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Preface

Preface to Special Issue of *Chemical Geology* on Precambrian Chemostratigraphy in honor of the late William T. Holser

The use of chemical changes in seawater as a stratigraphic tool in the Precambrian began in earnest as scientists worldwide were aiming to driving a ‘golden spike’ at the critical boundary between the Phanerozoic and Proterozoic eons. Convinced by the pioneering research of William “Bill” T. Holser and colleagues on ancient ocean chemistry, several groups began carbon isotope studies across thick boundary successions — to document long term variations in the chemistry of seawater. The earliest reports revealed remarkable isotopic variations of unimagined magnitude, but most workers disregarded the oscillatory isotopic signals as diagenetic in origin. However, using Holser's stratigraphic approach, it soon became evident that geographically distant, but contemporaneous, and apparently well-preserved, marine strata on either side of the boundary recorded unique isotopic compositions. Holser and his colleagues (in particular see Veizer et al., 1980; Magaritz et al., 1986) quickly realized that in a Precambrian world lacking fossils with definable ranges, chemostratigraphy held the promise of providing a time line for the profound biogeochemical and climatic events of the Proterozoic Eon.

While the golden spike at the Precambrian–Cambrian boundary was ultimately decided on biostratigraphic grounds in a carbonate poor type succession from Newfoundland (Plumb, 1991), the spike defining the base of the newly-ratified Ediacaran Period was largely based on chemostratigraphy of the so-called ‘cap carbonates’ atop glacial diamictites (Knoll et al., 2004). These enigmatic deposits, which accumulated during post-glacial transgression, record the most profound carbon, sulfur, and strontium isotope variations in Earth history, and are the centerpiece of the controversial ‘snowball Earth’ hypothesis (Kirshvink, 1992; Hoffman et al., 1998). Lacking radiometric constraints on the absolute age and timing of these extreme isotope excursions, conflicting hypotheses of their temporal equivalence (Kaufman et al., 1997; Kennedy et al., 1998) and biogeochemical origins have proliferated (see review in Hoffman and Schrag, 2002).

By providing a way to tell Precambrian time (cf. Knoll, 2000), the number of studies relying on isotope stratigraphy in both the Proterozoic and Archean eons has grown exponentially over the past 20 years. Highlighting this achievement, the Fourth South American symposium on Isotope Geology (held in Salvador, Brazil, August 17–24, 2003, including over 300 participants from 15 countries) focused the opening day on the use of chemical stratigraphy in Precambrian successions of South America and their equivalents worldwide. This conference spawned the idea for a special issue of Chemical Geology based on Precambrian chemostratigraphy, and ultimately, to the 11 papers assembled here. The volume provides a distribution of studies that are broad in both space and time, highlighting chemical events through the latter half of the Proterozoic Eon and into the Lower Cambrian Period (Fig. 1). In the context of all the recent isotopic activity in Brazilian laboratories, it is notable that the earliest isotopic study of a Neoproterozoic cap carbonate was done on post-glacial sediments in the Irece Basin of Brazil (Torquanto and Misi, 1977).

The man to whom we dedicate this volume, William “Bill” T. Holser, was a stalwart gentleman, artist, and scholar who served his country, his family, his institutions, and his scientific community (Fig. 2). After serving in the navy during World War II, Holser received his master's degree from Caltech (1946) and his doctorate from Columbia University (1950). From then to the end of his career, Bill pursued his eclectic interests at various academic and industrial research

