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Bibliography of Phanerozoic palaeontology and stratigraphy of Pakistan

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The stratigraphy and palaeontology of Pakistan covers almost all intervals of geologic time, Precambrian to Recent, some more elegantly than others, especially Permian and younger sequences from the southern two-thirds of Pakistan. Palaeozoic sequences of pre-Permian age are restricted to northern Pakistan where metamorphism has tended to obliterate fossils, and where tectonic complexity—especially frequent thrust faulting—often obscures relationships and, in the absence of fossils, ages may remain controversial and stratigraphic relationships problematic. Palaeontology, taking advantage of occasional "windows of opportunity" with materials which have escaped severe deformation, will continue to have an important role in unravelling the structure of this vast region.

The foundations of the stratigraphy and palaeontology of Pakistan go back to the remarkable pioneering work of W. T. Blanford, A. B. Wynne, C. L. Griesbach, W. Waagen, F. Noetling and C. S. Middlemiss in the 19th century, to the work of H. H. Hayden and E. W. Vredenberg early in the 20th, to the labours in Hazara of D. N. Wadia and the exemplary mapping by E. R. Gee in the Salt Range 50–70 years ago and, in more recent times, the impact of the sustained energies of R. A. K. Tahirkheli. Remarkable work was achieved, often under conditions for which the word adverse would be an understatement. E. W. Vredenberg comes to mind, with camel and violin, collecting his way across Baluchistan—a palaeontologist analogue perhaps of artist-violinist J. A. D. Ingres...

Palaeontologic data accumulated over the past 150 years from several stratigraphic intervals in Pakistan have invested them with global importance. Among these are:

- The Cambrian and especially Permian–Triassic sequences of the Salt Range and Trans–Indus ranges documented in classic studies by A. B. Wynne, W. Waagen, F. Noetling, F. R. C. Reed, E. R. Gee and, later, O. H. Schindewolf and Curt Teichert.
- Diverse Mesozoic ammonoid faunas documented especially by L. F. Spath, and in more recent years by A. N. Fatmi.
- Superb Mesozoic–Early Cainozoic faunas, especially molluscs, echinoids, scleractinians and brachiopods brought to prominence by P. M. Duncan, W. P. Sladen, J. W. Gregory, F. Noetling, E. W. Vredenberg (especially) and later by L. M. Davies, L. R. Cox, F. E. Eames, H. M. Muir-Wood and, more recently, by M. W. A. Iqbal and A. N. Fatmi.
- Mesozoic–Cainozoic microfaunas documented, specifically as regards foraminifers, by W. L. F. Nuttal and later by A. F. M. M. Haque and A. A. Kureshy.
- Incredibly diverse vertebrate faunas of the late Cainozoic (Siwaliks) of northern Pakistan documented voluminously by

G. E. Pilgrim early in this century, and expanded by recent work by a galaxy of vertebrate palaeontologists, especially by P. D. Gingerich, L. L. Jacobs, M. Pickford and D. R. Pilbeam. These faunas are now chronologically constrained by integrated high-precision stratigraphic/sedimentary and magnetostratigraphic investigations undertaken by several people, among them D. W. Burbank, G. D. Johnson, and N. D. Opdyke, working in highly effective collaboration with the Geological Survey of Pakistan and with numerous staff and postgraduate students of the University of Peshawar.

The origin of this bibliography derives from the discovery that less than 25% of the geological literature published in Pakistan is cited in GEOREF, the main source for obtaining a swift coverage of the literature published on a specific topic or specific region. The situation is least satisfactory with regard to literature on vertebrate palaeontology; this has been poorly covered by both GEOREF and *Biological Abstracts*, though the *Zoological Record* is useful in helping fill this lacuna.

Our compilation is not exhaustive; it expands on a preliminary version issued to participants in the First Pakistan Palaeontological Convention and 6th international meeting of IGCP 421, *North Gondwana mid-Palaeozoic bioevent/biogeography patterns in relation to crustal dynamics* held at the University of Peshawar in September 1999. There are few references to unpublished reports and postgraduate theses. Not included are numerous articles in which stratigraphy has been incidental to economic geology, mineralogy, structural, tectonic or petrologic presentations, notably for the Kohistan Terrane and the Nanga Parbat Syntaxis (e.g. Khan et al., 2000). Numerous citations of such literature can be found in the excellent overview of the geology and tectonics of Pakistan by A.H. Kazmi & M. Qasim Jan (1997). Useful for older literature and for literature on areas adjoining Pakistan to the east and west are the *Bibliography of Indian Geology* by La Touche (1917), the *Bibliography on Himalayan Geology* by Kapoor *et al.* (1976) and the *Bibliography on the Geology of Afghanistan* by Kästner (1971). Many of the cited references have not been checked against the original publications—a mammoth task beyond the means of compilers without access to all relevant libraries in Pakistan and India. Because most titles provide a clear indication of content, no attempt has been made to annotate the bibliography. It is hoped, nevertheless that even casual perusal of it will draw attention to many publications, including some long forgotten, which include important data and opinions.

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