The Origin Of Mountains

Synopsis

The Origins of Mountains approaches mountains from facts about mountain landscapes rather than theory. The book illustrates that almost everywhere, mountains arose by vertical uplift of a former plain, and by a mixture of cracking and warping by earth movements, and erosion by rivers and glaciers, the present mountainous landscapes were created. It also gives evidence that this uplift only occured in the last few million years, a time scale which does not fit the plate tectonics theory.Another fascinating part of the evidence, shows that mountain uplift correlates very well with climatic change. Mountain building could have been responsible for the onset of the ice age. It certainly resulted in the creation of new environments. Fossil plants and animals are used in places to work out the time of mountain uplift, which in turn helps to explain biogeographical distributions.

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Customer Reviews

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A must-read for all geology students and for those laypeople interested in the current state of big-picture geological theorizing. Ollier and Pain perform at least three useful functions in issuing their book. First is to bring the long-neglected but richly productive discipline of geomorphology back

into vogue. Second is to trigger a long-needed re-examination of plate tectonics as the all-purpose answer to every sort of geological question. The authors do not repudiate the basic concepts of continental drift, sea floor spreading, etc. but instead urge the primacy of testable field data over what they see as the knee-jerk invocation of subduction as the near-universal cause of the folding of rocks and of the elevation of mountains. The third function of this book relates to the second--by engendering a healthy, constant skepticism toward toward plate tectonics as an explanation of "everything", The Origin of Mountains will keep the imaginations of geology students fresh and elastic, and thus ready to see bold new solutions to new geological problems.

I am one who finds mountain landscapes inspiring, and no doubt many laymen and scientists do the same. As a professional geologist, I have enjoyed some of the beautiful mountain scenery of India, continental USA, Mexico and Hawaii, and how mountains form is of great interest to me.I found 'The Origin of Mountains' to be a very thought-provoking and excellent work. The book is indeed ground-breaking in that it makes the reader realize what processes really create mountains, and how there is a large discrepancy between field facts and models. For example, although many plate tectonic treatments picture a subducting slab diving beneath another plate and causing both folding of rocks and mountain formation, the authors emphasize that such simplistic cartoons have nothing to do with reality, in that folding has nothing to do with mountain building, and the production of mountain topography is a much later event. Always, folding and rock deformation are succeeded by peneplanation, then uplift of the plains to produce plateaus, and it is the erosion of these uplifted plateaus which creates mountains. Mountains are, ironically, created by "epeirogeny" followed by erosion, and not by "orogeny", though etymologically orogeny means mountain formation but has lately been applied to the process of folding and deformation.The book has 13 chapters: 1. Introduction; 2. Simple plateaus and erosional mountains; 3. Fault block mountains; 4. European mountains; 5. Western North America; 6. The Andes; 7. Asian mountains; 8. Mountains with gravity structures; 9. Volcanoes and granite mountains; 10. Mountains on passive margins; 11. Plains and planation surfaces, drainage and climate; 12. Problems of mountain tectonics; 13. Science and the origin of mountains.Mountains from all over the world, and of all types and tectonic settings are described. The book is rich in illustrations, with a nice colour photograph of the Chilean Andes on the cover and numerous black and white photographs inside, which are clear enough. The line drawings/geographic maps are all quite clear and neat, though a weakness of this book, perhaps its only substantial weakness, is that many of the geographic maps do not show either a scale (e.g., Fig. 4.23), or latitudes-longitudes (e.g., 3.4), or both (e.g., 4.17, 11.23). It is very difficult in these