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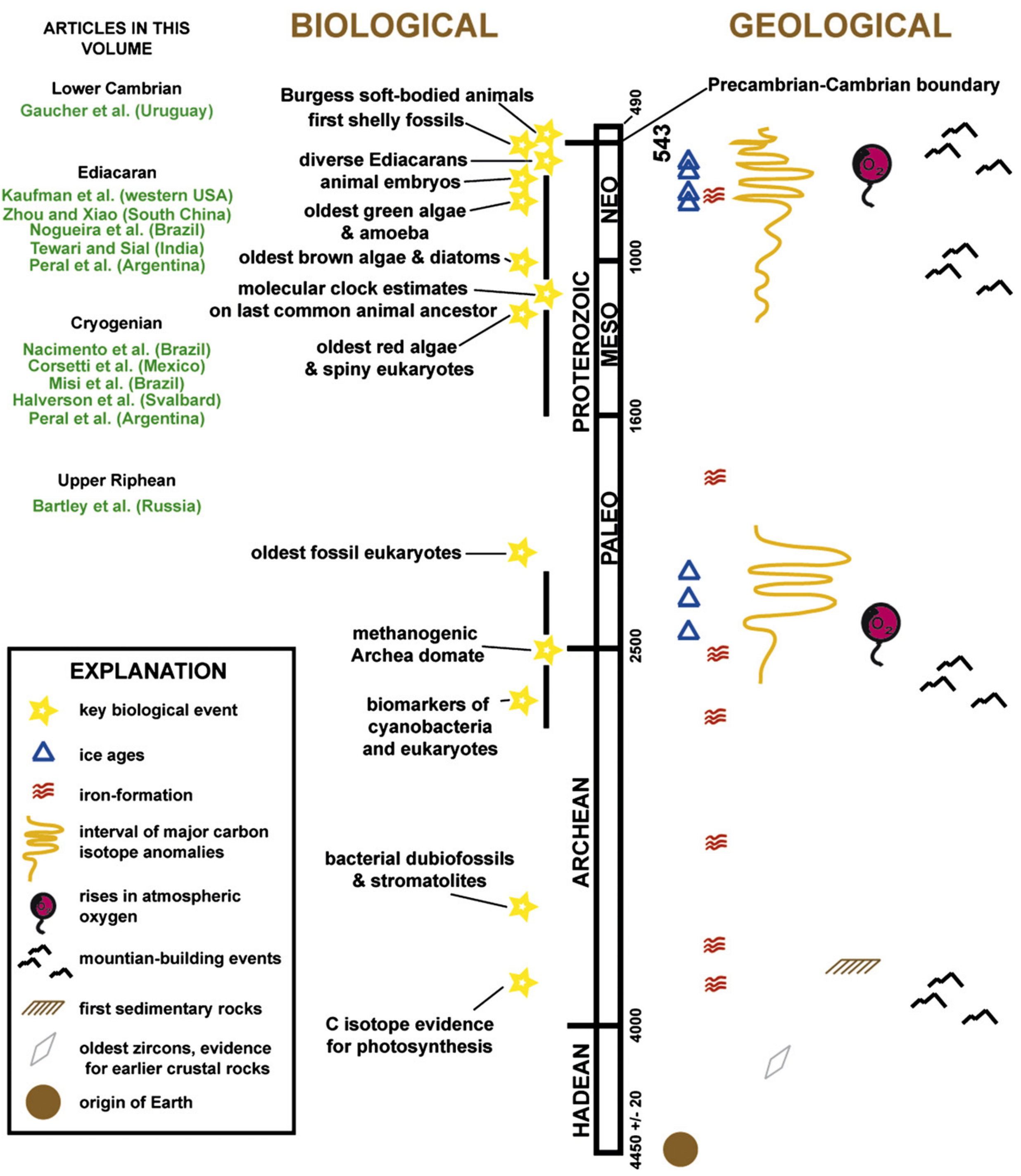

Fig. 1. Geological and biological events in Precambrian Earth history. The timeline is modified from Knoll (2003) and includes relative subdivisions of papers, listed by first author, presented in this Special Issue.

laboratories. He was a faculty member at Cornell University, UCLA, and ultimately at the University of Oregon where he served as chairman of the Geology Department for several years. Bill was an editor of several journals, including *American Mineralogist*, and was a fellow of the MSA, GSA, AGU, SEPM, and the Fulbright Foundation. While his research covered a broad spectrum of personal interests from crystallography

