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Each year's Annual Review is a treat, and this year's (2019) collection of

reviews has kept the promise. The first article every year is a memoir of a distinguished astronomer, and this year, it is from a person who held the position of Chief Astronomer at NASA almost from its inception, from 1959, for two decades. Nancy Grace Roman not only steered the very first astronomy satellites launched by NASA, but was also responsible for the development of the Hubble Space Telescope, which was finally launched in 1989 and revolutionized astronomy, which earned her the nickname 'mother of Hubble' and rightly so. She studied astronomy in an era when women were not encouraged to take up science in high school, let alone in universities. In this memoir, which she submitted just before she passed away, she writes about her struggles and achievements, the story of her problems with Ph.D. supervisor William Morgan at the University of Chicago, and how she steadfastly overcame the obstacles because of her determination and mental strength. She even mentions the legendary S. Chandrasekhar, who was a faculty in the department, and who once remarked that it was not the policy of discrimination against women, but that they could get women 'for less' to do the same work, which makes her wonder how a person who must have faced discrimination among the Europeans and Americans, could have been insensitive to the problems faced by women. It is a memoir that should be read by all practicing scientists, even if to remind ourselves the long way we have come. Personally, I was inspired by her taking up computer lessons in mid-fifties, learning to write programs at an age that most of us would likely to simply manage with what we already know and be a science manager. She always took up the challenge of learning new things, and did not think less of going back to teaching children after her retirement.

Other articles are no less interesting. Among the reviews on solar system bodies, there is one on cometary chemistry, after the adventurous rendezvous of Rosetta mission with the Comet 67P. The detailed results obtained from the mission revealed that the amount of organic molecules that could have been delivered to the Earth by comets was substantial. The variation of deuterium to hydrogen ratio in different comets is now thought to be due to variation of the ratio in the protoplanetary disk, which was inhomogeneous, and from which comets originated.

Another article on the relation between solar corona and solar wind reviews the important work that have been done on this topic in recent years. There are still many unanswered questions in this regard, and the data are not yet sufficient to cull the right theoretical model, and the article points towards the direction of future observations that can help resolve the issues. A related review of the solar chromosphere shows how detailed 3D simulations have helped to understand the role played by magnetohydrodynamic shock waves in the energetics and dynamics of chromosphere, that was not possible with previous simpler 1-dimensional models.

A review of the studies of atmospheres of exoplanets shows that the field is on the verge of a revolution of some sort. Very detailed observations are now available for tens of exoplanets. Recent studies have also revealed a rich diversity of chemical compositions and processes in those atmospheres than astronomers had expected from the studies of solar system objects. It appears that astronomers are hopeful of detecting biosignatures in an exoplanet over the next decade, which would be an exhilarating discovery.

Going beyond the solar system, the evolution of star clusters is the topic of a fascinating review. We learn about recent findings regarding the formation of stars in molecular clouds, and the aftermath of this process. Molecular clouds are inherently inhomogeneous, and stars form in the densest parts. This process also pushes the gas away, except from very dense regions. The continuous removal of gas for a hundred million years can unbind a cluster, which then slowly disperses. These processes leave a signature on the cluster mass function, because they are not equally effective over all mass scales.

A variety of highly luminous supernovae have intrigued astronomers for the last decade or so, and a review in this collection sums up the data as well as the theoretical ideas. It is perhaps too early to expect theoretical models to develop to the extent of explaining the rich collection of data. It could be that the source of enormous energy lies in a rapidly spinning magnetar or an accreting black hole, or in some cases, even some radioactive isotopes such as ^{56}Ni. However, despite the difficulties in understanding the phenomena, the prospect of using such supernovae as standard beacons for cosmological studies is exciting indeed.

Another intriguing phenomenon that has kept astronomers agog is that of fast radio bursts. These short, milli-second bursts of radio signals have several aspects that challenge simple interpretations. Some of them are seen to repeat, while some others are not, and in some cases, it is apparent that magnetars are the culprit behind the burst. The distances can sometimes be measured, but the amount of gas that the radio signals have appeared to have passed through is so enormous that it defies simple explanations. These bursts are sure to keep astronomers busy for some time to come.

Moving to extragalactic objects, a review on galaxy evolution through the observations of bright lines emitted by them is timely. Stars typically do not emit bright lines, and only show absorption lines in their spectra, and so galaxies, being collections of stars, mainly show absorption lines. However, regions of star formation, in which photons from stars excite gas and make them emit bright emission lines, can be a useful probe for studying the properties of galaxies. Another review on very faint dwarf galaxies, which form the lowest rung in the hierarchy of galaxies in the universe, shows that they are not only interesting from the point of view galaxy evolution, but also for testing dark matter physics.

In addition, there are also reviews on jets from active galactic nuclei, and cosmological tests of gravity. On one hand there have been attempts to test the general theory of relativity to more accuracy than ever, and on the other hand, to go beyond the standard theory in order to explain some of the cosmological observations. The detection of gravitational wave has also opened the way to study the cosmological importance of variations in these models, and this article discusses some ideas for future tests, which may herald a new golden age for the study of general relativity.

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