

A CONSIDERATION OF THE PALEONTOLOGICAL CONTRIBUTIONS OF WILL DOWNS WITH A GENERAL CORRELATION OF CHINESE NEOGENE LOCALITIES

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William R. Downs, III, known as Dong Weilin to many friends, died a relatively young man (1950 ~ 2002) at the height of his career in paleontology. His career began at the Museum of Northern Arizona in 1975. One of his early tasks was the preparation of Triassic cynodonts from Antarctica for Edwin H. Colbert, then Curator Emeritus of the American Museum of Natural History and Curator of Vertebrate Paleontology at the Museum of Northern Arizona (Colbert and Kitching, 1977). Will prepared the Early Jurassic armored ornithischian *Scutellosaurus* for Colbert (1981), and he collected and prepared a skull of *Pentaceratops* from the Cretaceous of the San Juan Basin (Rowe et al., 1981). One of his early ventures into screen-washing was near the *Pentaceratops* site in the San Juan Basin (Flynn, 1986) where mammals were poorly represented. In the mid-1980's, Will left the Museum of Northern Arizona to become affiliated

with Northern Arizona University, also in Flagstaff. In addition, he was briefly employed to revamp the fossil preparation laboratories at Southern Methodist University in Dallas, during which time he joined in excavations of a large series of small primitive ornithopods in Texas (Winkler et al., 1988). He maintained an office at the Bilby Research Center, and then the Department of Geology, at Northern Arizona University until the time of his death.

Throughout his career, Will maintained an interest in the Paleozoic through Holocene of the Colorado Plateau and Basin and Range provinces of the southwestern United States (Agenbroad and Downs, 1984; Lindsay et al., 2002; Polcyn et al., 2002; Winkler et al., 1992). He was early on impressed with the Upper Triassic Chinle Formation. His work at the *Placencias* Quarry, the Downs Quarry (named for him), and Petrified Forest National Park helped to double the known Chinle fauna through screen-washing (Jacobs, 1980; Jacobs and Murry, 1980). He discovered the first mammals from the Lower Jurassic Kayenta Formation (Jenkins, Crompton, and Downs, 1983) and thereby catalyzed renewed fieldwork yielding the phenomenal increase in knowledge based on Kayenta mammals, tritylodontids (Sues, 1986), caecilians (Jenkins and Walsh, 1993), frogs (Shubin and Jenkins, 1995), turtles (Gaffney et al., 1987), and dinosaurs (Attridge et al., 1985), all groups with obscure Early Jurassic records, and many of which he collected.

In 1978 Will joined fieldwork in the Siwalik Group of Pakistan and continued working there until 2001. Between 1978 and 2001, arguably the best and most significant stratigraphically and chronologically controlled sequence of Neogene rodents ever assembled was collected, in very large part due to his efforts (Downing et al., 1993; Flynn et al., 1997, 1998; Jacobs and Downs, 1994; Jacobs et al., 1989, 1990; Badgley, Downs, and Flynn, 1998; Lindsay and Downs, 1998, 2000). All told, Will compiled an impressive suite of assemblages, mostly from Punjab Province but also from Baluchistan, amassing some 10,000 small-mammal teeth that he personally separated from matrix and

mounted on pins. Along with rodents, his screening efforts turned up snakes, lizards, primates, tree shrews, and assorted other creatures. He developed an enviable comprehension of the sequence of faunal change and a sense for the evolutionary and faunal events of every major small-mammal group. His closeness to the data came from washing tons of fossiliferous rock from over 100 localities and from collecting many large specimens, including proboscideans, rhinos, and crocodylians.

In 1991, and again in 1992 and 1995, Will participated in fieldwork in Triassic rocks of eastern Greenland (Jenkins et al., 1994). In 1993, 1994, and 1996, he pursued Triassic fossils of Morocco, an extension of his considerable work not only in Greenland and the American Southwest, but also Africa and Arabia. In 1992, he prospected Yemen (Jacobs et al., 1999). His most extensive African fieldwork was in the Permian, Cretaceous, and Tertiary rocks of Malawi where he spent four field seasons and published both on dinosaurs (Jacobs et al., 1990, 1992, 1993; Jacobs, 1993) and on a crocodylian with a peculiar mammal-like dentition (Clark, Jacobs, and Downs, 1989). Will was also a member of a French-led multinational team in Cameroon that discovered both dinosaurs and Cretaceous mammals (Brunet et al., 1986, 1988; Jacobs et al., 1988). He explored Miocene rocks in Kenya, his most significant work as part of the expedition that collected the primate *Equetorius*, which Will prepared (Ward et al., 1999). His last fieldwork in Africa, undertaken in the summer prior to his death, was in Uganda, at Mount Elgon.

However much Will appreciated the rest of the world, without question his favorite area was China. Beginning in the mid-1980's and continuing until his death, Will's love affair with the people, food, and fossils of China grew. He published on Chinese rhinos and their response to climatic variations (Deng and Downs, 2002), and on the Oligocene insectivoran *Didymoconus* (Wang et al., 2001), as well as on broader biostratigraphic and faunal issues. Will was a key player in the Sino-American team studying the late Neogene sequence of Yushe Basin, Shanxi Province, building a sequence of small-mammal localities calibrated with magnetic polarity stratigraphy and spanning the time between 6 and 2 Ma (Tedford et al., 1991; Flynn et al., 1997). One of his last papers, published posthumously, was a contribution to a festschrift honoring Richard Tedford, co-leader with Qiu Zhanxiang of the expeditions to the Yushe Basin. The paper is on Pliocene gerbils from Afghanistan (Flynn et al., 2003).

