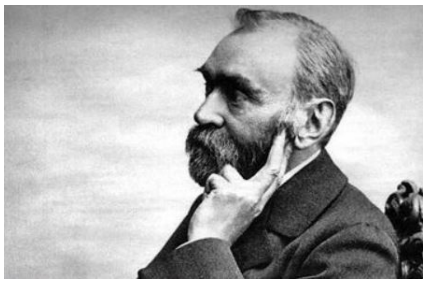
The Mountain Mystery

Just 50 years ago, no one knew why the Earth has mountains. Now we do. This is the story of how we figured it out – and how we keep learning.

The Geophysics Nobel Prize

Posted on October 7, 2014

Well, they did it again. That committee in Sweden announced all sorts of science prizes (and a lot of money, too) to pioneers in medicine, physics, chemistry, and even peace. OK, that last one isn't a science prize, I think. But – once again – the good committee missed handing out a **Geophysics Nobel Prize**. Or one for geology, geography, oceanography, environmental science, or – you're with me aren't you? What's with that?



Alfred Nobel, wondering who should get this year's Nobel Prize in Geophysics.

Granted, **a Nobel Prize in Earth Science** would not be greeted by the nerd-humor that accompanied this year's Physics Award for inventing light emitting diodes, aka LEDs. Jokes like this one about the three discoverers who LED the way: "How many Nobel Prize winners does it take to change a light bulb?" – Three.

To whom does one award the prestigious prize in the geosciences? I wrote a bit about this in ***The Mountain Mystery*** . . .

> *. . . the plate tectonics model with its spreading seafloor, plunging trenches, colliding plates, and convection currents is the best general explanation for ocean basins, islands, continents, and mountains. Every geologist accepts there will be modifications of plumes, channels, blobs, megablobs, and things yet undiscovered that will rewrite this story. However, as Marcia McNutt, past president of the American Geophysical Union recently said, "The development of plate-tectonic theory certainly warrants a Nobel Prize. There is no doubt that it ranks as one of the top ten scientific accomplishments of the second half of the 20th Century."*
>
> *The Nobel committee does not honour earth science. No one will ever get the prize for showing us how mountains have formed. But if they did, to whom should the trophy go? Alfred Wegener is recognized for continental displacement, but Arthur Holmes showed the power source for moving the continents. And he proved that the Earth is billions of years old, not millions, allowing time for processes to occur. Alexander du Toit in South Africa bravely heaped evidence upon continental mobility. Marie Tharp and Bruce Heezen discovered the ocean rifts, Harry Hess said the seafloor spreads from those rifts, and Morley, Matthews, and Vine saw the magnetic striping that proved it all. Isacks, Oliver, and Sykes pointed out how the ocean crust is subducted and recycled. Jason Morgan and Xavier Le Pichon carved up the plates and used Euler's laws to rotate them. Tuzo Wilson fixed a host of messy loose ends – finding plumes, transform faults, and cycles of ocean birth – and ocean death. It is our tendency to select a single figure as the symbol for progress and creativity, but none of these scientists worked in isolation. They all borrowed from Steno and*

Hutton and Lyell and Smith – who in turn built upon the ideas of their predecessors. There are discoveries worthy of a dozen Nobel Prizes.

Geophysicists need not apply.

About Ron Miksha

Ron Miksha is a geophysicist who also does a bit of science writing and blogging. Ron has worked as a radio broadcaster, a beekeeper, and is based in Calgary, Alberta, Canada. He has written two books, dozens of magagine and journal articles, and complements his first book, Bad Beekeeping, with a popular blog at www.badbeekeeping.com. Ron wrote his most recent book, The Mountain Mystery, for everyone who has looked at a mountain and wondered what miracles of nature set it upon the landscape. For more about Ron, including some cool pictures taken when he was a teenager, please check Ron's site: miksha.com.

View all posts by Ron Miksha →

This entry was posted in Culture and tagged mountain mystery book, Nobel Prize. Bookmark the permalink.

4 Responses to *The Geophysics Nobel Prize*

cjonescu *says:*

January 6, 2015 at 4:35 pm

Well, there isn't a Nobel Prize strictly speaking, but there is the Crafoord Prize (http://www.crafoordprize.se) which is given out every four years in geoscience and is often considered the geological Nobel (unlike the Nobel, which is given for a specific discovery, the Crafoord is more of a lifetime achievement award; like the Nobel, it is awarded by the Royal Academy of Sweden and there is a ceremony very nearly the same as for the Nobel winners, though with much less press coverage). Of course this only started about 1983, so many of the players in plate tectonics were out of the picture, but even so it is interesting (and a bit surprising) to note that none of the names listed above were awarded this prize.

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Reply

Miksha *says:*

January 6, 2015 at 7:37 pm

Thank you for pointing us towards the Crafoord Prize! It is great that at least one major international award is granted to Geosciences. The American Peter Molnar (U of Colorado) was a worthy 2014 winner. I am, however, nonplussed that the 2002 award was given to Dan McKenzie instead of Jason Morgan. My feeling is not so much for McKenzie's self-described fairly violent left wing political activities in the 1960s (which inadvertently turned the Brit into something of an American draft dodger during the Vietnam War); instead, my feeling is due to the

controversy that surrounded McKenzie's hurried publication of a fundamental element of plate tectonics (Euler equation rotational movement of plates). Some (including the brilliant Xavier Le Pichon) hinted that it was Jason Morgan's talk at a geophysics conference that led to McKenzie's presentation of the same idea prior to Morgan's own paper's publication. From The Mountain Mystery:

> Allegations began that McKenzie borrowed ideas from Morgan's spring 1967 presentation. After that pivotal conference, outlines with sketches and talking points were passed out by Morgan to various geophysicists, including a close associate of McKenzie's. But McKenzie, who began writing his paper a month after Morgan's talk, says he never saw the talk, the outline, nor the sketches. Xavier Le Pichon, a highly respected geophysicist who was also researching the way rigid plates slip around, felt is was "astonishing that McKenzie twice missed the opportunity to learn about Morgan's model."

