

My Earth science educator story – Eamonn Grennan What I did, why I did it and what happened



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Many people study Geology or Earth Science at first year in a University or Institute of Technology in Ireland as a fourth (compulsory) subject or as a subject within a course which they had not considered as involving geology, e.g. Environmental Science. As a consequence, many see it as a chore, thinking 'why are we here?', and engage only very reluctantly, if at all, in the subject. It is important therefore to provide a positive case for geology without the student being forced to listen to a lecture on the benefits of and the positive contribution that geology makes to human existence.

In their first very lecture in "Geology" or maybe even their first ever lecture, it is important to get them to relax, to grab their attention and to illustrate that not all learning is difficult. So the first thing I do is to inform them that there will be a question on the exam paper from every lecture during the term - they are all now listening.

Even though it's their first official lecture, many would have been already aware of my own pro-mining stance. So, I ask them, "How many of you are against mining?"

Gradually the hands will go up, at least 50% 'against mining'. "Ah come on, I know there must be more of you against it, you won't hurt my feelings", I say, as I move around the lecture theatre.

Hands representing over 80% are now raised, so I say, "well at least 80% of you are honest, so that's a great start".

"Can someone tell me a metal that is in ordinary everyday use?" Silence.

"Oh, let's pick on someone", shudders and down-cast eyes all round. I count the number of rows and the number of students in each row and ask a student in the front row for a number between 1 and 12, "7", "now that wasn't too hard".

I ask another student for a number between 1 and 8, "5".

Out loud I count, 7 rows and 5 people in from the window. I look the student in the eye and say, "Don't blame me, they picked you!!"

"Now, how about a metal in everyday use in or around the house". Silence.

I then turn to the class, and say, "Help this poor student out". Eventually after much muttering and hints from neighbouring students, the student says "Iron".

"Great", to which I add, "now that wasn't so hard was it, but remind me to give you an extra mark in the exam for that".

I ask the rest of the class for an example.

"A nail". "Great", I reply.

I write down “Iron” on the board and “nail” alongside it. I have found that the ‘horizontal’ is more definitive and works better, as it’s a type of ‘list’ rather than a ‘table’.

Iron uses are relatively few, so I suggest that we ‘park’ iron for a few minutes.

“Does anybody know another metal in common use, especially around the house?”

I’ll hear ‘gold’, ‘aluminium’ and ‘copper’, each of which I write on the board.

But I’m looking for lead, which I will eventually get. Because of its very extensive use, lead is a great one to start with, for four over-arching reasons, namely, its variety of uses, its name, its physical attributes and its many common everyday uses outside of the house. I want then to think about the common use of metals in and around their home and in general (unseen) ways.

“So, where is lead used around the house?”

“Lead on the roof, Sir”, whereupon I take thin piece of flat lead from the bag perched on the bench in front of me.



Flat lead sheet ‘out of the bag’.

“What’s that lead called?”, I ask.

“Lead flashing, Sir”, to which I add “We’ll have none of that (flashing) in here”, which always gets a laugh.

“Come on now, I want you to think about where else, not necessarily in the house, where you might find lead in or close to the house”.

“Lead weights on a fishing line”, says the country lad.

As I’m writing on the board, I ask, “Are lead weights used anywhere else?”

Eventually someone says, “Weights on race horses”.

I take a round lump of lead concentrate from the bag, throw it from hand-to-hand and then hand it to someone and they sometimes let it drop or nearly drop onto the desk because they are surprised by its weight. Another laugh!



Lead mine and concentrate samples.

“Why do you think that lead weights are used in horse racing?”

One will get lots of nearly correct answers, until someone will eventually say that it’s because of its density, low volume but high weight.

“But, Sir that’s not in the house.”

“Exactly”, I say, “that’s why I want you to think now, outside the house, but you should also know that his/her uncle is a jockey”. Another laugh.

Most are now relaxed, but there's always a few who are too shy to participate or are resolutely refusing to do so.

"So where else will you find lead?"
Silence.

"Let's go back to the roof" and addressing the particular student, I pose the question, "Why is lead flashing used on the roof?" Silence.

"Come on folks, help this student out".

Eventually, some says, "it stops leaks".
"Good. Why?"

After some not quite correct answers, someone will say, "because it doesn't rust."

"Exactly", I say, "it does not react with either air or water, and there is another reason why it is used, can someone tell me?"

