

## DEDICATION TO NORM J. SILBERLING AND E. TIMOTHY TOZER

It is both an honor and a pleasure to dedicate this volume to Norm Silberling and Tim Tozer, two of the great knights errant of the Triassic timescale. Nearly 30 years ago, in 1968, Norm Silberling and Tim Tozer published one of the classic mileposts along the path to a global Triassic timescale. Titled “Biostratigraphic classification of the marine Triassic in North America” (Geological Society of America, Special Paper 110), this work owed much to Norm and Tim’s immediate predecessors, Si Mueller and Frank McLearn, who had amassed much of its underlying data. Nevertheless, it was Norm and Tim’s masterful synthesis that established a standard Triassic ammonite zonation that has been tested and elaborated for decades and is still central to many aspects of the ongoing work on the Triassic timescale.

Born 28 November 1928 in Oakland, California, Norm Silberling grew up and was educated in northern California, ultimately receiving a Ph.D. in geology from Stanford University in 1957. Norm was a student of the legendary Si Mueller, who followed James Perrin Smith (Mueller’s thesis advisor) in developing the phenomenal record of Triassic ammonoids known from Nevada. Before finishing his Ph.D., Norm saw service in the Korean War, where he was awarded two combat stars. After the Ph.D., his professional career began on the faculty of Stanford University, and then he moved in the 1970s to working for the U. S. Geological Survey, first in Menlo Park, California, then in Washington, D. C., and finally in Denver, Colorado, where he retired in the mid-1990s.

During Norm’s scientific career he was never far from Nevada, though both Alaska and, ultimately, New Zealand also became field areas. From the 1950s through the 1970s, Norm’s research evolved from ammonoid biostratigraphy to regional stratigraphy and ultimately into tectonics. Indeed, Norm was one of the key players in developing an understanding of what are variously called suspect (or allochthonous, or accreted or displaced) terranes, particularly based on his Alaskan work. His application of the terrane concept to the geology of western Nevada revolutionized our understanding of the Mesozoic geological history of the Great Basin. Indeed, it is fair to say that Norm’s contributions to tectonics are at least equal to his work on Triassic biostratigraphy.

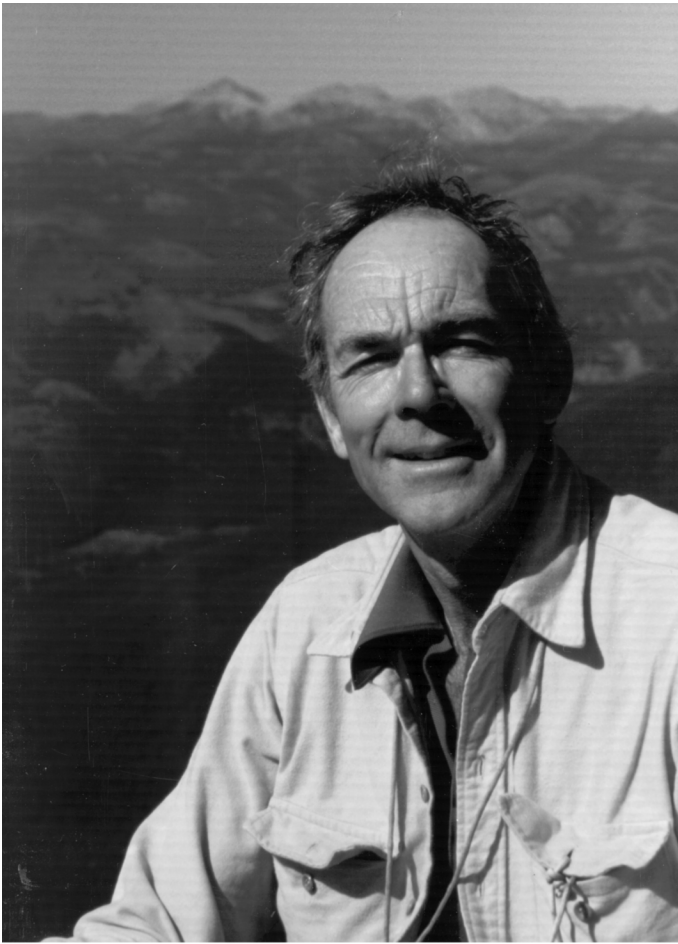
Thus, Norm Silberling has really had two careers as an earth scientist and contributed more to both than most contribute to a single career. He truly stands as one of the twentieth century’s most important Triassic ammonite biostratigraphers, one of its most perceptive tectonicists and one of the most accomplished students of the geological history of western North America.

