Houstonian joins academy to which Washington, Jefferson and Franklin once belonged

By AARON HOWARD • Thu, Oct 07, 2010

A Houstonian will be honored this weekend, along with 229 outstanding Americans in academia, the arts, business and public affairs with induction into the American Academy of Arts and Sciences. Dr. Moshe Vardi, the Karen Ostrum George Professor in Computational Engineering at Rice University, will join nominees such as actor Denzel Washington, film director Francis Ford Coppola, theologian Harvey Cox Jr. and Microsoft’s chief software architect Ray Ozzie as one of the Academy’s 2010 Fellows.

Membership in the American Academy of Arts and Sciences currently consists of some 4,000 fellows and 600 foreign honorary members. These include more than 200 Nobel Prize laureates and 50 Pulitzer Prize winners; more than 100 MacArthur and Guggenheim fellows; and numerous Grammy, Tony and Oscar award winners. The Academy was founded in 1780; early Academy members included George Washington, Thomas Jefferson and Ben Franklin.

Vardi is best known as co-author of a book on epistemic logic, “Reasoning About Knowledge.” His book and two of his published papers on computer-based problem-solving have received more than 1,000 academic citations.

Epistemic logic is the logic of knowledge. What can we know? Vardi points out that reasoning about the knowledge of any group can involve distinctions in a number of states of knowledge. “The Muddy Child Puzzle,” a well-known type of logic puzzle that uses the process of inductive reasoning, is one example.

The puzzle works like this: Five children are playing in a muddy yard. Mom comes out and warns the kids not to get mud on themselves, or they will be punished. During their play, some of the children get mud on their foreheads. The children can see each other, but not the mud on their own foreheads. So, they do not know if they are muddy. Mom comes out, looks at them and announces: “At least one of you is muddy. Do you know if you have mud on your forehead?”

The children don’t. However, after asking the same question five times, the children will be able to figure out who has the muddy forehead. So, the question is: How did they know? How could they figure it out?
“If there is one child, then immediately the first time the child will reason: it is me,” said Vardi. “Now suppose there are two children, Moshe and Aaron. Moshe might say the following: Suppose I am not muddy. Aaron will look at me and say that he is muddy. If I’m muddy, then Aaron could not figure out anything. Aaron thinks the same way.

Thus, the first time, neither of them can figure out if they are muddy. But, with the second questioning, they both can infer from the negative answer in the first round that he must be muddy. If there are five children, they will figure out that the problem in the fifth round of questioning.”

An elegant puzzle, but of what possible use? Vardi’s book goes on to say that reasoning about knowledge of other people (epistemic reasoning) is a key in many situations. Examples include diplomacy, bargaining, economics and computer science.

Said Vardi: “In any situation where you have multiple agents – that includes robots, computers or people – and they are trying to act as a group, we have to engage in epistemic reasoning. In fact, the book was co-written by four of us. So, we had to engage in epistemic reasoning to finally agree on what would be in the book.

“I know this model of reasoning has been used by people who design coordination protocols and by people who build distributed computing systems (computers that have to coordinate to problem solve). It gives you a framework for thinking. Citations that employ this framework are spread all over the place, from philosophy to economics to computer science. We have attempted to give people a vocabulary to analyze a host of situations.”

Far away from the world of computers, one might imagine using Vardi’s model in Middle East diplomacy, for example. You start negotiations by asking: What do the sides know about each other? Then, you game the second level: What do they know about what they know about each other? And then, if you’re really good, you can take it to the third level: What do they know about what they know about what they know about each other? Vardi said that the espionage writer Tom Clancy actually explored this kind of reasoning in one of his books.

Academy induction ceremonies will be held Oct. 8-10 in Boston. The program includes a cultural reception Friday, celebrating arts and humanities with actor John Lithgow and author Marilyn Robinson. The induction will be held Saturday afternoon, followed by a social evening. The Sunday program includes an academic event, ‘The Future of Cultural Communication.”

The 2010 fellows get to meet each other informally at the Saturday night social. Any room that mixes actor Steve Martin, CNN’s Christiane Amanpour, climate change expert Christopher Field, jazz saxophonist Sonny Rollins and epistemic logic modeler Moshe Vardi should be full of intelligent and witty conversation.
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