

Backbone — The Rockies

CONVERSATION BETWEEN PETER BERG AND ROBERT CURRY

Peter Berg: What is the significance of the Rockies to North America? How do they control water, for example?

Robert Curry: The Rockies are the watershed of the continent in the sense that the western half of the continent, west of the 100th Meridian, is a zone where precipitation is less than potential evaporation, so we have aridity. It's arid except for the mountain ranges and western rivers. Those western rivers which provide water for the irrigable land (including the rivers that flow east from the Rockies like the Missouri) all derive 95 percent of their precipitation in the mountain ranges.

The great hydro-power of the Pacific Northwest doesn't actually originate there. It has nothing to do with the Pacific Northwest. It's very interesting to talk to the governors of that area. They think, "Well, we're having a drought; we'll have to go out and seed clouds." It won't change things a bit to cloud-seed Oregon to increase hydro-potential since the hydro-potential of rivers in Oregon is very low.

The Rockies bisect the West — the center of the West. The arid land areas of North America lie half east of the Rockies and half west of the Rockies. The Rockies are the backbone of the arid land portion of the North American continent. And they are the watershed, and they supply virtually all of the water except for those rivers like the Sacramento, the San Joaquin, the Willamette, that originate in mountains west of the Rockies.

PB: How about soil?

RC: The soils of the Rockies are young because the mountains are geologically active; they are actively eroding; they are actively and recently glaciated. Their rivers are actively down-cutting. So the soils are young; they're forming today and their nutrient reservoirs are rich. They're immature. The biotic elements of the Rockies are for the most part in succession; not yet stable, not yet mature, not yet climax. The nutrients of the Rockies wash down onto the prairies.

PB: It's all owed to the Rockies, the fertility east and west?

RC: Yes. The Rockies constantly give up that fertility and maintain themselves in a constant state of succession . . .

PB: The mountain valleys themselves.

RC: Right, and the mountain ridges, the conifer forests giving up the nutrients that wash down below. So, the mountains themselves stay perennially immature in terms of soils.

PB: An adolescent condition.

RC: You know, we talk about old forests and climax, but that is really not the case with the Rockies. They haven't climaxed yet; not since well before the last glaciation, perhaps 600,000 years. We have very little in the Rockies like, say, the Sequoia forests and the west side of the Sierras which have enormously old soil. Those are old mountain forests.

The geologic history of the North American continent is one of extreme antiquity in the east, intermediate antiquity in the Rockies, and very youthful status on the west coast. The Appalachians and the Catskills are old ranges which are even traceable to the original continental mass that broke off from what is now Europe. The Rockies, however, result from a mountain-building event that is unique to North and South America. They are similar to the Andes. They appear to have formed at about the same time that the last major continental breakup occurred and they are probably somehow related to that splitting-up, 60 to 100 million years ago. Something created an incredible condition of imbalance in the continental masses of the Earth. What the event was we don't know.

PB: As the original continent began breaking up, whatever that original gestation event or trauma was, North and South America were separate from each other and began making their trip across what is now the Atlantic. As they made that trip, those two masses met a similar kind of obstacle that caused the formation of the Rockies and the Andes.

RC: Correct, and that obstacle was the oceanic plates of the Pacific Ocean which the continents of North and South America began over-running. At that Cretaceous time, that time of dinosaurs, the Rockies and Andes were formed by the continents buckling over, stubbing their toes over, humping the Pacific Plate. There's no word better than *humping*. There were enormous compressional events which, in the Northern Rockies (the Wyoming/Montana line northward) and particularly in what is now Canada, exerted so much compressional stress that the ranges folded, buckled, and broke. Great, high mountain ranges that were probably on the order of 15 to 25 thousand feet in height originally, broke off and slid east out into the prairies. This has given us some classic features like Chief Mountain in Montana and what are called over-thrust belts in the Canadian Rockies. Further to the west, in Alaska, Canada, and the northern United States, it formed the Rocky Mountain Trench. In the Southern Rockies, Colorado, and New Mexico, there were actually two mountain-building events. Both were related apparently to times when the continent began drifting westward, which occurred twice; once in the Pennsylvanian and once in the early Cretaceous.

