

# Preface

The word permafrost was coined by S.W. Muller in 1943 and the International Hydrological Decade started in 1965, under the auspices of the United Nations Education, Scientific and Cultural Organization (UNESCO). While valuable observations and cursory measurements had been made in permafrost areas in the early half of the twentieth century, the latter part of the century witnessed expansions in measurement and mapping programs in areas of permafrost that are difficult to access and expensive to operate in. Resource development and environmental assessment provided the added impetus. Concerted effort was made to embark on projects, ranging in scale from experimental plots to small drainage basins, to study the properties, distribution, movement and storage of water as they are directly and indirectly influenced by the presence of permafrost. Investigations in the field and laboratory remarkably advanced permafrost and hydrologic sciences. When the new millennium arrived, a wealth of knowledge had been acquired to consolidate the formal status of permafrost hydrology.

Hydrology is by nature both scientific and applied, as is permafrost investigation. Permafrost hydrology benefits from progress in other disciplines; included among them are atmospheric and climatic sciences, hydrogeology and soil science, geotechnical and environmental engineering, biological and forest sciences, periglacial, fluvial and glacial geomorphology. The interdisciplinary flavor of permafrost hydrology adds to its scientific strength and practical merit while its relevance to these other disciplines is reciprocal. The permafrost domain still encompasses many scientifically uncharted territories with innumerable hydrologic features yet to be discerned, many processes to be understood and pertinent new concepts to evolve. The excitement of discovery will continue to entice future investigators.

This book provides a survey of the status of progress. Through this book I wish to share my experiences with professional and non-professional but interested readers, be they practitioners, researchers or students. The materials are presented in sufficient detail for the instruction of young permafrost hydrologists at a senior

level, and broad enough to satisfy the needs of cross-disciplinary researchers and practitioners who can make use of the information without having to delve into the complexity of permafrost or hydrologic sciences. Emphasis is placed on discussion of permafrost and hydrologic processes with the premise that an understanding of the physical processes is fundamental to experimentation, theoretical and modeling work in permafrost hydrology.

I have learned much from published articles on permafrost, hydrology and related or even unrelated subjects, from the work of my colleagues and from discussions with my dedicated research associates and students. For this book, various people have kindly permitted the use of their photographs that uniquely capture a number of hydrologic processes and phenomena: George Brook, Sean Carey, Richard Heron, Ross Mackay, Philip Marsh, Frank Nicholson, Chris Spence, Robin Thorne and Kathy Young. Ross Brown graciously provided snow data I requested specifically for this book. I specially acknowledge the help of my friends Michael Mollinga, Robin Thorne and Laura Brown who improved the manuscript and produced many of the fine maps and diagrams.

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