around the turn of the century, some of his excavations turned up other, more unusual fossil animals. Most would have discarded these unfamiliar fossils—but not Ou Saïd: he knew these fossils were unusual and something special. In fact, he had unearthed the Fezouata Biota, one of the major palaeontological discoveries of the last decade.

Not only did Mohamed discover the Fezouata Biota and recognize its significance, but crucially, he was extremely open and supportive of scientific research on any of these new discoveries: apart from providing unfettered access to all his collecting sites, any exceptionally preserved fossils collected by him were put aside and made available for scientific study. All his material is carefully kept separate for each excavation, allowing every specimen to be accurately assigned to the GPS coordinates of the excavation. His systematic excavation techniques are textbook, and it would be hard to improve them. Last but not least, he is a truly remarkable collector, recovering mm-sized fossils that are almost invisible to the naked eye. Repeatedly, he has handed colleagues slivers of seemingly barren shale. After they failed to locate anything of interest on these small pieces of rock, Ou Saïd, with a big smile, would point out a minute red dot that under a hand lens suddenly manifest itself into a perfectly preserved mm-sized arthropod, priapulid or even sponge. Even highly incomplete and fragmentary material does not escape his attention: while most collectors only focus on the large and conspicuous, commercially rewarding material, Ou Saïd understands that even fragmentary specimens of common taxa are of scientific importance since they document the presence of a specific fossil at a certain site.

Although Ou Saïd never received any formal palaeontological training, and in fact he never attended school, he displays an amazing insight into the fossils he discovers – to the extent that it would put many 'professional' palaeontologists to shame! His understanding of the local geology translates into an uncanny ability to pinpoint sites in the desert for excavation, with a remarkable degree of success. Without Mohamed's kind help, collaboration and understanding of the fossils, the Fezouata research would quite simply not exist, and it is no exaggeration to state that the success of the Fezouata project can be traced back entirely to Mohamed Ben Moula and his family. While recently, as a result of this success, some other local collectors have also started to take an interest in the Fezouata fossils, Mohamed 'Ou Saïd' Ben Moula undoubtedly remains the master of this remarkable biota. Nowadays, he is joined in the field by his sons Lahcen, Brahim and Yusuf, who exhibit the same talent and enthusiasm for the subject as their father, ensuring decades of exciting discoveries to come.

Ou Saïd is an outstanding example of how collectors and scientists can work together in a mutually beneficial relationship. Indeed, considering that Mary Anning herself was a commercial fossil trader from a humble background, it is particularly fitting for Ou Said to receive this award in her name; for all intents and purposes, he is her twenty-first century equivalent and heir.

In an appropriate climax to the IGCP workshop, focussed on capacity building, outreach and Early Palaeozoic palaeontology, the international delegates visited the desert to see for themselves some of the many richly fossiliferous sites, discovered by Ou Saïd in the Fezouata Shale (Fig. 12). It was a truly unique experience.

South-west Asia: where plates and people collide

Rasoul Sorkhabi (University of Utah) writes The Geological Society of America has recently published *Tectonic Evolution, Collision, and Seismicity of Southwest Asia: In Honor of Manuel Berberian's Forty-Five Years of Research Contributions* (Fig. 13). Southwest Asia includes the Arabian Peninsula to the south and the mountainous Anatolian–Iranian plateaus that merge with the Caucasus 'knot' in the north. The region has a long history of human settlement and culture closely associated with natural resources and environmental changes. Geologically, south-west Asia is a convergent zone between the Arabian and Eurasian tectonic plates and is characterized by active deformation and seismicity (Fig. 14). It is this aspect of the region that is the focus of this GSA Special Paper.