I (Spencer Lucas) worked with Norm in Sonora, Mexico, during the mid-1990s. Together, we collected the first Early Triassic ammonites found in Mexico, and Norm brought great clarity and wise caution to interpretation of the structural morass of the Caborca terrane from which lesser observers have mostly conjured tectonic fantasy. I can truly say that Norm is a fine gentleman and a gentle soul—soft spoken and well spoken, but with a penetrating intellect and vast experience that made him one the most valuable field collaborators of my career.

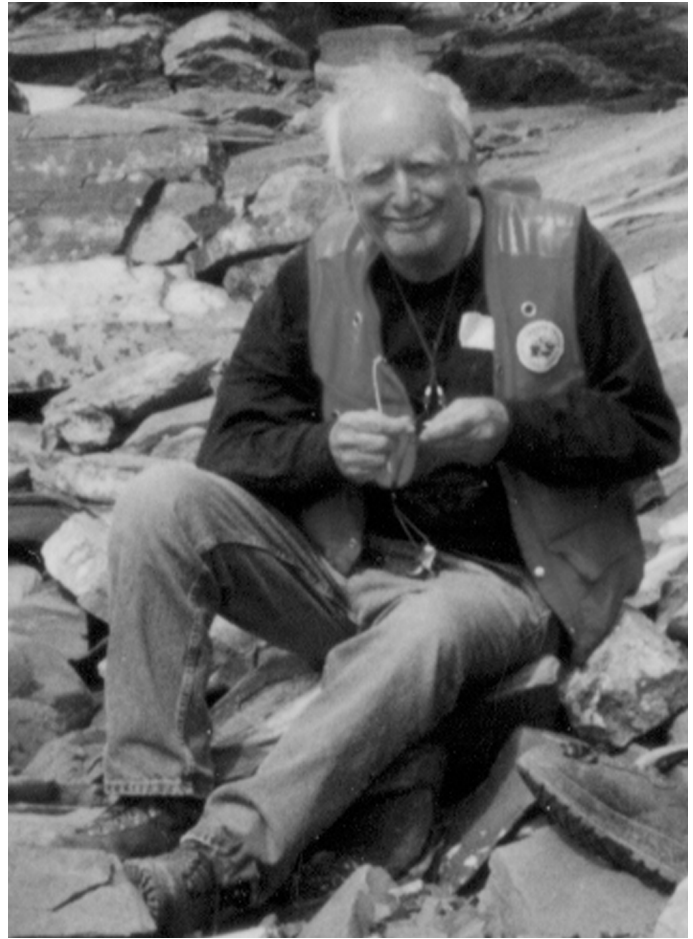
Tim Tozer was born 13 January 1928 in Potters Bar, England. In the 1940’s, the family moved to Canada where Tim completed high school, after which he returned to the UK to attend University at Cambridge. After graduating in 1948, Tim travelled back to Canada to undertake PhD studies at the University of Toronto (1952), and then work as a lecturer at the University of Western Ontario (1948-1952). Starting in 1952, Tim then began over a half-century of work with the Geological Survey of Canada, first in Ottawa and later in Vancouver.

Tim’s early research work in Canada involved Cretaceous-Paleocene nonmarine molluscs, but his interest became firmly focussed on the Triassic after meeting Frank McLearn, a GSC colleague and leading authority on the Triassic and its ammonoids, who retired the year Tim joined the GSC but kept active writing and mentoring Tim. Tim’s first exposure to Triassic rocks was in the southern Yukon where he spent the 1953 season studying the Lewes River Group. That same year, he visited Cowichan Lake on Vancouver Island with George Jeletsky, and then Tyaughton Creek in south-central B.C. with Howard Tipper, both crucial areas for latest Triassic biochronology.

