

On The Foundational Crisis in Mathematics

Dr. Robert Lowe

Division of Mathematics and Computer Science
Maryville College

Bernhard Riemann

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17 September 1826 - 20 July 1866

- Contributed to Number Theory, Analysis, and Differential Geometry



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- Wanted to make a rigorous foundation of mathematics grounded in set theory.
- His essay was the starting point for Cantor's work.



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Georg Cantor

Georg Ferdinand Ludwig Philipp Cantor

3 March 1845 – 6 January 1918

- Proved that the real numbers are uncountable.

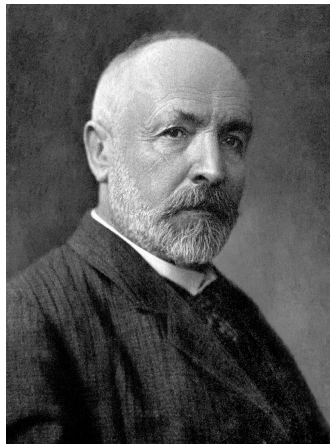


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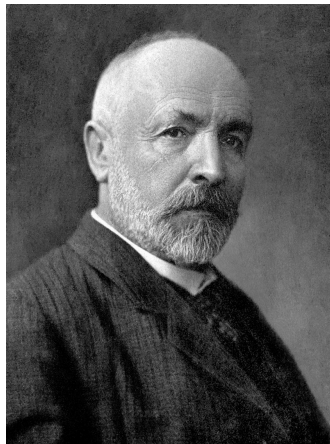


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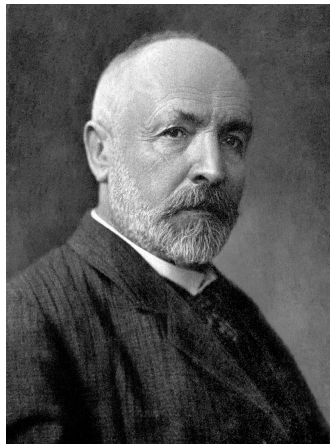


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- Proved that there is no largest cardinal number.
- Foundation of theory of infinite sets.
- Cantor's Paradox: The set of all sets is its own power set. Therefore the cardinal number of the set of all sets is bigger than itself. (Source: Wolfram Math World)

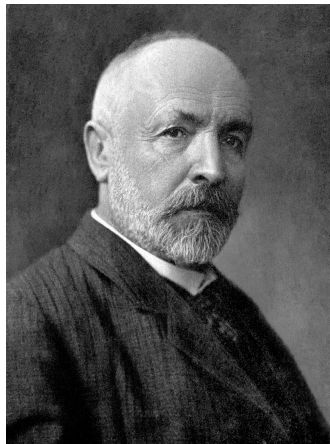


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- Invariant theory, Calculus of Variations, Commutative Algebra, Algebraic Number Theory, Foundations of Geometry, Spectral Theory of Operators, Mathematical Physics, and Proof Theory
- Started as a logicist, later founded formalism.



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27 February 1881 – 2 December
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- A mathematical statement corresponds to a mental construction, and a mathematician can assert the truth of a statement only by verifying the validity of that construction by intuition. –*L.E.J. Brouwer*



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Bertrand Arthur William Russell, 3rd
Earl Russell

18 May 1872 – 2 February 1970

- Philosopher, Mathematician,
Essayist, Social Critic, Swell Guy

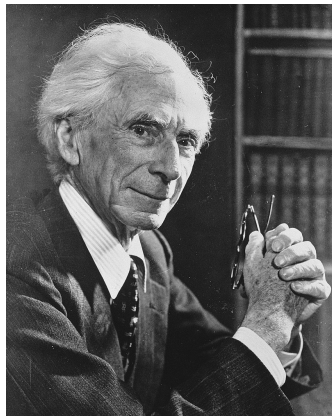


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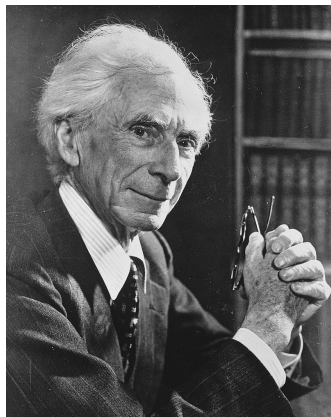


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- Sparked considerable interest in formal logic through his works pertaining to the foundation of mathematics.

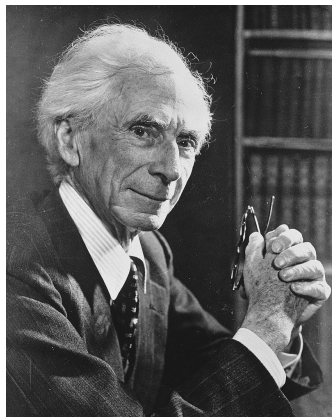


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- Worked with Russell to produce
Principia Mathematica.



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- A Friend of Albert Einstein
- Known for his Incompleteness Theorems
- Basically proved that Hilbert's program was not realizable.



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Alonzo Church

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14 June 1903 – 11 August 1995

- Mathematician, Logician, and Computer Scientist
- Doctoral Advisor of Alan Turing
- Created λ -Calculus which formalizes computation.
- Proved that the Entscheidungsproblem was undecidable.



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Alan Turing

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23 June 1912 – 7 June 1954

- Logician, Cryptographer, Mathematician, Father of Computer Science

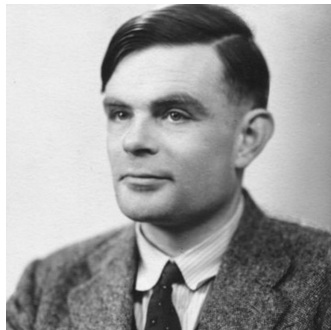


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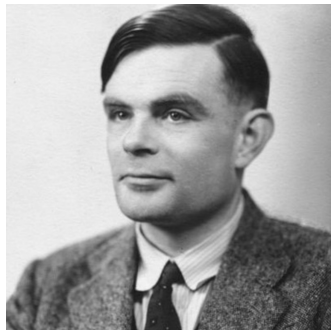


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- Part of the Group that broke the German enigma code.
- Famous for “Turing Machines” which formalizes computation and proved the undecidability of the Entscheidungsproblem.

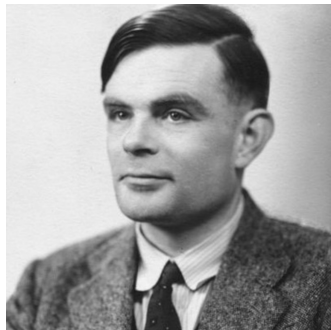


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