The Sky's the Limit

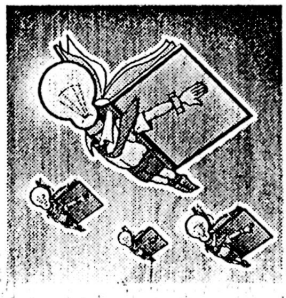
We Need More Star-gazing in Schools

By J V Narlikar

The International Astronomical Union (IAU) had its triennial general assembly in Sydney, Australia, in the second half of July. Around 2,000 astronomers from all over the world gather on such occasions to present and debate recent findings and also lay down certain policy decisions and action points.

On this occasion too, while the glamour was attached to observations claiming to nail down precise details of how our universe began, to the enormous bursts of gamma rays, to the elusive neutrinos and the still harder to detect gravitational waves, or to the discovery of new planets around stars other than the Sun, quiet brainstorming was going on about how to bring astronomy more prominently into school curricula and how to train school teachers who would be required to do the teaching.

Indeed, the importance the IAU attaches to this issue was reflected in that the Union felt it necessary to devote one of its few key resolutions to this topic. The resolution asks that the educational systems include astronomy as an integral part of the school curriculum at both the primary and secondary levels and to provide adequate resources to implement this goal. Why? Because, as the resolution states, astronomy, when properly taught, nurtures rational, quantitative thinking and an understanding of the history and nature of science, as distinct from rote learning, and pseudo-science.



The IAU feels that scientific and mathematical literacy and a workforce trained in science and technology are essential to maintain a healthy population, a sustainable environment and a prosperous economy in any country. It also reminds us that astronomy has a proven record of attracting young people to an education in science and technology and, on that basis, to careers in space-related and other sciences as well as industry.

Historically, astronomy had held centre-stage in the early development of science. For ancient civilisations, the riddles of nature were dominated by the space and sky. The law of gravitation, the first of the fundamental forces known to physicists today, could be discovered by Isaac Newton, only because of the astronomical observations of Tycho Brahe and Johannes Kepler. Even today, astronomy creates the kind of awe and wonder in the mind of the common man as no other science can.

The interesting aspect of astronomy is that it can be taken further than the traditional night sky watch, and even at the school level one can explain various astronomical phenomena by simple applications of science. Take the solar eclipse. Even a partial one can be an awe-inspiring spectacle and one can understand why it helped breed superstitions in the olden times. Today, a simple table-top model can explain what actually happens. One can also explain the precautions to be observed when viewing a partial eclipse. We cannot stare at the full Sun for any length of time: It is too bright. But we are able to view a partially eclipsed Sun for a longer time, and therein lies the danger. For, harmful infrared rays are always emitted by the Sun and these may damage our eyes.

The eclipse brings the Earth, Sun and the Moon in a straight line. There are other such alignments too. The astronomers have always found transits of Venus or Mercury across the solar disc of interest both visually and theoretically. Again a simple model can explain to school children what such transits represent, and more importantly, how their timing is calculated. How the calculation is precise and can be observationally checked are two aspects that should be conveyed to students as examples of the scientific approach.

Why is the sky blue? What is a rainbow? Why do tides occur? What are meteor showers? Why are some stars blue, some red and some yellow? Why do planets change their positions in the sky relative to stars? These questions are prompted by relatively simple observations. Children will ask them if they are not suppressed by a repressive educational system. More important, they can be answered within the framework of science with suitable analogies and examples from daily life. If we do not promote scientific literacy this way, pseudo-science will come forward to fill the vacuum.

Science proceeds according to a well-defined set of assumptions and follows the rules of logical reasoning whereas pseudo-science is vague in its foundations and depends on individual vagaries for interpretation. Science insists on testable predictions and does not compromise with objectivity. Pseudo-science follows no such discipline and in it only the few successful predictions are quoted and the large number of failed ones forgotten.

It took scientists many centuries to figure out the general rule that governs planetary motion. But by then pseudo-science had a field day. The irregularity of planetary motion (the Greek word 'planet' means 'wanderer') prompted some to ascribe will and power to the planets.

Today, even though scientifically debunked, this pseudo-science continues to flourish in many societies. In our country, a no-objection certificate is needed from planets for arranging marriages, swearing in cabinets, creating new states, starting a new house or proceeding on a long journey. Only when we are politically and economically free will the mind function normally and critically, wrote Nehru in *Discovery of India* lamenting our superstition-ridden society. That was in 1944. We became free in 1947, and today after more than six decades we have moved farther away from Nehru's dreams.