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The Schiehallion Experiment Exploded

by Miles Mathis

I have to admit I had never heard of the Schiehallion experiment before about an hour ago. One of my readers in Scotland sent me a link in response to my last paper on deflection of a plumb-bob in the Himalayas. I went to Wikipedia, where it took me about 30 seconds to spot the huge flaws in math and procedure.

In my last paper, I said that the one second deflection measured at Kaliana in the Himalayas and other places must have been either a margin of error or caused by something other than gravity. But this experiment at Schiehallion claimed to measure 11.6 seconds. The experiment has been redone several times since then, "confirming the original number." If correct, that might at first seem somewhat harder to dismiss as a margin of error than 1 second; which is why I am here to dismiss it.

The Schiehallion experiment, led by Nevil Maskelyne, took place in Perthshire, Scotland, in 1774. But some of the fault may go to Reuben Burrow, a mathematician from the Royal Greenwich Observatory who went along to help in the calculations. Most of the blame goes to the Royal Society, which commissioned the experiment and then accepted the results without a close analysis or questioning the claimed accuracy.

We can already tell there must be major problems with this experiment just from comparing it to other experiments of the same sort. To start with, the numbers from this experiment have never been tallied or resolved with much smaller numbers from much larger mountains. On the same page, we find that Bouguer found 8 seconds at Chimborazo in 1738. Chimborazo is 20,000 ft compared to 3,500 ft for Schiehallion (with only a 2,350 ft rise). As I mentioned before, the measured deflection of the entire Himalayas (at both Kaliana and Jalpaiguri) was claimed to be 1 second. These Indian experiments were done in 1855, almost a century later, with better equipment. How does the mainstream explain

this? Why is the deflection at the Himalayas 77 times smaller than expected but at Schiehallion it isn't? Are we to believe there are reverse mountains in the Himalayas, but not at Schiehallion?

The deflection number at Schiehallion is ridiculously large: if the measurements in the Himalayas were way below predictions, the measurements at Schiehallion must be way *above* the same predictions from the same set of equations. The mass of Schiehallion is many orders of magnitude less than the Himalayas, so that even accounting for varying distance, the predicted deflection of Schiehallion should be *very* much less than the 58 or 77 seconds calculated for the Himalayas. The 11.6" found is about 5 times smaller than the 58" predicted for Kaliana, but it should be *hundreds* of times smaller. It should be hundreds of times smaller than the one second "measured" at Kaliana. In fact, the equations that Kossmat used for the predictions in India should have been a confirmation of Newton's belief that if the force existed it was way too small to measure. Using Kossmat's equations for the Himalayas on Schiehallion should have predicted a deflection of something like <.5 seconds. Since the Himalayas produced at least 77 times less deflection than predicted, we would expect a measurement at Schiehallion of <.01 seconds.

Let's do some quick math to show this. We aren't told how far away the Schiehallion team was from the foot of the mountain, but say it was two miles. The distance at Kaliana was 56 miles. Then say that the diameter of Schiehallion is 2 miles and that the diameter of the mountain directly in front of Kaliana is 56 miles. The Schiehallion force should be about 784 (28 squared) times the Kaliana force, based on distance only. But the force is also determined by mass, and the mass of the Himalayas is very much more than 784 times Schiehallion. How much more? Well, say the rise from Kaliana is 17,000 ft and of Schiehallion is 2,350. Using the numbers I already gave, we can calculate that the one Himalaya is 5,675 times the mass of Schiehallion. Which means that one Himalaya would cause 7.2 times the deflection of Schiehallion. You will say, "Great, that just about matches your calculation above, which indicated Schiehallion at 5 times smaller." But you are missing my point. The point is, there is not just one Himalaya in front of Kaliana. There are dozens, and then the entire Tibetan Plateau behind that. These calculations could be confirming only if we pretend that nothing affects the plumb-bob at Kaliana except one Himalaya. Since that cannot be true, my calculations confirm the opposite: the number at Schiehallion is way too large.

Of course, this discrepancy is never addressed or admitted. The various experiments have been published and analyzed in isolation for centuries, and no one thinks to point out the contradictions among them.