Dan McKenzie made other contributions to Earth Sciences and the allegations that McKenzie used Jason Morgan's work were neither proven nor admitted by McKenzie. But at the time it was a big deal to scientists involved. In my mind, the 2002 Crafoord Prize could have been more constructively awarded to someone else.

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Reply

cjonescu *says:*
January 10, 2015 at 12:42 pm

I cannot really comment on what happened or didn't happen long ago. All such prizes really depend on some element of luck–who advocates for whom, which feuds spill over which way, so to some degree fairness is in the eyes of the beholder. During my career (which fully postdates the discovery and initial application of plate tectonics), McKenzie's work keeps coming into play while much of Morgan's does not (part of this is that I am a continental geoscientist and most of Morgan's work is oceanic). Morgan's advocacy for a very broadly inclusive definition of hot spots (arguably the most prominent idea closely associated with his name) and advocacy for them being fixed in some absolute framework has fallen on hard times and didn't really advance anything in the past 20-30 years that I can see (and in some ways actually pushed things backwards; the relative motion of hot spots, which looked necessary even if you presume these originate at the core-mantle boundary, means that you cannot use hot spots as a frame of reference over long times, yet many spent considerable time and effort trying to do just that); McKenzie's work on continental deformation in contrast has altered the way many look at continental deformation and has been the basis for considerable productive work (e.g., basin subsidence models). So I personally don't have a problem with that award, though as I noted before, it is odd that several worthies from the main plate tectonics era escaped notice in the early days of the Crafoord. I would suspect something of a bias in the way the original nominating and evaluating bodies were created was part of the cause.

Did Dan misbehave in the 60s? Gosh, I don't know, but it is worth recalling that a lot of low hanging fruit were out there once fixist ideology was abandoned; in such an environment ideas can slide around quite a bit without clear provenance. Let me provide a much less interesting example I am familiar with. As a grad student at MIT, I worried a lot about how Death Valley and Mt. Whitney could be so close together–it seemed there was no way this could be an accident. I had a map of topography and Bouguer gravity on the wall above my desk. Eventually a light bulb went on and the then-recent concept of lithosphere-spanning low-angle normal faults provided a link. I scribbled out a manuscript that included a description of how such a low-angle fault would cause uplift far from the surface outcrop by thinning the mantle lithosphere, thinking I had figured this out on my own (this made an obvious prediction: Pn velocities should be higher under Death Valley than the Sierra, which seemed profoundly counterintuitive given the dogma at the time; I remember thinking that had that been the case, certainly it would have been commented on, but I went and looked in the literature and-amazingly-the Pn velocities matched my idea well. There is nothing quite like predicting something you personally didn't know about but could immediately look up that is immensely gratifying). But in running the paper past Brian Wernicke at Harvard, Brian forwarded a copy of a recently published paper of his making that exact point. At the time I shrugged and figured this shortened my own too-lengthy paper; I figured that with all the crosstalk between Harvard and MIT that maybe I had heard the elements of Brian's paper over a campfire but hadn't really recognized I had heard it. Some years later a prominent colleague who knew us both suggested that it might have actually been working the other way around–Brian's paper might have been informed by my early rantings on this. I have no idea. In the broad scheme of things it really hardly matters–the implications of the low-angle fault model

were quite obvious and I am sure several others came to the same conclusions before or near the same time as Brian and I did. (Indeed, this shows up most prominently in the concept of asymmetric rift margins across the Atlantic, a concept developed and fostered by others far from that MIT-Harvard confab). So does this mean that Dan incorporated ideas from Jason without recognizing it? Possibly. Does it mean that Dan is cleared of any intellectual theft? No, and frankly there is no way to prove or disprove it. Was this an idea that was bound to develop? Rigid plates would quickly emerge from global seismicity maps and the idea that seafloor was only created at ridges, and once you have that in mind, describing the rotation of shells on a sphere becomes pretty hard to avoid. So multiple origins for the math seem plausible.

If the Crafoord was exactly like the Nobel, I think you are on firm ground in saying that Morgan should have had the prize alone or shared it with McKenzie. If you are looking at the overall impact over a lengthy career, as I understand the Crafoord committee does, I don't have a problem with the committee's decision. But your opinion might vary, and that is perfectly fine. Both men have made considerable contributions to the field (and both have been widely lauded for those contributions, so I don't feel bad if either is denied one more laurel).

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Reply

Miksha *says:*

January 10, 2015 at 1:40 pm

Cjonescu – thank you for your comments. They add to an understanding of the Morgan-McKenzie controversy and the significance of the Crafoord prize. Perhaps Dan McKenzie's work contributed significantly to Earth science beyond the initial dispute.

I have to agree with your assessment of the hot spot theory – it no longer seems as convincing as it did in the form first developed by Tuzo Wilson and then expanded by Jason Morgan. But this leads nicely to one of my all-time favourite scientific quotes, made by Jason Morgan shortly after his seminal paper on plate motion was published. A colleague asked Morgan what he could possibly do about plate tectonics to make an even greater name for himself. "I don't know. Prove it wrong, I guess."

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