cases for readers unfamiliar with the particular area to grasp its exact location and extent. Some vertical profiles of local areas (e.g., Figs. 8.2, 8.8) do not have the trend of the profile or the depths/heights marked on them. Line sketches of Mt. Snowdon in Wales (Fig. 2.13) and Stone Mtn. in Atlanta (Fig. 2.21) do not convey to the reader an idea of their size. This good work would have been even better had the line drawings been perfect. Of course, there also are many line drawings in the book that do not have these shortcomings.A good aspect of this book, written by two well-known and reputed geomorpholgists, is that even if you are not a geomorphology specialist you could learn a lot, or clarify your concepts, with the book. Many topics in geomorphology (planation surfaces, drainage patterns, etc.) are described, with descriptions of worldwide examples. However, a glossary of technical terms at the end would have been helpful. Still, a useful index and a bibliography of well over 400 references (up to year 2000) are given.I go on to make a few other relatively minor comments. The authors observe that in fold belts many rivers follow the axes of anticlines, and they argue that the anticlines may have formed *after* the formation of the river valley, due to isostatic uplift along the valley. I think that this is interesting and plausible, but I am not convinced that this is so in every case of a river following the axis of an anticline. As I understand, the process of folding at shallow depths produces brittle deformation in the form of pervasive cleavage parallel to the axial plane of the fold, and on large scale anticlines the existence of this cleavage could well lead to selective erosion by streams and production of a river valley. The authors' discussion of nappes being driven by gravity, and not horizontal compression (as postulated in plate tectonics) (Chapter 8) is very interesting. The Mexican volcano Popocatepetl (Chaper 5), contrary to the authors' statement, is quite active; the other two large Mexican volcanoes Pico de Orizaba (Citlaltepetl) and Iztaccihuatl are inactive. Coastal monoclines at passive margins are not all with 2 degree seaward dips (Chapter 10); the Panvel monoclinal flexure in western India shows lavas dipping seaward by 18 degrees or more (see H. C. Sheth, Tectonophysics 294, 143-149, 1998).I very much appreciate the authors' view (Preface): "Sadly, in our opinion, Earth Science has become too concerned with theory, models, and dogma... We hope, in our small way, to encourage people, from students to professionals, to have a new look at mountains, without reference to pre-conceived theories, but with attention to what can readily be seen." The last chapter is about theories and bandwagons, the neglect of landscape evidence, and orthodoxy and disregard for ground truth. The authors' feeling is that (pp. 300-301) "Plate tectonics as a general principle has been enormously helpful in many aspects of geology, but its practitioners have neglected the ground surface, and have often been uncritical in their time scales... we are not totally converted to the religion [plate tectonics]. You can believe what you like, but please don't

send missionaries!"In summary, with its few minor weaknesses, I highly recommend this book. The paperback edition at ~US$50 is pretty good value for money, noting its scientific content (observations, ideas and the global coverage) and also its good production. It is a book which deserves a careful reading by everyone interested in and impressed by mountains, and it is a book which deserves a place in every Earth Science library.

I bought this book as I was interested in something valuable about mountain ranges, but after reading it I have a feeling this is more a work of the geomorphology vs. geology kind!! I'm definitely disappointed, and a bit amazed at its contents. There is something curiously anachronistic in the way the authors tackle their stated goal to analyze the origin of mountain landscapes. Their train of thoughts seems to develop along the lines of those glorious theories and ideas that shaped geological thinking as gods-of-the-gaps before plate tectonics finally started making some sense (or at least, so it seems thus far) of geologic evidence on several observational scales. Here we find mountains interpreted in terms of geotumors, mushroom tectonics and the good old geosynclines... The latest developments (and by latest I mean some solid four decades of research) in structural geology and global tectonics are dismissed as a scientific fad, while the authors focus instead on exogenous processes as the main producers of mountain landscapes. Personally, I certainly agree that erosional processes do shape what we see up there (give or take stuctural and lithologic controls). Yet, what brought and thrust those landscapes upwards in the first place, we're not given to know... Except for some really dubious claims, like the irrelevance of active plate margins, the absence of compressive deformation along the Pacific margin of South America and even in the Himalayan region (which is somehow the most compressed place in the world after Rome's subway) or revamping the role of gravity tectonics, interpreting thrust faults as huge crustal slabs sliding downward (...but then just what pushed those rocks upwards first?!?). A proposal is even advanced for the origin of anticlines as isostatically rising up after fluvial erosion partially removed the lithostatic load of the above-lying landscape. It all sounds so Davisian: the continents were just higher once, but then they started crumbling down, and mountains today should be viewed as mere leftovers of erosion... I just wanted to learn something more in-depth about mountains, but I seem to have read a book from the nineteenth century or something like that, when geologists where still fumbling through vague theories. It was valuable nonetheless back then, but we have moved on today. Perhaps plate tectonics and structural geodynamics aren't perfect at present, we can't understand just everything yet (especially not me, because I'm into sedimentology) but at least we have a sensible and coherent framework to advance and test hypotheses. Ollier and Pain have

simply ignored it all. They get two stars anyway, not just one, because science benefits greatly from counterviews and discussion, not from generalized, passive agreement about any given topic. If the views expressed in this work ever had to be accepted by some members of the geological community, then they sure will stir a heated debate of such importance as to contribute very much to testing and reasoning about the validity of the plate tectonics paradigm. My point is, nonetheless, that criticizing the mainstream needs the support of valid evidence, not obsolete, misleading notions. It should be a step forward, whereas this book just feels like a giant leap backward...I really liked two of Ollier's previous books, the one on regolith geology was actually excellent, but this time I even wonder whether the publisher bothered to submit this book to any reviewers before going through the press?? Or maybe I really haven't understood a fat nothing about geology yet....

altitudes of important mountains, etc