

of late, 'kilonova' candidates have also entered the list, as in the case of GW170817.

Thus, GWs have opened up a promising future for astrophysics. Details of 2G, and the promise of 3G GW detectors are discussed in the last chapter. This will also serve as a guide to those aspiring to enter this field of research.

The book has a glossary to help beginners, who may need to read and re-read it. Some mathematical details as appendices would have probably helped the students. The brief biographical sketches in boxes amidst the chapters provide some personal details, which seem irrelevant to the content of the book. A couple of more sentences on their scientific study would have been more appropriate. I was looking for the name of Prof. C. V. Vishveshwara or his books, considering his study of quasi-normal mode oscillations in the early 70s.

Ajit Kembhavi, well known for his contribution to the field of cosmology and leading India for fruitful international collaborations, and Pushpa Khare with her experience in the field of gravitational lensing and quasar studies, have done a commendable job in bringing out this book at a time when GWs are emerging as the new trend for researchers in astrophysics. With an excellent portrayal of the efforts, excitement and joy of the scientists involved in GW research, this book serves as a good introduction to astrophysics in general and GWs in particular. It is a useful guide for students and teachers to keep track of further research in the field, which promises many surprises.

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**A Monograph on Potential Geoparks of India.** D. Rajasekhar Reddy (ed.). Indian National Trust for Art and Cultural Heritage, New Delhi. 2021. 266 pages. Price: Not mentioned. ISBN: 978-93-82343-45-5.

Geological diversity in India with diverse rock types of different ages is of paramount significance. Various rock types exposed in the interesting landforms of the country's various physiographic regions

are of immense scientific and aesthetic value. Despite a rich geological and cultural heritage, there is no geopark in this country. Specific laws to protect the archaeological sites exist in the country while the geological heritage sites remain unprotected.

The Indian National Trust for Art and Cultural Heritage (INTACH) protects the archaeological and historical sites, the geological heritage sites do not fall under its purview. This monograph, highlighting the need for a formal body for such protection, has earned enormous praise from the geological fraternity. The monograph has been meticulously edited by Rajashekhar Reddy and it contains 14 chapters. They describe the significant geoscientific features of specific areas that fulfill UNESCO's conditions for giving them Geoparks status. The curtain-raiser chapter by the editor lists intrinsic characters of a geopark and the criteria to be fulfilled before one can request UNESCO to accord geopark status to a specific area.

In the first article, Biswas and Chauhan make a case for the Kutch rift basin as a potential geopark. They have identified 70 geosites under 9 geostations, namely Bhuj, Mandvi, Naliya, Narayan Sarovar, Lakhpat, Matanomadh, Nakhtrana, Kavda and Rapar. Each of these sites has been meticulously tabulated and supported with good quality illustrations. Apart from these, Dholavira Archaeological Museum, Wood Fossil Park, Gangtabet Temple and Banjara Hills could be additional components in this geopark site. Kutch basin is well known for its extensive exposures of Jurassic fossiliferous beds, Cenozoic beds, salt flats (Rann) and numerous tectonic features. Geological heritage sites discussed in this chapter indicate that the area of the Kachchh basin is *de facto* a natural textbook for teaching, learning and researching any discipline of geology.

In the following article, Bhargava *et al.* present the details of wetlands between Renuka Lake to Koti-Dhaman-Sataun in the Himachal Himalaya. Rock exposures in this area range from 1800 Ma old Rampur Group of rocks to 16–2.6 Ma old Cenozoic sediments. These rocks represent shallow marine, subtidal, glaciomarine and fluvial sedimentation. This proposed geopark site exposes the geomorphological, cultural and architectural features listed in table 1 and figure 2 of the article. Explanations for the figures could have been a little more elaborate. What element of these outcrops could be of interest to the visitors

is also not stated clearly. The Renuka Lake in the area is of great tourist attraction. Several cultural and religious institutions in this area are significant.