Another thing no one ever thinks to mention in regard to these experiments is that anything less than 10 seconds of arc is very hard to measure under any circumstances or with any machines, especially in the field. Modern theodolites now have an accuracy of one second, but that accuracy is in the angle, not in the leveling. Since in these plumb line measurements we would have to level to the zenith (both E/W and N/S), we must add the error of the level (see below), which is now about 4 seconds and which was more than that in 1774. *And levels would be affected by deflection just like the plumb-bob.*

We can take an example straight from the Wiki page on Schiehallion, which lists the mountain as both 3,553 ft and 3,547 ft. That reminds us that we are correcting the height of mountains to this day, with much better equipment than they had in 1774; and the margin of error is still greater than anyone wants to admit. The height of Everest has been corrected in the past couple of decades. It was 29,002 (including snow) in 1856, it was 29,029 in 1955, and it is listed as 29,038 (including snow) now. That is a change in 150 years of .124%. If we compare that to the Schiehallion measurement, we find 11.6" is a variation from zero of only .0036%.* Accuracy of one part in 28,000 for Schiehallion in 1774

compared to one part in 806 for the measurement of Everest's height in 1856. In accepting these numbers from 1774, we are assuming they could be 35 times more accurate in measuring angles in 1774 than they were measuring heights in 1856.

I will be told that the increase of these numbers is due to Everest actually rising, so that the older measurements aren't signs of error. While Everest may be rising slowly, the change in number since 1856 cannot be due to that rise. Why? Because if Everest had risen .124% in 150 years, its total rise would take only 120,000 years. But the Himalayas are said to be around 50 million years old. Those who think that Everest has risen 36 feet in the last 150 years have their rise around 400 times too fast.

So were the Scots of 1774 that incredibly accurate? I have quite a bit of Scots blood and my fiancée is descended from one of the major clans, but I am afraid I am going to have to go against my heritage and betrothals here. Considering the facts of the experiment, the accuracy is probably overstated by a huge margin—hundreds of times at least. The astronomer Charles Mason, chosen by the Royal Society to select the mountain and prepare the experiment, refused to work for the one guinea (just over one pound) per day offered. This means that those like Maskelyne and Burrow who *did* go were willing to work for very little—and live in tents in the cold rain—which should suggest that they were not at the top of their respective fields. Like all the other facts, this fact is seen but not *observed*. It is not analyzed. The Royal Society sent less qualified people to do this important experiment, and then accepted their calculations without question. Why? Because the experiment, as run, confirmed what they wanted to confirm. They wished to confirm "the Newtonian system," and they did that. The experiment is used for that purpose to this day. If the experiment had found no deflection, it would have been worked over by the Royal Society for months and then dismissed as poppycock. But because it confirmed the desired deflection, it was left alone of serious analysis and permanently enshrined. That is the way science worked and still works.

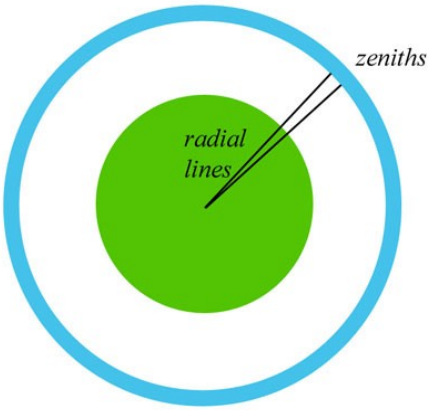
I don't doubt the greater points of "the Newtonian system," and I am not questioning it here. But I certainly *do* question the results of these old experiments. Another reason *you* should also question them can be seen by continuing to study the page at Wiki. It tells us that a 2005 experiment on Schiehallion used a pendulum at the top and bottom of the mountain to find a density of the Earth of 7,500 ± 1,900 kg/m^3. Both the number and the variance should raise your eyebrows so far they join your hairline. The number 7,500 is nowhere near the current figure of 5,515. It is 36% wrong. As is the variation of 1,900. That is margin of error of over 25% with the machines of 2005. And yet we are supposed to believe they were able to measure to within .0036% with the machines of 1774?