But the major mountain-building event in terms of the Rockies today is known geologically as the

Laramide Revolution. It occurred at the end of the Cretaceous, about 60 million years ago. The great inland seas were in the places that are the Rockies today, all the way from the Seward Peninsula in Alaska to Tierra Del Fuego at the tip of South America. Those areas which were plains or lowlands that were swampy and for the most part brackish salt water of the inland seas — they buckled and humped up at the time of the shifting of the continents westward, and the total environmental stresses changed radically. Much more aridity, wet/dry cycles, more cold/hot. It destroyed the living habitats. It destroyed the niches for virtually all organisms. A whole new set of beings existed. This was going on all over the world, of course. All the continents were shooting across, all humping. A period of 10 million years for the total process with alternate periods of aridity and wetness.

In that next 50 million years, the events that formed the Rockies raised the continents up all over the world, out of the oceans. The same event raised the continents and gave us a high period of continentalism, destroying the shallow brackish inland sea, humid forest dinosaur lifestyle; and gave rise to the grass-eating, wide-and-free-roaming mammalian populations. The same event that gave us the Rockies gave us our mammalian populations. That is the point I'm trying to make.

PB: Then the Rockies are the backbone — literally the mammalian backbone!

RC: Yes, it is. The mammal-forming time.

PB: Terrific!

RC: And that thing carried through as the theme of the Rockies, including the time of Man. The migration routes of big herds of animals changed in response to the stresses. Prior to the Rockies, an animal could be born and always raise her progeny in the same square mile. The Rockies signaled the end of that. They demanded life forms which were extremely adaptable; you come down out of your forest and move . . .

PB: Bipedality.

RC: Right, the bicameral mind. That evolution of extreme aridity peaked in the Rockies about 20 to 30 million years ago. An extremely arid time, so arid that most of the rivers of western North America just quit. It looked like Death Valley. The Canadian Rockies looked like Death Valley; a few scraggly trees way the hell up on top of the mountains. Salt brackish lakes where today we have the Columbia River. Deep trenches with huge washes down them.

PB: There must have been huge flash floods.

RC: HUGE flash floods. We know that was the characteristic of the Rockies; that's where all the gravels came from.

PB: I can see it. It just amazes me how geologists carry this movie around in their heads.

RC: And there were incredible kinds of roaming animals that survived. Camels. Typical kinds you will find in deserts.

PB: Saharan!?

RC: Saharan kinds of things, yeah. African kinds of animals. Then about 10 million years ago it began to break, began to get more mild. About 3 million years ago we began to get these wet periods. Wet like today.

PB: Were the Appalachians like the Rockies?

RC: No, the Appalachians were just like they are now — lush.

PB: But the Rockies' rough configuration has been there for awhile.

RC: Yes. Say 10 million years ago there was sufficient run-off to integrate the rivers into their present form. To set them in their valleys.

PB: The gorges were made then?

RC: Well, they might have been cut intermittently during the flash floods, but during the later period the water worked out its balance, its roots that were now going to hold. It's important to realize that they hadn't worked them out before. The rivers would totally change course, because they would fill up an empty lake and it would spill out a different place.

About 3 million years ago we began to have periods with run-off equaling or exceeding that of today. The glaciers first began to form high in the mountains at roughly 2½ million years and at roughly 1 million years we began to enter our current kind of climate.

The average, typical climate of the Rockies in the last million years and for the next million years is one of dominantly glacial conditions — that is, 65 to 70 percent of the time, locked in ice.

PB: Then we're currently in an inter-glacial period?

RC: A very unusual inter-glacial period within a million-year span. This, I think, worries people.

PB: Why does it worry people when the time span is a million years?

RC: Because within that million years there are many cycles. The average inter-glacial is 10,000 years and we've already been in this one for 10,000 years.

PB: Do you mean that if an earth scientist is employed by the government to make a study about, say a dam, then in the back of his mind will be the million-year cycle we're currently in?

RC: A competent person.

PB: And that will play a part in his decision?

RC: Well, it won't play a part in any political decisions . . .