Vaddadi and Vaddadi highlighting the geological potentials of the Pune Ahmednagar tract, proposed a geopark in this part of the world-renowned Deccan Flood Basalt Volcanic Province. This province tells us the story of a unique, catastrophic and episodic volcanic eruption that took place ca. 65 million years ago. Lava caves, lava channels, and vesicular and amygdaloidal flows represent the ancient volcanic eruptions. In addition, there are 75 ka old volcanic ash-beds derived from Toba Volcano of Indonesia. Multi-storied potholes and ornamental zeolite crystal-bearing rock cavities are significant features of this area. Furthermore, several archaeological and historical sites in this belt increase the potential of this site to be a geopark. The article is well illustrated, although the description of individual figures should have been a bit more elaborate.

Jaisalmer basin of Jurassic age in Thar Desert of Rajasthan deserves a geopark status, argues Wadhawan. He lists several geologically significant features of this terrain, including an existing fossil-wood park, well-preserved dinosaur footprints, excellent scenic scarp sections, cuesta landscape, stony pavements, inland Rann with ephemeral playas, and highly photogenic sand dunes in support of his argument. Apart from these, an ancient abandoned village at Kuldhara, several historical monuments, traditional water harvesting structures of Rajasthan, and unique desert animals increase the potential of this site for being declared as a geopark.

Reddy and Karadu present the case of Vishakhapatnam as a potential geopark site. The most important geological and geomorphological sites include Erra Matti Dibbalu, where very picturesque coastal red-sand dunes occupy a large tract. Deep gully erosion in the stabilized aeolian sands, the natural arch formed by marine erosion, cliff faces, platforms and benches formed by wave action, volcanic ash deposits, famous Borra caves and Arku valley, bauxite deposits with characteristic pisolites are noteworthy geological features. In addition, numerous archaeological and historical sites of great cultural significance and a wildlife sanctuary add to this area's credit and increase its potential as one of the first geoparks in India. This article includes well-documented, nice pictures and maps.

A volcanic impact crater, the Ramgarh Crater, needs to be declared a Geological Heritage site immediately before pieces of evidence of meteorite impact on earth get lost by vandalism and some developmental activities in the area. Sisodia, in his article, narrates the presence of a beautiful lake and several historical temples that add to the beauty of this geologically significant site. Therefore, a small geopark with a stand-alone meteorite impact crater and nearby historical sites should be possible.

Bhargava *et al.* feel that the Pin Valley in the Spiti Himalaya offers several unique geological and geomorphological features of a potential geopark. These include the late Triassic coral reefs and the Permo-Triassic boundary beds in the Guling village. Added attractions are ammonoid-rich beds, Permian black shales and Ordovician conglomerates. Rare exposures of Ediacaran–Lower Cambrian rocks add up to the importance of the Pin Valley as a potential geopark. The area falls in the Tethys Himalayan inner line with a cold desert environment. Restriction to the entry of foreigners in this region is now relaxed. This region is now accessible to all nationalities, hence will attract significant foreign tourists. High altitude wildlife and Buddhist monasteries are of great attraction.

Mathur *et al.* have batted for Jodhpur as a prime candidate for a geopark. It includes a Neoproterozoic Malani Igneous suite of rocks, classed as the third largest felsic volcanic province. A thick pile of low dipping succession of sandstone, limestone and shale overlies the volcanic sequence. A spectacular array of ripples and cross-beds, columnar stromatolites and trace fossils of the Ediacaran/Lower Cambrian affinity is exposed in this belt. Outcrops of volcanic breccia, welded tuff, rhyolite porphyry, volcanic flows and columnar joints provide impressive sights for geology students and tourists. The area has numerous ponds, natural lakes and water conservation wells. Many historically significant sites like Mehrangarh Fort, Chamunda Temple and archaeological sites dot the area proposed for this geopark.

