Technical Council on Cold Regions Engineering Monograph

Frozen in Time

Permafrost and Engineering Problems

Siemon W. Muller

Edited by Hugh M. French
and Frederick E. Nelson

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Permafrost and Engineering Problems

S.W. Muller explaining the origin of ice wedges at a mining exposure on Goldstream Creek, Fairbanks, 1944

Frozen in Time: Permafrost and Engineering Problems

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DEDICATION

It was with great pleasure that I am able to approve of, and sign off on, the publication of my father's last work. This manuscript certainly lived under the radar for many years. I knew that Dad was working on a manuscript for publication, but I had no idea of its status or location after his passing.

My special thanks and appreciation go to Professors Hugh French and Frederick Nelson for undertaking the compiling and editing that was required to get this historical document and original graphics ready for publication.

I would like to expand on some items in the biographical sketch of quite a remarkable man and his adventurous life. It started in Eastern Siberia, then an escape to China, passage from Shanghai to the United States by way of the steamship, "Golden State" of the Pacific Mail Steamship Line in the early 1920s. He followed his brother, Bill, to the University of Oregon where he entered as a sophomore based on an incredibly strong transcript from his high school in Vladivostok.

While doing field studies for his Stanford Doctoral Dissertation in 1928, he discovered a fossilized *Ichthyosaurus* in Central Nevada. This site subsequently yielded more than 40 of the largest remains of this creature ever found in North America, some over 50 ft. long.

His special interest in stratigraphy and paleontology led him to investigate the connections between North American geological formations with those of Europe. During a sabbatical in Germany in 1937-38, he started this research, but Hitler sent him home before he could complete it. During 1956-57 he returned to continue his research, but this time he was interrupted by the Hungarian Revolution and the call by the U.S. State Department to interview and help place academic refugees.

During World War Two, Dad served his country with the United States Geological Survey. First, he identified the location of strategic resources, and second, he completed a tour of duty as a Civilian Scientific Consultant assigned to the Alaska Division of the U.S. Air Transport Command under the command of Brigadier General Gaffney. Dad greatly appreciated the full support of the General and his staff during his work in Alaska.

Eventually back at Stanford, Dad got back into what he loved most—teaching. He expected his students to achieve, and he enjoyed sharing in their success. All the former students with whom I have visited said they loved his classes and really appreciated him as a teacher and mentor.

I want to extend a heartfelt thank you to Bucky Tart for his persistence in trying to find me. I was amused as he described the difficulty Professor French had experienced trying to track me. Obviously the contact in the Stanford Department was new and not aware of my relationship with Professor Muller, or that we have been contributing for many years to the Department of Earth Sciences in the form of

Dad's memorabilia as well as annual financial gifts in Dad's name.

The timing of my meeting with Bucky was amazing because, literally the day before he came to meet with my wife, Sherry, and I, when I authorized the publication of Dad's book, we had finalized an agreement with Stanford to fund the ***Professor "Si" Muller Memorial Fellowship for Graduate Geological Studies*** in the School of Earth Sciences at Stanford.

I hope this book will be a significant contribution to the field of permafrost research. I'm sure Dad would be very pleased to know that time and need have finally caught up with his observations and research.

ERIC MULLER
Bow
Washington

February 24, 2008

ACKNOWLEDGMENTS

We thank Bucky Tart and the Technical Committee on Cold Regions Engineering, American Society of Civil Engineers (TCCRE, ASCE), for agreeing to "thaw" this manuscript, which had remained, metaphorically, in a frozen state for so many years. We thank Eric Muller, Bow, WA, for graciously giving ASCE copyright of his late father's manuscript. Bequests to HMF from the late Roger J.E. Brown and the late Troy L. Péwé were also obvious prerequisites to publication of the manuscript. FEN wishes to acknowledge his late father, to whom he owes his interest in cold regions. Staff Sgt. Fred E. Nelson, a search-and-rescue pilot in the U.S. Army Air Force's Alaska Defense Command, spent more than two years during the later stages of World War II at the Galena airfield on the Yukon River. Siemon Muller is known to have visited the Galena installation during his 1943–45 assignment to Alaska. It is intriguing to reflect on this crossing of paths at a small, remote outpost.

August 2007
Hugh French, North Saanich, British Columbia, Canada
Frederick E. Nelson, Newark, Delaware, USA

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INTRODUCTION

Chance favors the prepared mind.
—Louis Pasteur

Serendipity plays a surprisingly important role in science (Roberts 1989). Together with the idiom "every dark cloud has a silver lining" and the figure of speech "being in the right place at the right time," *serendipitous* is an entirely appropriate way to describe Siemon William Muller's contributions to permafrost science.

Muller is something of an enigma to many students of permafrost science. Although he wrote the highly regarded and authoritative first English-language book about permafrost (Muller 1947), he did not contribute to the field's primary literature. Few permafrost scientists are aware that Muller had a long and distinguished career in paleontology and stratigraphy. Although some know that his permafrost work arose from the necessity to avoid or correct military-engineering "SNAFUs" in Alaska and northern Canada during World War II, very few are aware that he maintained interest in the subject into the 1960s or that he had quietly compiled a massive review of Soviet and North American permafrost literature. The greatest mystery, however, is why he set that nearly completed manuscript aside shortly before retiring from university service.

Muller has frequently been credited with having synthesized the term *permafrost* (for example, Brown 1970, Gary et al. 1972, Washburn 1980). Today, he is widely regarded as the father of North American permafrost science, almost entirely on the basis of the book resulting from his civilian service to the military during World War II (see Frontispiece and Plate I). This compilation of Russian-language literature, first distributed as a classified report under the title *Permafrost or Permanently Frozen Ground and Related Engineering Problems* (Muller 1943b), was nominally revised and reprinted in 1945, and appeared in 1947 in commercial book form under the imprimatur of J.W. Edwards of Ann Arbor, Michigan. The latter edition became the standard permafrost text in North America for more than 20 years and continues to be cited widely.

Here, we present a nearly complete, previously unpublished (frozen) manuscript about permafrost. The book appears to have been completed during the early 1960s, near the end of Muller's career. From today's perspective, the book's comprehensive nature is unusual—it covers basic scientific knowledge about perennially frozen ground, the engineering problems associated with it, the geography of permafrost, related elements of landscape science and ecology, a smattering of periglacial geomorphology, and detailed treatment of the physics of frozen ground. There is, however, no doubt that frozen-ground engineering is the ultimate focus of the volume or that Muller intended it as an expansion of his earlier effort. Like its predecessor, many of its parts read like a "how-to" manual for engineering personnel working in pioneering or primitive circumstances.

The wide-ranging nature of the topical matter contained in this book is in distinct contrast with most modern permafrost texts and monographs. Permafrost science