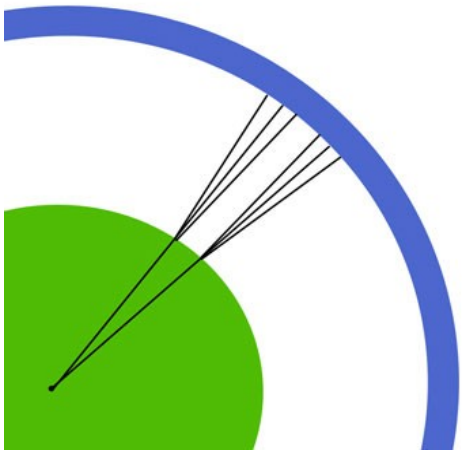
Wiki then tells us of the 2007 re-examination of geophysical data at Schiehallion using a 120km radius digital elevation model and a computer, to find a density of the Earth of 5,480 ± 250 kg/m^3. Again, we have an error of .6% and a margin of error of 4.5%. So both the teams of 2005 and 2007 are telling us they cannot match the .0036% accuracy of 1774. The 2007 team was 1,250 times less accurate than the 1774 team, and the 2005 team was almost 7,000 times less accurate.

That is enough to destroy the original experiment, but I will continue. This page at Wiki makes clear the difficulty in finding a vertical when you are already using a plumb-bob to measure deflection.

Normally, the plumb-bob would give you the vertical, so in these experiments the vertical has to be found in another way. Burrow and Maskelyne found it by calculating a difference in locally determined zenith north and south of the mountain:

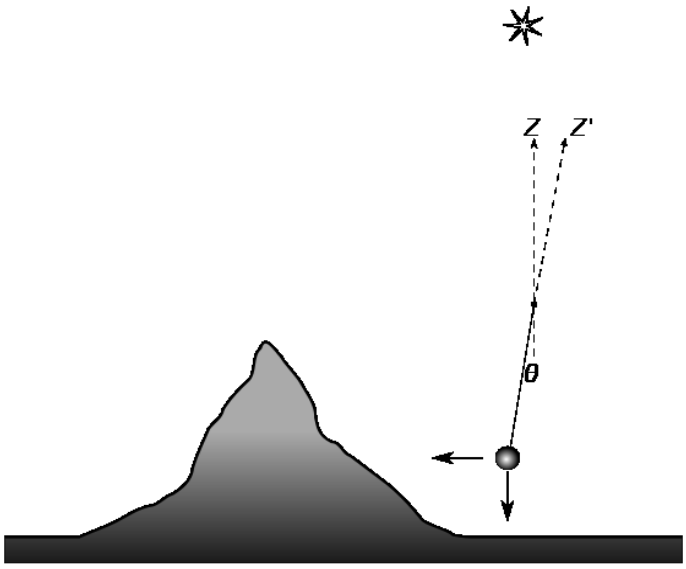
After accounting for observational effects such as precession, aberration of light and nutation, Maskelyne showed that the difference between the locally-determined zenith for observers north and south of Schiehallion was 54.6 arc seconds. Once the surveying team had provided a difference of 42.94" latitude between the two stations, he was able to subtract this, and after rounding to the accuracy of his observations, announce that the sum of the north and south deflections was 11.6".





He did that by observing stars. The problem there is that stars are moving very quickly across the sky, moving as the Earth rotates. Time becomes a huge factor, because not only do you have to measure quickly, you have to match your times in the north and south stations. In other words, if the boys in the south station are taking longer to do their astrometry than the boys in the north station, you have a problem.

Let's look at Wiki's illustration here:



Under that, it says,

The deflection is the difference between the true zenith Z as determined by astrometry and the apparent zenith Z' as determined by a plumb-line.

But that wasn't the Scots' actual method, as they admit. They used the latitude to give them Z, not astrometry. They used astrometry to give them Z':

It was necessary for him to determine the zenith distances with respect to the plumb line for a set of stars at the precise time that each passed due south.

