THE SCIENTIFIC NATURE OF GEOMORPHOLOGY

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Preface

Geomorphology is concerned primarily with generating knowledge about the terrestrial surface of the earth, excursions into planetary 'geomorphology' and submarine geomorphology notwithstanding. Whether or not all contributions to knowledge derive from science is a philosophical issue, but it is reasonable to assert that most geomorphic knowledge is derived scientifically. Numerous articles have appeared over the last few years expressing concern about the future of geomorphology or voicing opinions about the character of geomorphic enquiry (e.g. Richards 1990, 1994; Baker and Twidale 1991; Yatsu 1992; Baker 1993; Rhoads and Thom 1993, 1994; Bassett 1994; Rhoads 1994), but these articles, while divergent in many respects, agree on one point - that geomorphology is a science and, therefore, a scientific discipline. What seems to be at issue is what this status as a science implies for geomorphologic theory and methodology. The current debate appears to reflect tension between a research tradition rooted firmly in geology/ physical geography and an emerging approach grounded more directly in the scientific principles and methods of physics and chemistry This tension has initiated a period of introspection as geomorphologists search for a way to reconcile traditional and emerging perspectives.

The nature of the current debate cannot be completely appreciated without placing it in the appropriate historical context. Much of modern (American) geomorphology emerged during the turn of the century, a period when territorial expansion and exploration in western North America were rife, and was accompanied by the scientific work of such renowned geomorphologists as C. E. Dutton, G. K. Gilbert, and J. W. Powell. The result in the USA was a scientific discipline pervaded by a preoccupation with fieldwork. However, the most famous geomorphologist of this era (arguably of any era) William Morris Davis, is renowned for his unifying conceptual framework. Indeed, the other great geomorphologist of the same period, G. K. Gilbert, is also revered for his conceptual approach, although appreciation of his remarkable insights took much longer to develop.

Conceptually, turn-of-the-century geomorphology was dominated by the biologically inspired, all-embracing 'Geographical Cycle' of William Morris Davis (1899). By virtue of widespread support and limited opposition, this grand vision of landform development dominated geomorphological research between about 1900 and 1945, and geomorphological teaching for many more years thereafter. The demise of the 'Geographical Cycle' as the dominant overarching conceptualization of landscape development did not result in the emergence of another, similarly dominant, model. It is true that John Hack's (1960) resurrection of G. K. Gilbert's concept of dynamic equilibrium became very influential in

the 1960s and remained so, as did Strahler's (1952) emphasis on process. However, whereas Davis's ideas were a strictly geomorphological theory, those of Hack and Strahler were more generalized principles designed to guide research.

Today, it is reasonable to characterize geomorphology as a burgeoning scientific discipline of increasing societal significance which, while embracing the very latest concepts in chemistry, physics, mathematics, and computer modeling, lacks not only a unified body of theory, but, more importantly, a clear and unifying sense of disciplinary identity. In particular, there is a growing schism between those focusing upon reconstruction of the development of individual landscapes (often Quaternarists) and those seeking general principles governing landscape dynamics (most frequently numerical modelers, or process-oriented geomorphologists). This conflict is not an inherently valid one intellectually, but is a perceived one that commonly rests on the different scales at which the two groups work and the varying techniques they employ. Nevertheless, whether valid or perceived, the schism, if allowed to grow through inadvertence, could promote fragmentation of geomorphology.

The driving force behind the production of this volume is the belief that by overtly focusing on the discipline's methodological and philosophical underpinnings, geomorphology can thwart the tendency toward fragmentation. Indeed, it could be argued that the failure to engage such issues in the past has in part led to the current situation. Geomorphology already is over 100 years old, yet this volume is the first concerted attempt to bring together a diverse group of practitioners to systematically explore the methodology and philosophy of geomorphology. If geomorphologists are to develop a profound and robust sense of disciplinary identity, they must attend to foundational issues more fully than they have in the past.

The purpose of this volume is to initiate a broad examination of contemporary perspectives on the scientific nature of geomorphology. This initial exploration of methodological and philosophical diversity within geomorphology is viewed as a necessary first step in the search for common ground among the diverse group of scientists who consider themselves geomorphologists. The volume aims to simultaneously advance, enhance, and strengthen geomorphology as it enters the twenty-first century by clarifying the bases for internal debate, by showing how geomorphology fits into the realm of science at large, by examining the relationship of the discipline to other areas of knowledge, by providing an improved understanding of methodological diversity within the discipline, and by identifying potential bases for disciplinary unity.

To achieve these goals, contributors were asked to address specific topics in a manner that illuminates contemporary conceptual issues or problems and that casts light upon desirable or potential developments. It was not the editors' expectation or aspiration that the contributors would speak with a single voice; indeed, they have addressed issues which can variously be described as methodology, theory, philosophy, or amalgamations of all of these components and of less clearly identifiable ingredients as well. Given this situation, the organization of the chapters of this book into distinct groups is based not on some essential set of criteria, but instead reflects the editors' perception of prominent commonalities among individual contributions. The first group, which is loosely labeled ‚philosophical', commences by addressing fundamental issues in the philosophy of science and moves on to consider philosophical issues in geomorphology. The second group of 'methodological' chapters addresses in one form or another scale issues,

encompassing not only how we attempt to arrange our ideas of scale, but how they influence our scientific methodology, as well as the limitations that our dating metrics impose upon our scientific understanding. The third group focuses on geomorphological modeling. As models form the primary link between what we are able to measure and study directly, namely the world as it is, and how we think about the world, their role in the discipline is both pivotal and critical. The fourth, and final, group of chapters addresses geomorphology's position in the web of academic disciplines, as well as illustrating an important future role - geomorphology in the service of society. Each group of chapters is prefaced by a brief introduction.

One final note - this volume should be seen as inceptive, rather than definitive. There are, no doubt, many important aspects of geomorphology that receive no attention herein. No apology is offered for these omissions. Rather, the hope is that others will feel compelled to champion their importance elsewhere.

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