Different branches within geomorphology

Historical geomorphology is concerned with the evolution of forms over the past centuries, mainly in relation to different types of human pressures. It relies heavily on archival documents. **Paleo-environmentalists or geoarchaeologists,** long-term geomorphologists, explore these same evolutions over several millennia, distinguishing control factors related to human activities from those resulting from natural climate dynamics. They generally use sediment cores that they collect from alluvial plains and old arms and on which they conduct multiple analyses (study of pollens, macro-remains, shells, metals and other pollutants...).

The **so-called dynamic geomorphology** addresses the mechanisms, the processes that govern the forms. Much of the community relies on the laws of physics to explain riverbed dynamics as a result of Wolman's work. Sometimes we talk about a **reductionist approach**, trying to reduce the complexity of the phenomena to identify the dominant processes or the respective role of each of them. In this context, **experimentation** is widely developed, whether *in situ* or *ex situ*. Many studies are based on physical models and artificial channels. The use of **"morphodynamic"** **numerical modelling** is also an important field in the field. The aim is to reconstruct the change in bed geometry from mathematical formulae that integrate the flow of water and solid transport over a period of time and their impact on this geometry.

Statistical geomorphology is an emerging field that allows us to explore the complexity in all dimensions of a river system and to understand the diversity of phenomena in different spatial and temporal contexts. In particular, it explores the effects of scale from a **so-called holistic perspective**. It often relies on comparative approaches between sections or watersheds to identify thresholds of change or key factors explaining these changes. For example, it makes it possible to assess the effect of changes in land use (deforestation, reforestation, urbanization), or developments (dams, dikes, weirs) or practices (extraction of aggregates, cleaning, bed maintenance) on water and sediment flows and, *ultimately*, on the geometry of river beds.

Reductionist and holistic approaches complement each other to address river complexity from grain to large regional hydrographic complexes.

The domain is also growing at its interfaces. Some people talk about **hydromorphology, ecogeomorphology, biogeomorphology or sociogeomorphology** (fluvial). These terms reflect the emergence of new scientific fields explored between two existing disciplinary fields. Indeed, ecological (or biological) dynamics can influence the characteristics of a riverbed, or even its evolution. They are also influenced by it. A riverbed is part of a generally humanized territory and is often at the heart of operational challenges. This is what socio-geomorphology, for example, addresses.

Cover image. [Source: Water Agency RMC]

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