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## COLLOQUIUM

# The Skolem Problem

Prof Florian Luca

(Stellenbosch University & Max Planck Institute for Software Systems)

**DATE:** Monday, 1 September 2025 | 16h00–17h00 SAST

**VENUES:**

- **Stellenbosch University:** Neelsie Cinema
- **University of the Witwatersrand:** Room P215, 2nd Floor, Physics Building
- **North-West University:** Seminar room K310, Physics building G5
- **Online**

--- A recording of the talk will be published on the NITheCS YouTube channel afterwards ---

### ABSTRACT

The Skolem Problem asks to determine whether a given integer linear recurrence sequence (LRS) has a zero term. This problem, whose decidability has been open for many decades, arises across a wide range of topics in computer science, including loop termination, formal languages, automata theory, and probabilistic model checking, amongst many others.

In the talk, we will present the history of the problem and review the state of the art. Also, we introduce the notion of "large" zeros of linear recurrence sequences. We show that such zeros are very rare and in fact there shouldn't be any according to the Cramér model concerning the distribution of primes. We therefore conjecture that large zeros do not exist, which would entail the decidability of the Skolem Problem.

This research is joint work with J. Ouaknine (Max Planck) and J. Worrell (Oxford), supported in part by the 2024 ERC Synergy Project DynAMiCs.

### BIOGRAPHY

Florian Luca (born 16 March 1969, in Galați) is a Romanian mathematician who specialises in number theory with emphasis on Diophantine equations, linear recurrences and the distribution of values of arithmetic functions. Luca graduated with a BS in Mathematics from the Alexandru Ioan Cuza University in Iași (1992), and a PhD in Mathematics from the University of Alaska Fairbanks (1996). He has held various appointments at Syracuse University, Bielefeld University, Czech Academy of Sciences, National Autonomous University of Mexico and the University of the Witwatersrand. Currently he is a professor at Stellenbosch University. He has co-authored over 800 papers in mathematics with more than 350 co-authors and several books. He has received numerous awards, such as an Alexander von Humboldt Fellowship in 1998, a 2005 Guggenheim Fellowship for Natural Sciences in Latin America and Caribbean in 2005 and a CNRS Ambassador Fellowship in 2024. He is a member of the Academy of Science of South Africa and of the African Academy of Sciences. He has been twice A-rated by the National Research Foundation (2015 and 2022).



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