Satyanarayana *et al.* propose that a part of Kurnool district could qualify as a large geopark. The terrain exposes unique geo-

logical and geomorphological features, pre-historic caves with rock art and areas with Paleolithic tools. Numerous forts and temples offer excellent tourist attractions. The article describes all the geological, archaeological and historical features in the Kurnool district without zeroing on a geopark-specific tract. The area around Eparchean Unconformity, various granite hills, conglomerates and agglomerates and diamond dumps are also worthy geological features.

A profitable Pb–Zn–Ag mine at Zawar in the Udaipur district of Rajasthan also displays remnants of ancient mining and metallurgical practices. Ranawat describes the geological, archaeological and cultural sites in the vicinity of the Zawar village. Age of the rocks in the area ranges from 2.6 Ga Banded Granitic Complex to ~1.7 Ga Aravalli metasediments and ~1 Ga Delhi Supergroup of rocks and Quaternary alluvium. The area has several historical and archaeological sites with lakes of Pichola, Fatehsagar, Bari, Udaisagar and Jaisamand, Nathdwara Temple and cultural centres.

The Rahr-Bengal geoheritage tract is historically the place of the Sena Dynasty. Guha discusses the prospects of this tract for consideration for a geopark. This tract exposes Meso to Neoproterozoic rocks of Singhbhum Craton and the Eastern Ghat Mobile belt. Laterite is seen all over the place. Paleolithic and Neolithic implements, fossilized human jaw bone dated 10,000 BC are of great interest and tourism value. Visitors can go to many archaeological and historical heritage sites along this tract. Badlands and clinker laterite occur in many locations. Different forms of structures carved in semi-consolidated sediment piles display beautiful features produced by wind and water. Raniganj Coal Field, Amkhoi Fossil wood park, the Heritage University *Shantiniketan* founded by Rabindra Nath Tagore are places of great interest. The article does not identify a specific tract for a geopark. However, the authors should select a few manageable locations in the vast area proposed for a geopark.

Rathore and his colleagues consider Ajmer can be a successful candidate for a geopark. This terrain exposes metasedimentary rocks of Proterozoic Delhi and

Aravalli Supergroups. Unfortunately, the geochronological information given in the article is incorrect. The proposed geopark area comprises many hills, including Taragarh Fort and Ana Sagar Lake in the Ajmer Valley. Nepheline Syenite at Kishangarh is also near to this place. One can visit numerous historical and archaeological sites, lakes and places of worship in this terrain.

Biyani describes a touristic trail around Dehradun in Uttarakhand. The proposed terrain includes the Mussoorie hills of the Lesser Himalaya with rock exposures ranging in age from Mesoproterozoic to Quaternary. Exciting rock exposures of phyllite, quartzite, dolomite, limestone, glacial diamictite and phosphorite will attract geologists as well as tourists. In addition, sulphur springs, stalactites-stalagmites of Sahastra Dhara, Robber's Cave, Himalayan Frontal Fault on the foothills, Quaternary Doon gravels, Krol-Tal Boundary – once considered to be the Pc-C Boundary are of great geological significance apart from being favourite tourist spots.

Sudhanshu *et al.* have suggested the entire Jaipur town with an area of 33 sq. km as a geopark. It looks a bit ambitious to designate the whole township as a geopark. Four high quartzite hills: the Jhalana Dungri, Nahargarh Ridge, Amer Ridge and Bhomia Ji Ridge, surround the proposed geopark site. These quartzites and other low-grade sedimentary rocks belong to the Delhi Supergroup. Moti Dungri with a fort and a temple, Nahargarh Ridge with an impressive fortress, a tropical rain forest sanctuary, a biological park, Amer Ridge with Jaigarh Fort, Amer Temple and Palace are additional tourist attractions. In addition, Maota Lake, Man Sagar Lake with Jal Mahal, Baoris, City Palace, Royal Gai-tor Cenotaphs, Chand Pole, Hawa Mahal, Jantar Mantar are of great tourist importance.

The book deserves to be in all libraries and is worth reading.

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