PROPOSAL NUMBER.: 0100403
INSTITUTION: Temple University
NSF PROGRAM: ALGEBRA,NUMBER THEORY,AND COM
PRINCIPAL INVESTIGATOR: Zeilberger, Doron
PROPOSAL TITLE: Symbolic Computation and Combinatorics

PANEL SUMMARY:

What is the matter

The PI is one of the leaders in enumerative combinatorics. He has a subtle understanding of the suggested problems which are appreciated to be of fundamental importance. His work on symbolic computation solidly belongs with the most exciting recent work in the area. Zeilberger's work has been outstanding, generating not just new results, but also general techniques which may be effectively applied to other problems.
In addition, the PI had recently graduated some students who certainly benefited from working in this new important area.
Zeilberger is a highly regarded expert in his area, doing excellent current research. We recommend strongly that the proposal be funded.

PANEL RECOMMENDATION:
Recommendation Key: Fund = F, Fund If Possible = FIP, Do Not Fund = DNF

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TITLE: Symbolic Computation and Combinatorics
RATING: Excellent

REVIEW:
What is the intellectual merit of the proposed activity?

The proposal includes several extensions to the authors previous work
automating computer proofs of hypergeometric identities and enumeration. The line of work has
the potential of revolutionizing mathematics. Under the previous grant, these methods have
proven huge results (some also proven by humans) including the alternating sign matric
conjecture, Conway's lost cosmology theorem, Chan-Robbins conjecture, Beukers conjecture, and
a conjecture of Graham.

The proposed extensions would be applicable to Macdonald's constant term identities, the Mehta
integral, and the Selberg integral.

What are the broader impacts of the proposed activity?

The software produced by the author and his students is used across the world by mathematicians
and physicists. "Currently, the National Institute of Standards and Technology is wiring the
classic handbook of mathematical functions by using WZ theory as its driving force."

Summary Statement

This proposal must be funded.

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RATING: Excellent

REVIEW:
What is the intellectual merit of the proposed activity?

The proposer is one of the world's leading figures
in enumerative combinatorics. HIs work on machine-
assisted methods has been brilliant, creative, and
always exciting. He has been responsible for
really major breakthroughs in the past, and this
shows comparable promise for producing more work
of comparable impact. He is an especially good
mentor and caring supervisor of graduate students.

What are the broader impacts of the proposed activity?

Summary Statement

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RATING: Very Good

REVIEW:
What is the intellectual merit of the proposed activity?

The PI, especially with Wilf, has built up an intriguing and powerful
mechanism for computer generated proofs of (mostly) combinatorial
identities. This is a somewhat controversial approach and this
reviewer does not fully share the PI's optimistic appraisal of the
importance of the work. But his enthusiasm and selfconfidence work
well in this case. We also note how this enthusiasm is transmitted
to his collaborators and students. And there is no doubt that the
general notion of computer symbolic manipulation packages is here to
stay. Most important, the WZ theory already has a good number of
notable successes.

What are the broader impacts of the proposed activity?

Symbolic Computation is already here to some extent but many believe
that over the next generation it will change the way mathematicians
persue their craft. HAL, are you there?

Summary Statement

An exuberant PI with a somewhat controversial approach that already
has had much success.

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