The volume contains 19 papers covering the countries of Iran, Turkey, Armenia and Georgia. As the editor of the volume, when I was finalizing the introductory chapter last November a powerful 7.3 magnitude earthquake struck the Iran-Iraq border: The toll was 630 deaths (mostly in Iran and ten people in the

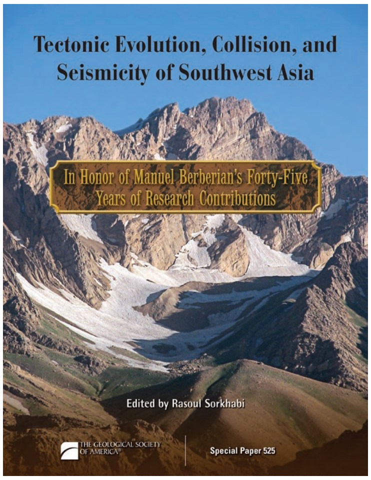

Fig. 13. *Tectonic Evolution, Collision and Seismicity of Southwest Asia: In Honor of Manuel Berberian's Forty-Five Years of Research Contribution*, edited by Rasoul Sorkhabi (GSA Special Paper n.525, 2017). The volume resulted from a topical session held at the 100th Annual Convention of the Geological Society of America, Denver, 2013.

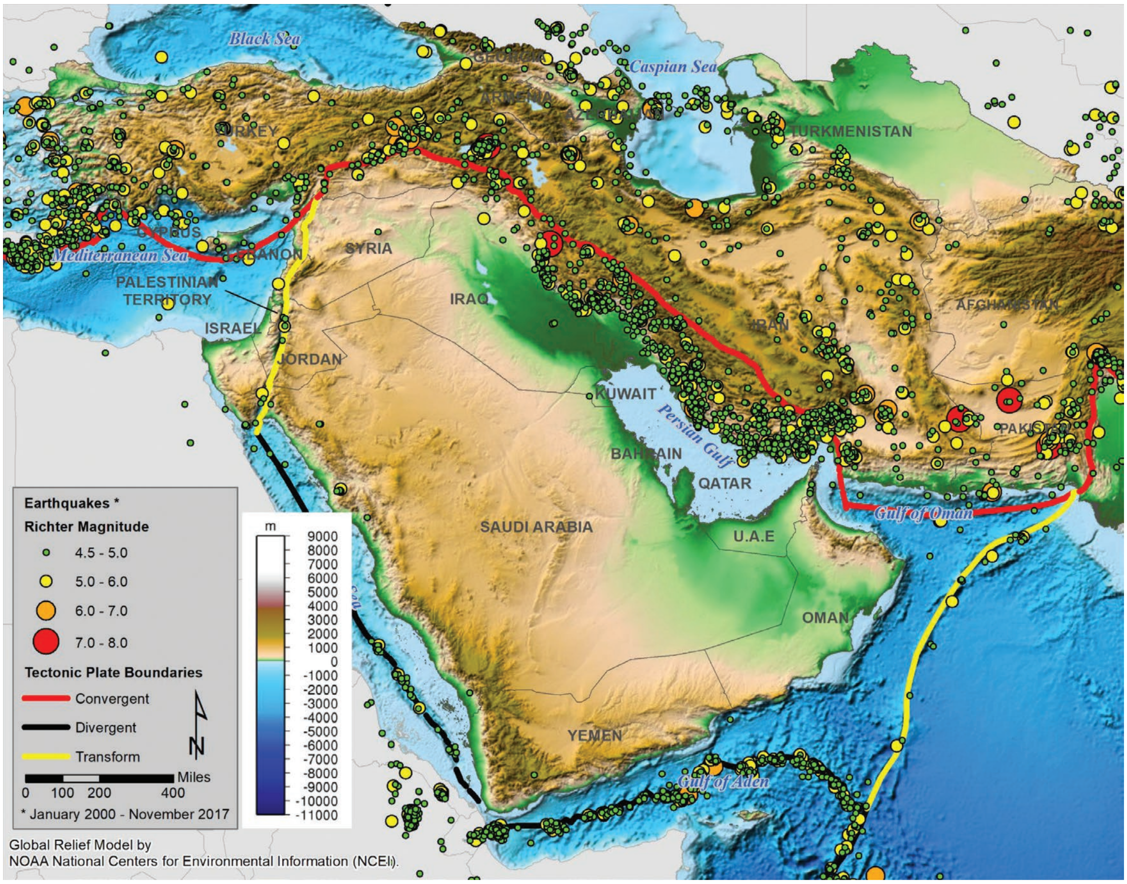

Fig. 14. Plate tectonic and earthquake map of south-west Asia (Arabia-Eurasian collision zone). The seismicity record includes earthquakes from January 2000 to November 2017, showing the epicentres of events with magnitudes > 4.5. (Sorkhabi, R. 2017, GSA Special Paper n.525, p.3).

Kurdistan region of Iraq), more than 8000 injuries (including 550 in the Iraqi side), and the destruction of numerous buildings and houses. More than 70 000 people—mainly in the Kermanshah and Ilām provinces of Iran—needed emergency shelter. The cold winter in the area also aggravated the plight of the homeless refugees. The earthquake (34.905°N, 45.956°E), like many other earthquakes in the region, had a shallow depth (19 km) and occurred on an oblique-thrust fault close to the High Zagros Thrust. A total of 664 aftershocks in Kermanshah were registered, the largest being 4.7 magnitude.