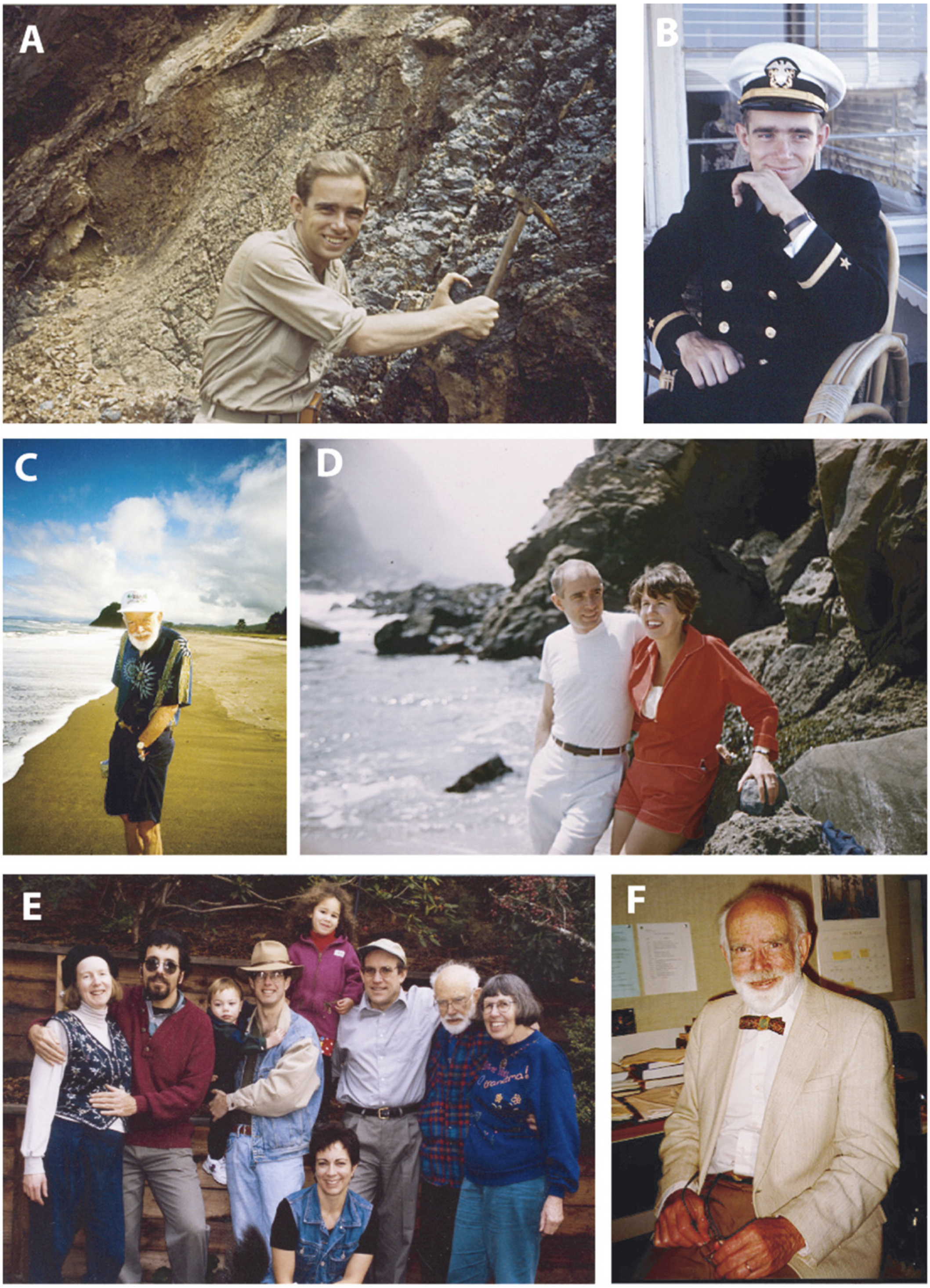

Fig. 2. A montage of photos of William "Bill" T. Holser throughout his adult life. A. Stationed by the Navy in French New Caledonia in the western equatorial Pacific Ocean (with geological hammer on the outcrop) during World War II; B. Navy Lt. Bill Holser ca. mid-1940's; C. Bill Holser strolling along the Oregon Coast in 1996; D. Bill and Mary Ann Holser at Big Sur, California in 1956; E. The Holser family in 1998 with daughter Margaret and husband Pat Anolfo (left), son Alec and wife Nan Binkley with children Brendan and Erica (center), and son Tom with Bill and Mary Ann (right); E. Bill Holser with classic bowtie in his University of Oregon office ca. late 1980's.

to meteorite impacts, it is his discovery and interpretation of remarkable sulfur and carbon isotope anomalies associated with environmental change and mass extinctions that serves as a backdrop to the current proliferation of studies in chemical stratigraphy. However, because his publications were spread over such a wide variety of disciplines and because he often worked in isolation, the scientific achievements of this modest man may have been largely under appreciated.

On the other hand, Bill Holser was also a champion of political and social causes, an avid outdoorsman, and a loving husband and father. He is remembered by his family as an artist, scientist, and optimist, whose unique sensibilities and appreciation of beauty defined his world view. After battling Parkinson's disease for several years, Bill died at home on Christmas Day in 1999 leaving behind an international reputation and a smile that warmed the hearts of everyone he knew. If his devoted family could not fully understand the visionary insights that Bill had about the ancient Earth, we can, as we stand tall on his broad scientific shoulders and look even deeper back into geological time.

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