"With respect to the plumb line" means that they are using the stars to measure Z'. It is curious that the current analysis can't get this simple fact right, and it may mean they are hiding it to keep you from noticing that "the precise time that each passed due south" is not precise at all. They want you to think that Z is being measured by astrometry rather than Z', because Z can then be checked against latitude. Z' cannot, for obvious reasons.

Again, a measurement cannot be taken at an instant, especially not a star position in 1774. They didn't even have cameras back then, much less computers. This would have been a very slippery measurement due to the speed of the star, but once we have two stations trying to match procedures, we have a large margin of error relative to a few seconds of arc. The time at which the star hits due south would have been no more than a guess, due to twinkling and smearing and other problems. Do you start your measurement when the leading edge of the star hits the line, or when the middle of the star hits the line? And that is just the first of dozens of problems you could spot if you wished to study the problem further.

Also a problem is determining where the plumb line would intersect the celestial sphere. Since Maskelyne was determining "the zenith *distances* with respect to the plumb line for a set of stars," he needs not only a star position but also a plumb line position. Unless the plumb line is right on the given star, he needs both positions; but in that case there would be no "distance." So this wording is implying that the plumb line is *not* intersecting the path of the given star. How do you determine where the plumb line hits the celestial sphere? Since there is no star there, you are just drawing a point in the void, by sighting to infinity. Another large margin of error in that, even now. And the star must be moving very fast relative to that drawn point in the void as well as relative to due south.

A further problem is encountered by the fact that the plumb line will never stop moving, even in zero wind. Cavendish encountered this problem with his hanging balls, as is admitted; and we have seen a similar problem in the Millikan oil drop experiment, where the drops were always in motion. How do you sight to infinity along a plumb line that will never stop moving? The glosses of famous experiments always somehow manage to hide most of the pertinent information, which makes them nothing more than propaganda.

Which brings us back to theodolites, which I mentioned in passing above. In 1773, Ramsden invented** the circular dividing engine and the more precise theodolite. It is doubtful that the Scots had one of these instruments at Schiehallion one year later in 1774, but even if they did, they were already beating its accuracy, which was no more than 4 seconds under the best of circumstances. You see, they were claiming to be able to calculate an angle of 11.6", and if you cannot *measure* at that accuracy you also cannot *calculate* at that accuracy. But, as you have seen, they had many other problems—like measuring a moving pendulum and so on—so that it is mathematically impossible for

them to claim the accuracy they had. They could not have been more accurate than the most accurate machine of the time, which gives them a baseline error of 4 seconds. If we add the other margins of error in the experiment, 11.6" is well below that margin. They could not possibly have measured at that accuracy, so they logically cannot calculate numbers at that accuracy.

This also destroys the claim of one second of arc at Kaliana and Jalpaiguri in the 1850's. At that time, the most accurate instrument for measuring angles was still the double theodolite of Jaworski, which was capable of measuring angles of 4 seconds. Two seconds wouldn't be measurable until the Zeiss glass circle theodolite around 1915, and one second wouldn't be measurable until 1926. But even with modern equipment, we couldn't measure to one second in the field conditions at Kaliana. Applying the plumb-bob to the equipment would cause other errors, due to swing and many other factors. For instance, once you have the theodolite on location, you have to level it or match it to Z somehow, which adds a margin of error. They didn't have laser plummets back then, and the dirty secret here is that the level in even modern theodolites is not as accurate as the theodolite itself. Before leveling, the the theodolite is accurate to one second, but that just means that the angle measurements are accurate to that degree. If the leveling is not equally accurate, the final measurement is not that accurate. Levels weren't accurate to one second in 1774, and they aren't that accurate now. There is simply no way that Pratt or anyone else could have measured to one second of arc in the field in the 1850's.

Perhaps now you can see why the newer experiments at Schiehallion avoided using the original methods. If the Schiehallion experiment were really so accurate, ask yourself why modern astronomers haven't just rerun it with new devices. Why would the teams from 2005 and 2007 prefer to rerun the experiment with pendula and digital elevation models, getting very rough numbers? If the 1774 team was able to obtain .0036% accuracy with the machines of the time, we should be able to beat that by hundreds of times. Instead we run experiments with 25% accuracy, and publish the reports proudly on the number 4 site on the internet? How does that make sense?