Through the 1990's, he worked the Oligocene to Miocene deposits of Lanzhou Basin in Gansu Province (Flynn et al., 1999), and helped develop a modern understanding of the fossil record of Tsaidam in northwest China, where he found the first late Neogene microsite in that area. Will also visited Guide Basin in Qinghai. He participated in IVPP field campaigns to Taben Buluk, which investigated the Miocene deposits overlying classic Oligocene strata. In 2001, he worked near the Cretaceous-Tertiary boundary in the Nanxiang Basin. Will was deservedly proud of his fieldwork in China. He was enthused about the area bounding the northern reaches of the Tibetan Plateau because it presented a geographic complement to his work done south of the Himalaya Mountains (Wang et al., 2003a, b). In 1994 he participated in the descent of the Yangbi River, Yunnan Province, an expedition specifically designed for geological reconnaissance. His expansive outlook was exemplified in one way by his participation in a study that explains increased sedimentation rates during the Pliocene as an effect of global climatic instability on erosion rates (Zhang et al., 2001). His last fieldwork in China was focussed on the Lower Jurassic of Xinjiang in the late summer of 2002, only a few months before his death. As his final fieldwork, it is fitting that it should have been in China.

Will was always ready for fun, but he was also dedicated to intellectual pursuits. His legacy of translations from Chinese to English include monographs and scientific papers on geology and fossil plants, fish, dinosaurs, and mammals, many of which can be found on-line at the Polyglot Paleontologist (web search Polyglot Paleontologist or at <http://www.uhmc.sunysb.edu/anatomicalsci/paleo/>). Given his broad familiarity with the fossil record, Will also had a mind for synthesis. He tabulated much of his understanding of Neogene fossil history, which was based largely on first-hand knowledge and his close work with others (for example, Qiu and Qiu, 1995). Fig. 1 is a correlation

Ma.	East Africa	South Asia	China	NA	Eu.	MN
5	Olorgesailie	Boulder Congl	YGSP Loc. #	Irvingtonian	Biharian	18
1	Kapthurin					
2	Olduvai	Chaudwan	<i>Elephas planifrons</i>	Nihewanian	Xiashagou	17
2	Koobi Fora					
3	Chesowanja	Tatrot	<i>Hexaprotodon sivalensis</i>	Yushean	Haiyan Youhe Mazegou, Jingle, Daodi, Gaozhuang, Bilike	Blancan
3	East Turkana					
4	Hadar	D h o k P a t h a n	<i>Selenoportex lydekkeri</i>	Baodean	Baode, Songshan, Lufeng, Jilong, Bahe	Hemphillian
4	Laetolil beds, Kanapoi					
5	Chemeron	L i t r a	DP13	Baodean	Harr Obo Ertemte	Ruscinian
6	Lukeino					
7	Mpesida	N a g r i	457	Baodean	Turofian	13
8	Lothagam					
9	Nakali	N a g r i	182 410	Baodean	Amuwusu	Clarendonian
10						
11		Chinji	311	Baodean	Tunggur	Vallesian
11						
12		Upper Vihowa	259	Baodean	Tunggur	Astaracian
12						
13	Ngorora	Kamlial	76 504	Shanwangian	Shanwang	Hemphillian
13						
14	Fort Ternan Beni Mellal	Lower Vihowa	750	Shanwangian	Sihong, Fangshan, Wuertu	Arikarean
14						
15	Maboko, Kipsaramon	Chitarwata	430	Shanwangian	Zhangjiaping, Xiejia	Agenian
15						
16		Chitarwata	592	Shanwangian	Zhangjiaping, Xiejia	Agenian
16						
17	Rusinga	Chitarwata	747	Shanwangian	Zhangjiaping, Xiejia	Agenian
17						
18	Koru, Songhor, Legetet, Chamtwara	Chitarwata	747	Shanwangian	Zhangjiaping, Xiejia	Agenian
18						
19	Napak I, IV, Meswa Bridge	Chitarwata	747	Shanwangian	Zhangjiaping, Xiejia	Agenian
19						
20		Chitarwata	747	Shanwangian	Zhangjiaping, Xiejia	Agenian
20						
21		Chitarwata	747	Shanwangian	Zhangjiaping, Xiejia	Agenian
21						
22		Proboscidean datum	Z150 Z108	Xiejiaan	Taben Buluk/Yinderte	2

Fig. 1 Chronology and correlation of key Neogene vertebrate localities in China, South Asia, and East Africa, with reference to biochrons of North America and Europe, as arranged by Will Downs

chart that Will developed to reflect his understanding of age relationships at the time he was compiling it. The correlation shows areas with which Will was personally familiar: the fossil records of China and the Siwaliks correlated against time; key African fossil areas tied in; the biochrons of North America and Europe plotted as a less significant frame of reference.

In his own unique, ebullient, irascible, uncompromising way, Will Downs was humble, gentle, and unassuming. He was co-author on over 30 diverse, consistently significant publications. His efforts in the field spawned research and publications beyond those that include him as a co-author, much (but not all) of which acknowledge his contributions. That will, of course, continue because the collections he made and the fossils he prepared are permanent. He was content to work hard for the good of the many projects of which he was a part but he did not seek adulation. He refused to allow the rodent genus *Downsimys* from the Bugti fauna of Baluchistan to be named in his honor, insisting instead that the patronymic name derive from his mother (Flynn et al., 1986).

In 1995, Will was presented the Morris F. Skinner Award by the Society of Vertebrate Paleontology for outstanding and sustained contributions to scientific knowledge through the making of important collections of fossil vertebrates. His contributions are lasting and of global impact. He made friends all over the world and was pleased, especially, with his collaborations in China.

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