A month later, in December 2017, as the GSA volume was in press, a 5.2-magnitude earthquake hit the town of Malārd, 40 km west of Tehran, Iran's capital. Some 117 people were injured and two people died apparently of heart attack (not by the earthquake itself). Nevertheless, this earthquake was very alarming as Tehran, with a population of eight million, sits on several active faults. The Tehran municipality published a map of emergency shelters in case of a 'Big One'. Mohammad Ali Najafi, Tehran's mayor, was reported to state that the Malārd earthquake provided a real-time opportunity for people in Tehran to evacuate to shelters and that the earthquake released some of the tectonic stress built up in the area.

The GSA volume was published in honour of Manuel Berberian's 45 years of research contributions to the geology and seismo-tectonics of Iran. Berberian (born in 1945 to a Christian family in Tehran) served as a pioneer researcher at the Geological Survey of Iran during the 1970s and 1980s. Author of numerous articles, maps and books, Berberian's latest work, *Earthquakes and Coseismic Surface Faulting on the Iranian Plateau: A Historical, Social, and Physical Approach* (Fig. 15) is a milestone in its field. The monograph documents data on the inferred, reported or recorded

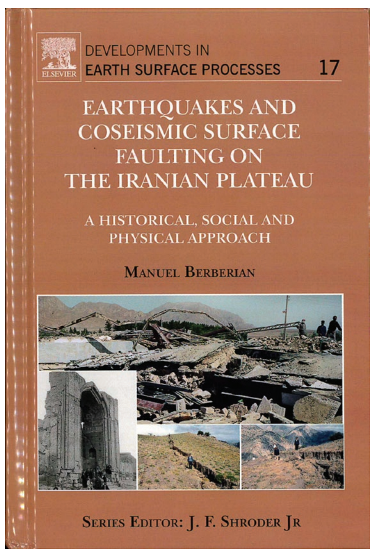

Fig. 15. Earthquakes and Coseismic Surface Faulting on the Iranian Plateau (*Developments in Earth Surface Processes 17*, edited by J.F. Schroder, Jr.) by Manuel Berberian (Elsevier, 2015).