The major focus of Tim’s fieldwork from the mid 1950’s was not in the Cordillera but in the far north. Together with Ray Thorsteinson, a contemporary from the University of Toronto, he was to spend a decade exploring the Canadian Arctic Archipelago (1954-1964). This was pioneering work. The geology of the Arctic was largely un-



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known, and Tim and Ray mapped vast tracts of the islands for the first time, establishing, among other things, the Mesozoic-Tertiary stratigraphy of the Sverdrup Basin. For Tim, this began with a 6 month field season by dog and sled; only later did Piper Super Cub aircraft become the mode of transport. Tim went on to establish the Lower Triassic stages and to define their constituent ammonoid faunas. This was to become the North American standard chronostratigraphy: Griesbachian, Dienerian, Smithian, and Spathian, aptly named after Arctic creeks that he had first named to commemorate distinguished researchers of the Lower Triassic.

Tim began work in northeast British Columbia in 1960, with a raft expedition on the mighty Liard River. This provided much Middle Triassic data to add to his knowledge of the Lower Triassic of the Arctic. In 1964, he visited Peace River Valley, treading in McLearn's footsteps and building on his legacy. Collaborative work with Norm Silberling began at this time – they were together in B.C. in 1965. Tim and Norm pushed forward with the marriage of Canadian and US Triassic data in a way that Si Muller and Frank McLearn never achieved simply because they never met. Tim was now in a position to produce his classic “Standard for Triassic Time” (1967), and shortly after that the joint landmark paper with Norm Silberling.

Tim travelled the world far and wide studying Triassic rocks and ammonoids, mastering his subject and meeting key players in the Triassic world. His fascination with the personalities of 19<sup>th</sup> century Triassic studies gave Tim's research a depth that few achieve – a view of the people behind the science. His famous ‘pink book’ - for which a GSC ‘Miscellaneous Series’ publication was invented! - lays out the unfolding drama of “The Triassic and its ammonoids: The Evolution of a Time Scale.” This scholarly masterpiece is highly recommended reading.

Tim's foreign travels and international liaisons enriched his science with wide ranging correspondents and opportunities to host visiting scientists. It was during one such visit in the late 1970's with a Chinese colleague that he flew over Williston Lake to view the drowned Peace River Valley where Frank McLearn had worked in the 1930's, and

that he had followed in 1964. It was here that Upper Triassic ammonoid zonation was carefully pieced together prior to the valley being dammed and flooded (1967). Rather than see only remnants of the former outcrops, Tim was startled to see new exposures around the entire lake shore. He wasted no time and immediately planned fieldwork that I (Mike Orchard), having recently joined the GSC, was fortunate enough to become involved with: the following year (1980) Tim and I set off to explore entirely new, ‘virgin’ outcrop - ‘dripping with ammonoids and bursting with conodonts’! This was undoubtedly the highlight of my early years with the GSC and hugely exciting for Tim, who now saw the somewhat synthetic ammonoid zonation laid out in clear succession. This was to be the beginning of our long collaboration intercalibrating the ammonoid and conodont scales. Over the next two decades we re-visited many of the sites in B.C. that Tim now knew to be pivotal in his biochronology, and some new ones like the Queen Charlotte Islands, where the pioneering George Mercer Dawson worked in the 1870’s. On that occasion, Tim used Dawson’s original field notes to locate unique localities – typical of Tim’s scholarly approach. It was Tim’s ammonoid zonation that truly laid the foundation for advancement in conodont biochronology. The impact of Tim’s work is manifest in his monumental 1994 work “Canadian Triassic ammonoid faunas”.

Tim’s knowledge of Triassic rocks throughout western Canada eventually led to his consideration of Cordilleran tectonics. Why were there reefs in the Yukon and anomalous distributions of certain fossils? Tim is credited with introducing the notion of transported fossil assemblages, and in 1982 he represented his views in a landmark paper assessing plate and terrane movements in which he proposed paleolatitudes for circum-Pacific allochthonous terranes.

Tim’s career achievements were recognised in 1989 by his paleontological peers when he received the Elkanah Billings Medal, awarded by the Geological Association of Canada for lifetime achievement in paleontological research. Four years later he received a rare honour with an appointment to membership of the Order of Canada, awarded by the Governor General of Canada for contributions “to our knowledge of the stratigraphy and structure of the Arctic Islands and the physical and biological state of our earth during the Triassic Period”. Truly deserved.

—Spencer G. Lucas and Michael J. Orchard

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