Well, I can suggest that this is done because it is better than trying to match the methods of 1774, and failing miserably. If we took expensive moderns machines to Schiehallion and tried to measure Z' in the way Maskelyne did, it would only show what an absurd mess the original experiment was. We could never measure the angle along a moving plumb line to one part in 28,000, using those methods. In which case we would have to erase the entire entry from Wikipedia and all the other texts and sources. No one wants to do that, so we continue to get pretty amateurish misdirection to this day.

In closing, ask yourself this: why would Wikipedia and the other contemporary sources mention the 1774 experiment, a couple of other poorly prepared experiments from more than two centuries ago, and then skip ahead to 2005, giving us modern experiments with huge margins of error? Europe spent tens of billions of dollars recently on the Large Hadron Collider. Why can't physics and geophysics commission real experiments to rerun these fundamental old experiments with our new equipment? How hard would it be to take some top-of-the-line theodolites and telescopes and levels to Schiehallion and get some real numbers? It appears to me that they purposely *aren't* rerunning any of these famous experiments because they fear the results. It is better to continue to prop physics up on these centuries' old experiments than to put them to a rigorous test. If they did rerun the Schiehallion experiment, they would get a null outcome, and they aren't prepared to face that fact. They think Newton would crash. He wouldn't, as I have shown, but they don't appear to understand that. They therefore can't risk damaging their cherished dogma.

Also ask yourself why our top theorists have time—and are underwritten—to address black holes and bosons and wormholes and dark matter and entanglement and symmetry breaking and string theory and

so on, but don't have time or inclination to address the fundamental mechanical problems I address. Perhaps if Stephen Hawking assured the current Royal Society of Scotland that a null outcome at Schiehallion would not jeopardize either Newton or Einstein, they would lose their fear of a new experiment. In that case some real work might get done in physics. But we don't see that. Why? I would suggest that physics has got its scarf caught in the wheels (see the demise of Isadora Duncan) and in its panic it can't remember where the brake is. Physics has lost its golden goose down a hole, and rather than climb down with a flashlight and a bag of corn, it now feels its best option is to seal the hole and turn the stereo up to drown out the honking. That is to say, contemporary physicists (along with other scientists) are lost at sea, and they have been lost for so long without water or bread that their minds have gone. The scorching sun has drained all sense from them, and they are gibbering. They no longer have the wherewithal to row toward land when it comes in sight.

This paper is just another in a long line of clear evidence that physics has given up on physics. It has put a lid on the old physics and started a new field, which, despite its name, contains no physics. Real physics was not moving fast enough and did not sell. It also wasn't big and inclusive enough: it didn't create enough jobs. The old physics resisted and even disproved the bureaucracy, whereas the new non-physics is nothing but bureaucracy.

I point once again to modern non-art, which is the perfect analogue to modern non-physics. In both, the tarted-up simulacrum of the object has replaced the object itself. A plastic replica of the old artifact has been filled with air, blown up far beyond its original size, then painted in acrylics and polished to a reflective sheen. It has been hung with flashing lights and mounted on a carousel, motorized and stylized. It has then been reproduced and replicated in very large numbers, and been hung in the great institutions of the world, bleakly filling the vast marble chambers and granite halls of the bloated and flaking cities. Once there, it has been attached to a screaming music and a shrill but ubiquitous press, filling all ears with a constant rot.

For this reason, you are pretty much on your own. The Royal Societies of the world stopped commissioning both art and physics long ago, so if you want to see a real painting, you better learn to paint. And if you want to see a real experiment with gravity, you best start saving for that precision theodolite now.†

*That is 11.6/(90x60x60)
**http://www.fig.net/pub/cairo/papers/wshs_01/wshs01_02_wallis.pdf
†Probably best to put your theodolite savings in an offshore numbered account, or a buried sock, unless you want the bankers stealing it from you.