I move around the class turning the flat piece in my hand, bending the odd corner. Invariably I have to tell them that it is 'malleable, which means that it can be flattened out and/or bent without it breaking', whereupon I take a wooden mallet from the bag, and waving it I say, "this of course has other uses."

I then pick on someone who has already given an answer and ask, "Are the walls of your house vertical?" The question appears so stupid that they think that it is a 'trick question'. They are also beginning to worry about the sanity of the lecturer!!

After a few seconds, he/she will give a very hesitant "Yes".

I then ask, "How does the builder / block-layer make sure that the wall is vertical?" Someone will speak up, "A plumb line, Sir".

"Great, and why is lead used as plumb line?"

"Because it's heavy, Sir". There is now lots of interaction, two or three all speaking at once with the answer.

I write "Plumb" on the board.

"Does anyone know the chemical symbol for lead?"

"P b, Sir".

I write the "P" and the "b" under the "P" and the "b" in Plumb and say, "Isn't that a coincidence!"

I inform them that lead was very well known to the Romans as "plumbum" and "What did they use it for?"

"Plumbing, Sir".

To which I respond, "We're doing great. Now can you tell me of any other uses the Romans had for lead, or where else you might find in the home?"

A student will ask the rhetorical question "Did they use it to make glass, Sir". "They did indeed and are there any modern day equivalents?" "Waterford glass, Sir". Whereupon I extract a cut-glass goblet from my bag.

"Anything else of a similar nature?" Occasionally someone will know, but invariably I tell them about the coloured glass in church windows and how over the centuries the lead, due to its density gravitates towards the base and the windows have to be re-fitted. I apologise for not having an example.

I then pose a series of questions. How did you get here today, has anyone got their own car, how does it start?" "Battery, Sir". "What's in the battery?" "Lead, Sir".

"Did anyone come on a bicycle?" "You'll be going home in the dark, do you have any lights". "Yes". "How do they work?" One will now get a smile, "With a battery, Sir", "and what's in the battery?", and as I say that, I open my hands like a choir

master and raise them up, to which most of the class shouts out “Lead”.

I produce a couple of batteries from the bag and they are now fixated on the bag wondering what else is in it.

“What’s on the interior walls of your house?” “Paper, Sir”. “Anything else?” “Paint, Sir”. “And what’s one of the primary constituents of paint?” To which they respond “Lead”. I take out a can of paint.

“Have we any outdoor sportspeople here, like fishermen/ women or shooters”. And before I even ask the question some will say “Bullets, Sir”. To which I again apologise for not having any, but I produce some lead-shot.

“And why is lead used?” Some might say “because it’s toxic”, but somebody else will say “because it’s heavy” and “maintains its line.”

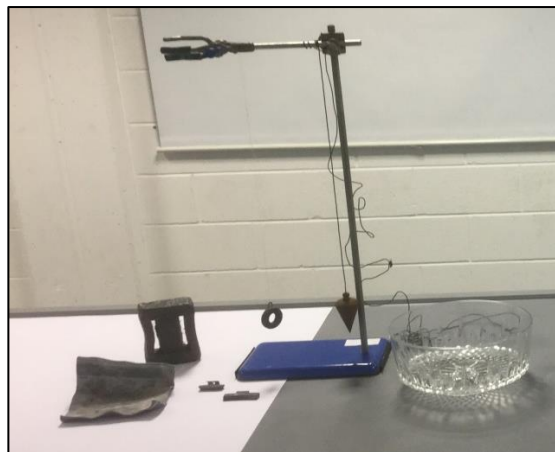
To conclude, I say that there is one other major use, although you won’t find one in Ireland. I explain that is used for radiological protection around nuclear power installations. In the past it was also used to make large industrial vats, it was used in pencils, ‘but it has now been replaced by graphite’, and of course for over 100 years it was used as an additive in petrol as an anti-knock agent.

The board now reads:

Flashing, pipes, fishing weights, horse-racing weights, plumb-line, crystal glass, church-window glass, car batteries, small batteries, paint, ammunition, radiological protection.

“So who’s against lead mining?” Silence. Eventually a few hands go up. I say “That’s good, we still have a few honest people here”.

“And don’t forget that in the exam you will be given two metals and asked for four common uses of each (worth ½% each). You could now have 4% of the marks required to pass the exam.”



Uses of lead 1 - from left to right: lead diving weight, piece of flashing and two (small) wheel-balance weights; (hanging samples) fishing weight and a plumb-line; Waterford glass bowl.



Uses of lead 2 - from left to right: two Waterford glass goblets; paint can and motorcycle battery and cartridges.

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