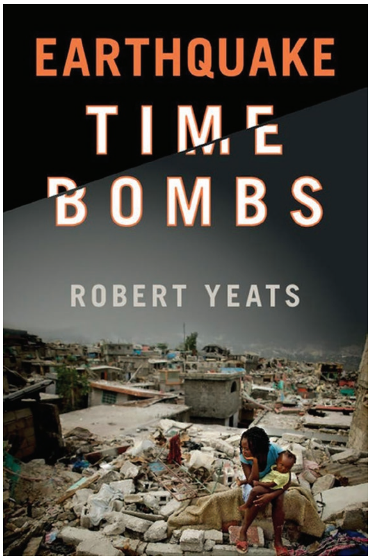

Fig. 16. *Earthquake Time Bombs*, by Robert Yeats (Cambridge University Press, 2015).

earthquakes in Iran: 22 prehistoric (pre-1 CE), 536 historical during 10–1900 CE, and 564 during the instrumental period of 1900–2014. According to Berberian, more than 165 000 people were killed by earthquakes in Iran from 1900 to 2017. In a paper titled 'Tehran: An earthquake time bomb' (GSA Special Paper 535, chap.4), Manuel Berberian and Robert Yeats analyze the risks of large-magnitude earthquakes originating on several active faults both within the city and nearby. The case of Tehran is especially noteworthy: this multimillion metropolis is the country's political and economic centre; the majority of the city's buildings are old, hastily-built or low-income housings for the rapidly growing population.

Robert Yeats, an emeritus professor of geology at Oregon State University, has greatly contributed to academic and public education on earthquakes through his research and publications, including *Geology of Earthquakes* (with Kerry Sieh and Clarence R. Allen, 1997), *Active Faults of the World* (2012), and *Earthquake Time Bombs* (2015). Yeats is vocal about the threat of earthquakes to many populous megacities around the world that are located in tectonically active areas or what he calls 'earthquake time bombs.' The list of these cities in his latest book (Fig. 16) includes Los Angeles, Tokyo, Wellington, Santiago, Jerusalem, Istanbul, Tehran, Kabul, Manila, Caracas, Mexico City, Haiti, and so forth.

Geologists cannot yet predict *when* an active fault will produce a deadly earthquake. Yeats admits that 'the failures to predict earthquakes is our failure as scientists.' Nevertheless, as he details in his books, we can take steps to mitigate the hazardous impacts of earthquakes: We can map *where* the active faults are, we can chronicle and analyze the seismic histories of active faults, we can design risk maps, we can construct resilient buildings, and we can increase public education and preparedness for large earthquakes.

In recent years, the vast region from Yemen to Turkey has made news for its grave political strife, religious violence, refugees and economic social issues. But geohazards and environmental issues are also critical problems in the region and cannot be separated from the region's political, economic and educational policies. As I write this article (7 March 2018), there is a report of a 5.3 magnitude earthquake that hit southern Iran (27.98°N, 57.639°E), about 140 km south-west of Bam, a historical city which was demolished in 2003 by a 6.6 magnitude earthquake, killing more than 26 000 people.

Geoscience can be very helpful for addressing some of the region's challenges and crises. Geoscience education, high-resolution geological mapping, research on seismo-tectonics and environmental issues as well as regional and international collaborations among universities, research institutions and international organizations should be high priorities for the countries in south-west Asia.

Research

Mount Etna—a giant hot spring!

As noted above, Mount Etna on the eastern coast of Sicily is Europe's most active volcano. It is largely composed of basaltic hawaiites and trachybasalts, with an open conduit feeding four active craters (Voragine, Bocca Nuova, North East Crater and South East Crater). There are three main types of volcanic activity at these craters: (1) non-eruptive emission of a gas plume through the free surface of the lava or through fumaroles; (2) long duration, slow effusive eruptions lacking explosive activity; and (3) violent explosive eruptions, characterized by lava fountains up to 1 km high, fast lava flows, high emission rates and with short durations. Given the level of activity and its location, monitoring the volcano to predict future eruptions is important. One way to do so is to monitor the release of gas from the volcano

Fig. 17. Eruptions at Mount Etna might be the result of the migration of huge volumes of gasses to the surface, bringing the rocks close to their melting temperature. (Image courtesy of Carmelo Ferlito, Universitá di Catania.)