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Event Award ceremony Brouwer Medal 2017

Laudation for Kenneth Ribet

At NMC 2017, on 11 April, the Brouwer Medal had been awarded to Kenneth Ribet for his contributions to number theory, in particular for the groundbreaking work in which he applies methods of algebraic geometry to number theoretical problems. This work later became of decisive importance for the proof of Fermat's Last Theorem.

This speech was pronounced at the event by Hendrik Lenstra, chairman of the Brouwer Medal Committee. An interview with Kenneth Ribet is published hereafter.

Ladies and gentlemen!

My name is Hendrik Lenstra, and I served as the chair of the 2017 Brouwer Medal Committee that was appointed by the Board of the Koninklijk Wiskundig Genootschap. The other members of the committee were Gunther Cornelissen, from Utrecht; Ronald Cramer, from the CWI in Amsterdam; Jan-Hendrik Evertse, from Leiden; Lenny Taelman, from the Universiteit van Amsterdam; and Jaap Top, from Groningen.

I wish to give account of the work done by the committee and the considerations that applied to the candidate that was selected. I have to warn you that there are limits on what I will be able to tell you. Many years ago I attended a laudation that was pronounced on an earlier Brouwer Medalist. The speaker enumerated many wonderful results that had been achieved by the candidate. And he concluded that 'therefore' the prize could *only* be awarded to this candidate. It struck me, at the time, that this was not a logical conclusion. Saying that 'only' one particular person deserves the prize, is a statement about all *other* candidates, and not about that particular person.

Not so long ago, during a reception following the Abel Prize ceremony in Oslo, King Harald of Norway asked the Abel Prize Committee how they had selected the prize winner. The answer of the committee was: Your Majesty, we considered all members of the entire world population, and we eliminated them one by one, until only one person was left.

That is, essentially, also the way the Brouwer Medal Committee proceeded. So, if you want to hear more about this year's prize winner, I shouldn't say more about the work of the committee. But I do want to tell you which criteria we applied.

There are two official criteria. The first is that the candidate should be an 'internationally authoritative mathematician' in the area of number theory in the broad sense; number theory, because that is the area that the Board of the Koninklijk Wiskun-

Photo: Gil Cavalcanti

Ken Ribet (left) receives the Brouwer Medal from Erik van den Ban, chairman of the Koninklijk Wiskundig Genootschap

Photo: Gil Cavalcanti

Ken Ribet with his wife Lisa Goldberg

dig Genootschap had selected for the 2017 Brouwer Medal. And the second criterion is that the candidate is able to give a lecture on his field that is of interest to a general mathematical audience.

There is a third, very informal criterion that the committee decided to apply, guided by the tradition of the Brouwer Medal. There are many prizes in mathematics, and they go to a relatively small number of excellent mathematicians. If you want your prize to be different from other prizes, then you should consider candidates whose work is more important than might appear from the number of prizes they have won. And that is what we did.

I want to mention two achievements of Ken Ribet in number theory that played an important role in the considerations of the committee.

The first is the Herbrand–Ribet theorem, which you just heard about in the Brouwer Lecture. It dates from 1976, and it represented, at that time, a methodological breakthrough. It used, for the first time, techniques from algebraic geometry to solve an important problem in algebraic number theory. Suddenly all algebraic number theorists had to learn algebraic geometry. The paper has been enormously influential.

Ken's second achievement I want to mention is the epsilon conjecture, which he proved in 1986, and which is now called 'Ribet's level lowering theorem'. I will not attempt to explain what it says, but it played a key role in the proof of Fermat's Last Theorem, and did later develop into a standard tool for solving exponential diophantine equations. When you arrange the proof of Fermat's Last Theorem 'in its natural order', then Ken's result is the last one that you apply. So some commentator remarked that it was really Ken Ribet who completed the proof of Fermat's Last Theorem, and not Andrew Wiles.

I like to mention a third achievement of Ken Ribet, not because it played a role in the committee's deliberations, but because, when I was Ken's colleague in Berkeley, I witnessed how it came about, and it gives you some insight into how Ken operates. (You may know that one mathematician in Berkeley got famous by doing his mathematics 'on the beaches of Rio', but that was not Ken.) One day, Ken found that he needed a certain statement about group representations, and he decided to ask one of our postdocs, who was a specialist in group theory. Now you should know that this postdoc had the habit of thanking God in his papers for leading him to the proofs of his theorems. I always felt that this was a rather frivolous thing to do, since I don't believe that God is a specialist in proofs; after all, He knows already what is true and what is not true, and He doesn't *need* proofs. And indeed, when the postdoc claimed he had solved Ken's problem, and gave a seminar lecture about it, it turned out that his solution was full of mistakes. After the lecture, we had a brief discussion about the problem, and Ken went back into his office. He started playing a computer game, I believe it is called 'Tetris'. It is a game in which little blocks fall down, and in my office, a few doors down the hall, I could almost hear them falling. After a while, Ken emerged from his office, and to my surprise he showed me the solution to his problem! It gave rise to a nice little paper, which has the peculiar property that its first half is written in French and the second half in English.

I trust you will agree that someone who beats God just by playing Tetris deserves nothing less than the Brouwer Medal.