PB: No one is doing any political planning around.

this. But if you were to consider the Rockies as an entity one would want to do so . . .

RC: Certainly.

PB: Because of its adolescent condition.

RC: The fact that it's kept in an adolescent condition by this constant change. The last million years is a time of constant cycles, but it's not progressive adolescence, something which goes through to maturity. It gets up to adolescence and then crashes back down. It's pre-climax.

PB: A rocky garden plant that keeps being cut back. That is a condition of the Rockies, so anyone thinking about them would have to take that into account?

RC: Absolutely. If you want to get a mature thing, you've got to go to Kansas or Arkansas.

PB: It means leaving the Rockies alone.

RC: The natural cycle is to continually knock it back to its virgin condition.

PB: It's been doing that for a million years and is likely to do it for another million . . .

RC: It's been doing it for 3 million, but for the last million it's been doing it very briefly. It's not going through an evolutionary stage to any ultimate old age and maturity.

Stripping the forests off the Rockies is like walking on new grass. It takes an incredible amount of time to get the first few blades up. Drive a car over the new lawn . . . mash it back, kill it permanently.

PB: And that's what will happen with the Rockies?

RC: Exactly.

PB: Unless we take into account its adolescent status.

RC: This is why most responsible plant ecologists would say that the Rockies should not be expected to produce any timber products. Those should be produced from mature soil areas like Louisiana and East Texas.

PB: Where dead trees replenish the soil — which is not true in the Rockies because the soil gets carried away!

RC: Exactly. So an upset in the Rockies spreads to the downstream areas in that it creates vaster flooding and greater nutrient run-off, more soil. This is why we're so screwed up in places like St. Louis. Everything has been screwed around with and the river is now flooding much higher than it used to — something like seven feet higher than 100 years ago. Which is another way of saying that the flood which would only occur once every 100 years a century ago repeats 10 to 15 times per century now.

PB: They're flooding because there's more siltation because of erosion.

RC: Right.

PB: Cut the trees and you get utter primary in the mountains and bad flood effects on both sides . . .

RC: And soil loss and immaturity. You never allow the soil to build up in its attempts to do so, which in time the glaciers will reverse anyway.

PB: Glaciers do that, but they give a benefit.

RC: As a matter of fact, some amazing things occur when the glaciers come. They so overload the rivers with silt (particularly the pro-glacial rivers which flow directly off the glaciers) that as the glaciers back away and the silt dries out, it blows east, and the prairie soils east of the Rockies become the richest soils of any in the North American continent.

PB: If the glaciers do it, changes occur on a huge scale. If we do it, our cities simply flood.

RC: Then the Corps of Engineers has ways to send it all down to the Gulf of Mexico.

PB: Total waste. Medium-sized effects and total waste, missing the chance to have a BIG fertilizer event.

RC: The Egyptian lesson of 4,000 years is lost. The Aswan High Dam — it's the same thing.

PB: But in a sense, we've done faster damage already in the Rockies.

RC: In 100 years. Here's the thing. The Rockies are always immature and yet they are always putting out. They have been purely a raw material source as far as the human species is concerned. It's forced child labor in the most literal sense, in that they purely strip off the minerals that are exposed and concentrated because of the compressional forces. . .

PB: We've just been mowing the Rockies.

RC: Mowing! "If it grows, cut it; if it moves, shoot it," has been the Rockies' slogan.

PB: We've got to work backwards now; we're so much in the hole after a couple hundred years that we've got to at least try to get back where we were. How can that happen considering the population increases that are occurring throughout the Rockies?

RC: An *exploitative* human population increase is out of the question. It is plausible to think of a human population increase where the people would have respect for the Rockies' environmental amenities — their youthful status. There's so much more we've got to do. . .

PB: If people move into the Rockies, they would have to be aware that the mountains' greatest role is not something that is experienced there but something that comes out of them. You can't carry out some activity in the Rockies without ramifications down below: on the plains, the Gulf of Mexico, the Sea of Cortez, the Columbia. Anyone who lives in the Rockies has to be aware of that responsibility. It's much wider than merely where you are. People are running up and down the spine of North America there.

RC: Right. In an orphanage.