Laudatio (“Hallel”) for Moshe Vardi

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Saarbrücken, March 2002

Some Biographical Highlights

- 1981 Ph.D. in Computer Science, Hebrew University. Thesis: The Implication Problem for Data Dependencies.
- 1981–1983 Postdoctoral Scholar, Stanford University.
- 1983–1993 Visiting Scientist, Research Associate, Research Staff Member, Second-Level Manager, IBM Almaden Research Center.
- 1993–Present, Rice University, Chairman and Chaired Professor.
- 1987 IBM Research Outstanding Innovation Award, Theory of Knowledge.
- 1989 IBM Research Outstanding Innovation Award,
  Automata-Theoretic Approach to Program Verification.
- 1992 IBM Research Outstanding Innovation Award, Zero-One Laws.
- 2000 Gödel Prize on Automata-Theoretic Approach to Verification (with P. Wolper).
- 2002 Member U.S. National Academy of Engineering.

Moshe Contributed Significantly to 4 Important Areas:
1. Logical Theory of Data Bases

- Foundation for evolution of data-bases from simple manipulation of unstructured data towards intelligent systems with deductive capabilities.
- Logical view of data bases as a finite model of logical formulas (the queries).
- Trade-offs between expressiveness of the query language and the complexity of query evaluation.
- His research was fundamental for many areas of data-base theory such as integrity constraints, complexity of query evaluation, partial information in data bases, and data-bases updates.

2. Logic of Knowledge

Together with Halpern, Fagin, and Moses, Moshe founded the modern computational logic of knowledge. This has many applications in economics, linguistics, and AI, but most impressively, it has been applied for the design, analysis, verification, and synthesis of distributed and fault-tolerant systems.

Together they founded the first interdisciplinary conference on Theoretical Aspects of Reasoning about Knowledge (TARK), which has been taking place regularly since 1986.

3. The Automata-Theoretic Approach to Verification

- Together with P. Wolper, Moshe demonstrated that all the questions arising in the important field of finite-state system verification can be solved effectively and efficiently, by using the powerful tool of finite-state automata over infinite objects.
- Why reinvent the wheel, when we can use the old and tried methods of automata?
- LTL model checking can be solved by automata over infinite words. CTL verification can be performed by automata over infinite trees.
- Moshe and Pierre won the Gödel award for this pioneering work.
- This activity revived the interest in automata theory and led to important new developments and significantly improved algorithms. A case in point is the extensive developments of alternating automata over words and trees.

4. Contributions to Finite Model Theory

- Finite-model theory is an appropriate framework for studying the logical properties of finite structures such as graphs, transition systems, and data bases.
- Fundamental complexity-theoretic properties turn out to be equivalent to problem formulation in finite model theory.
- A case in point is Moshe's PTIME characterization of model checking for predicate logic with fix-point operators.
- Another class of results by Vardi and Kolaitis concern limits and convergence properties of logical statements about finite graphs. They showed for example that several classes of NP properties have a 0-1 law, i.e., are asymptotically either always true or always false.

In Summary

- Vardi's scientific work is impressive in depth and variety.
- He has about 200 publications in journals and conferences.
- He has presented 50 invited lectures and key-speeches at prestigious conferences.
- And participates in steering and program committees of as many conferences (disjoint from the above 50).

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- He has about 200 publications in journals and conferences.
- He has presented 50 invited lectures and key-speeches at prestigious conferences.
- And participates in steering and program committees of as many conferences (disjoint from the above 50).
- Moshe is a true scholar and a formidable theoretician, but first and most an applied (or should I say effective) logician. Always motivated by real problems that have to be solved, preferably using good mathematics!

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Moshe Vardi, Logic and Automata: A Match made in heaven

He probably meant:

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I personally salute Saarland University at Saarbrücken for choosing such a worthy candidate for receiving the degree of an honorary doctorate.