named Niels Henrik Abel and a romantic Frenchman named Ã‰variste Galois, both died tragically young. Their incredible labor, however, produced the origins of group theory. The first extensive, popular account of the mathematics of symmetry and order, The Equation That Couldn't Be Solved is told not through abstract formulas but in a beautifully written and dramatic account of the lives and work of some of the greatest and most intriguing mathematicians in history.

## Book Information

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## Customer Reviews

Mario Livio's title suggests an exploration of unsolvable equations, in particular the drama enshrouding the mathematical conundrum of solving general, fifth degree polynomial equations, known as quintics. His subtitle, "How Mathematical Genius Discovered the Language of Symmetry," indicates that his work will also explore the role of symmetry in ultimately resolving the question of whether such polynomials could be solved by a formulas using nothing more than addition, subtraction, multiplication, division, and nth roots. These two subjects portend an interesting discussion on the solvability of equations and the peculiar mathematical race in Renaissance Europe to "discover" the magical formulas for solving cubics and quartics.One could reasonably expect that the groundbreaking work of Tartaglia, Cardano. Ferraro, Galois, Abel, Kronecker, Hermite, and Klein would be encompassed in this survey, and indeed they are. However, purchasers of this book are given no indication that they will spend well over half their reading time on rehashes of Abel's tragic life story and the mythology of Evariste Galois's foolish death, Emmy Noether's challenges as a woman mathematician in Germany, a history of group theory, Einstein's theory of relativity, the place of string theory in modern cosmology, the survival benefits of symmetry in evolution, Daniel Gorenstein's 30-year proof that "every finite simple group is either a member of one of the eighteen families or is one of the twenty-six sporadic groups," a trite and unnecessary diversion on human creativity, and finally, an even more outlandish (and utterly inconclusive) "comparison" of Galois's brain with that of Albert Einstein.

I became interested in this book for several reasons. The first is that I find Livio to be an entertaining writer. I read his book on phi and its relationship to beauty and found it interesting and enlightening. I have reviewed that book on  earlier. I met Livio in Princeton a little over a month ago when he gave a lecture on symmetry at the Princeton Plasma Physics Laboratory in one of a series of lectures intended for high school students. It was a fascinating presentation and he briefly discussed the book, mentioning how his research into the death of Galois led him to a new theory about how he died in the duel and who killed him. I found this very intriguing and I wanted to read about it.As a college undergraduate I majored in mathematics and modern algebra was my favorite subject. The course I took on Galois theory was the most fascinating to me and I marveled over the fact that a teenage boy had developed a branch of group theory that answered questions that had stumped the greatest mathematicians for centuries.So I bought the book and read it with very high expectations. I preface my remarks this way because I was somewhat disappointed in the book and my disappointment leads to my criticism here. But I don't want the critcism to detract from the fact that it is a well written and researched book and written in a style that like his other books makes it accessible to the general public and even the highly motivated high school students.First of all the title leads you to believe that it is completely about the solving of the problem for which polynomials can be solved by radicals (i.e. equations that only involve basic arithmetical operations a roots, e.g. square cube roots etc,)and which ones cannotbe so solved.

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