In this issue

Do Machines Mind?
Automating thought

On the Indian Republic Day this year, 26th January, Marvin Minsky died. But his thoughts did not. It is the same case with Alan Turing and John von Neumann. Their thoughts too, are not limited by biological life spans. And they all asked: can machines think?

Thought is a noun. Thinking is a verb. So we could reformulate the question: can we build machines that are 'able to dwell in a space of discovered areas, for the purpose of uncovering new frontiers for a given context, situation, task, wherein tools used for overall discovery/uncovering are not unknown, but their results are, in an autonomous manner?'

Pursuit of Artificial Intelligence has refined the very definition of thought – subject matter that was, hitherto before, in the realm of Philosophy. A General Article on **page 776** of this issue distils the thoughts of the stalwarts that spawned the information age and clarifies the concepts. Humans (and to some extent, other animals) synthesize bits of information into knowledge and solve today's problems on the basis of yesterday's knowledge and even look for missing pieces of information, if needed.

So far, computers were able to beat humans in Go and chess – games which have clear cut rules. But can we make machines that invent such games?

Nuclear Forensics
Clever ways to nab culprits

If you want to repeat the Manhattan Project today, it will not take as much time and effort as it took seventy years ago. Even not-so-developed countries and terrorist groups can embark on the project. The knowledge needed leaks, percolates. And the materials needed may also be pilfered.

Stolen nuclear materials have surfaced in the past. And when that happens, the question would naturally be: where did it come from? The forensics that come into play may not be as easy as DNA fingerprinting. But there are indeed techniques that allow the determination of the source of stolen nuclear materials.

Uranium or plutonium from different sources may look the same. But the detective or spy that intercepts the sample can deal with the problem – if he or she knows about the scientific tools to be used to determine the source from the sample: gamma spectrometry, mass spectrometry, Raman spectroscopy, Fourier-transform infra red spectroscopy, scanning electron microscopy, transmission electron microscopy and laser-induced breakdown spectroscopy.

Suresh Kumar Aggarwal gives you a Review of the state-of-art techniques, used on **page 782** in this issue – a review of interest for scientists and spies alike.

Electric Bus in Bustling Bengaluru
Deciding the contest with diesel

China so very graciously presented the city of Bengaluru with an electric bus. And the scientists in the city took this as an opportunity to do a comparative study of electric and diesel buses.

The cost of an electric bus is much more than that of a bus that runs on diesel. But can the initial investment be recovered? Can it transport the same number of people, in the same duration, in a crowded city? How long does it take to charge? How much does it run after charging? How does the cost of running it compare with that of diesel buses? And how about maintenance? Since electricity generation also produces pollution, how does it compare with the pollution generated by diesel buses? Are there any other advantages to electric buses?

The long history of trams and electric trains that run on rails cannot help us answer these questions about buses that run in busy but crawling traffic. Trains and trams make noise on the rails on which they run, whereas the rubber tyres of buses are quieter on bitumen roads. Moreover, unlike trains and trams, electric buses run on batteries and need no contact with electric lines except while charging. Without the rattle on the rail and the din of a diesel engine, passengers have more comfortable journeys and are less stressed.

A Research Communication in this issue tackles the questions that you and I invariably ask. And the answers given on **page 858** are quite encouraging. The newer technologies for solar energy capture and for storage batteries may help to further increase the relative advantages of electric buses.

Imagine – if all the vehicles on our roads run on batteries! Electrifying thought, isn't it?

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