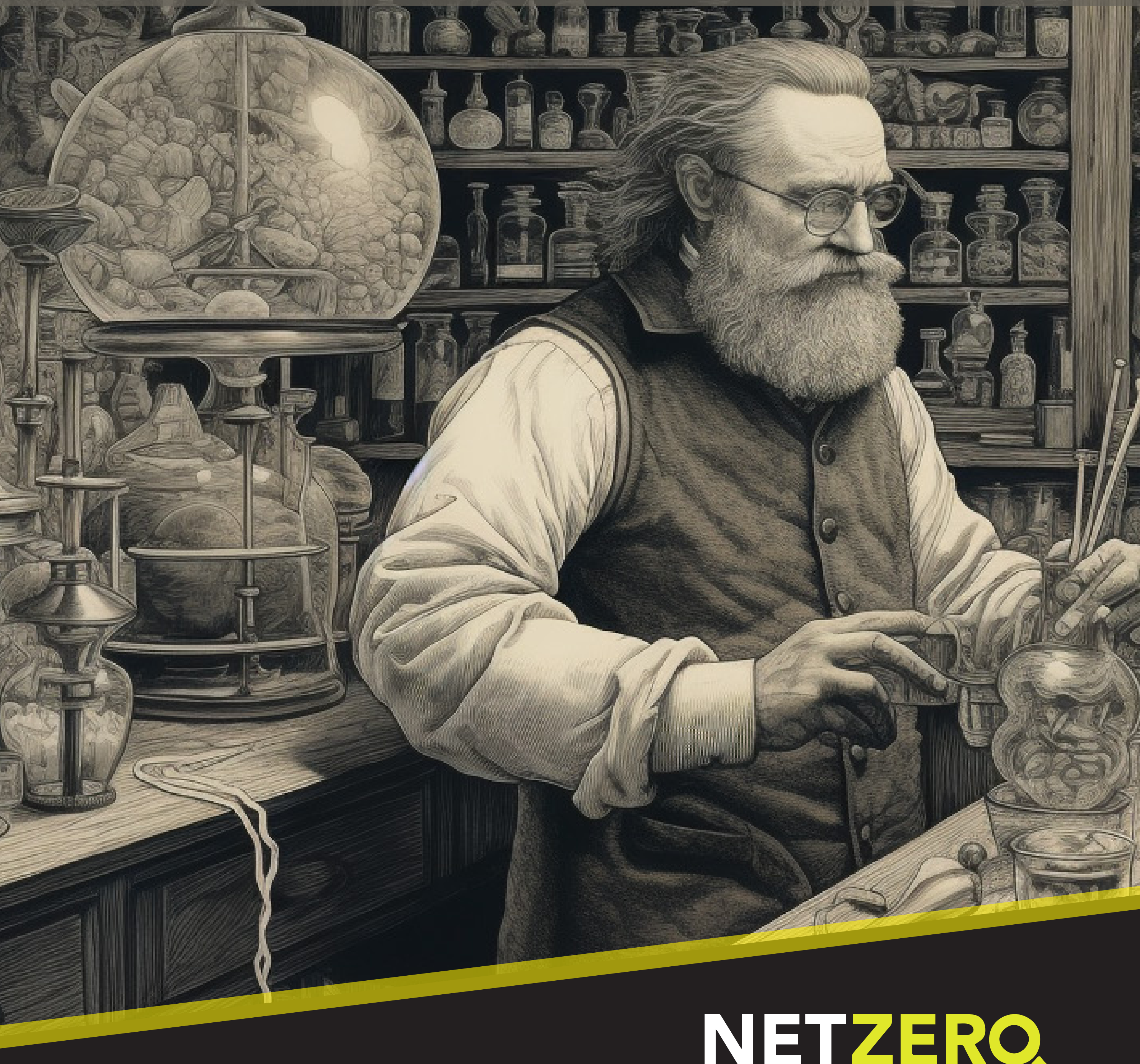
ON BROKEN SCIENCE

WILLIAM M. BRIGGS



NETZERO WATCH

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William M. Briggs

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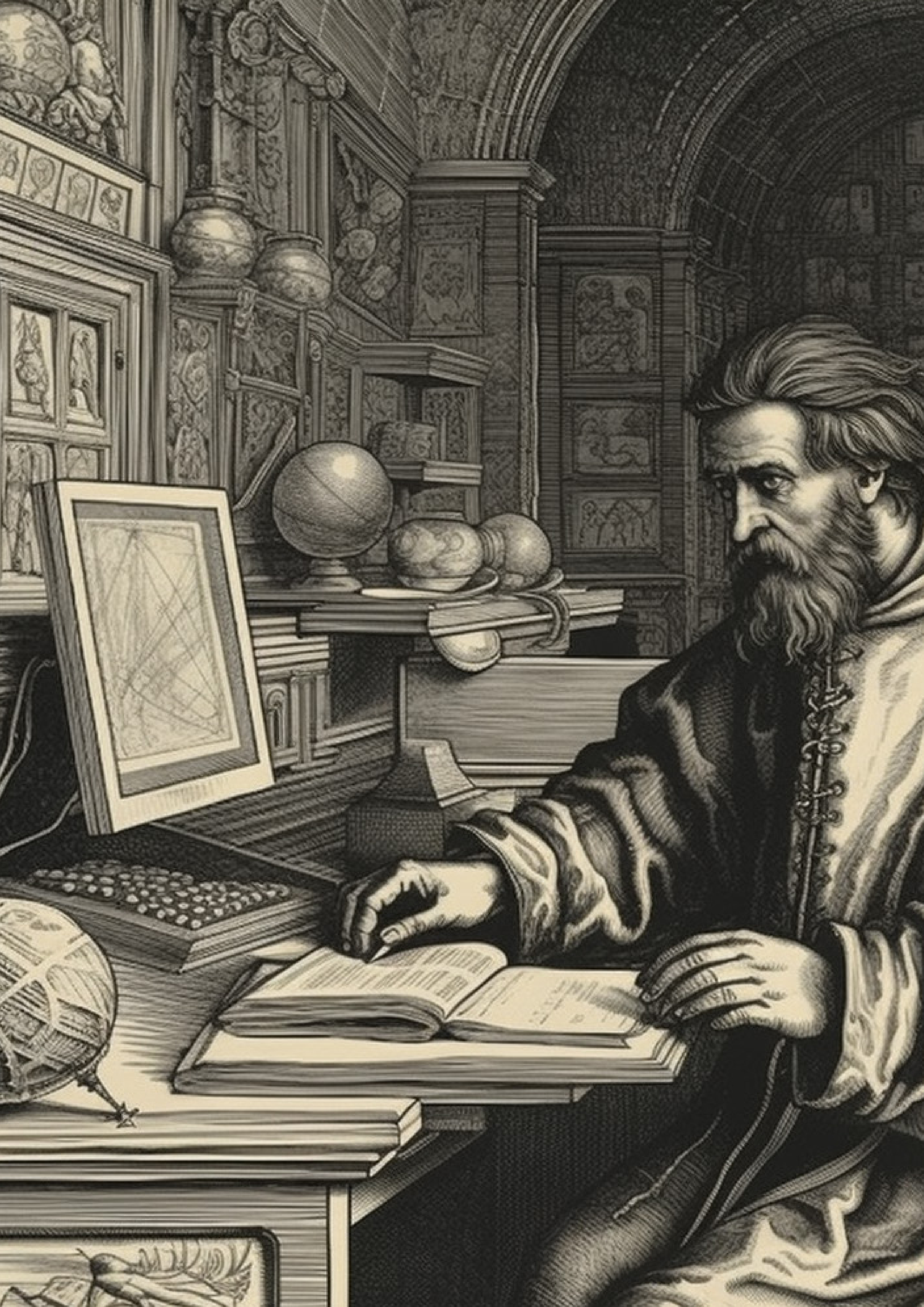
About this paper

This paper is edited from the transcript of a talk given by Professor Briggs at Hillsdale College, Michigan in April 2023. The talk was an invited contribution under the auspices of the Broken Science Initiative, https://brokenscience.org/.

About the author

William M Briggs is author of *Uncertainty: The Soul of Modeling, Probability & Statistics*, and co-author of *The Price of Panic: How the Tyranny of Experts Turned a Pandemic into a Catastrophe*. He earned his PhD in statistics and his Masters in atmospheric physics, both from Cornell University. He studies the philosophy of science and the use and misuses of scientific predictions.



Introduction

A fascinating experiment was conducted not too long ago. An experiment about experiments. About how scientists came to conclusions in their own experiments. What happened was this: social scientist Nate Breznau and others handed out identical data to a large number of researchers and asked each group to answer the same question. The question was: Would immigration reduce or increase 'public support for government provision of social policies'?

That can be difficult to remember, so let's reframe this question in a way more memorable, and more widely applicable to our other examples. Does *X* affect *Y*? Does *X,* more immigration, affect *Y*, public support for certain policies?

That's causal language, isn't it? *X* affects *Y*? These are words about cause, about what causes what. Cause, and knowledge of cause, is of paramount importance in science. So much so that I claim – and I hope to defend the idea – that the goal of science is to discover the cause of measurable things. We'll get back to that later.

Just over 1200 models were handed in by researchers, all to answer whether *X* affected *Y*. I cannot stress enough that each researcher was given identical data and asked to solve the same question.

Breznau required each scientist to answer the question with a 'No', 'Yes', or 'Cannot tell'. Only one group of researchers said they could not tell. Every other group produced a definite answer. About one quarter – a fraction we should all remember –answered 'Yes', that *X* affected *Y* – negatively. That is, more *X,* less *Y*.

Now researchers were also allowed to give some idea of the strength of the relationship, along with whether or not the relationship existed. And that one-quarter who said the relationship between *X* and *Y* was negative ranged anywhere from a strongly negative, to something weaker, but still 'significant'. *Significant*. That word we'll also come back to.

You can see it coming…about another quarter of the models said 'Yes', *X* affects *Y*, but that the relation was positive! More *X,* more *Y*, not less! Again, the strength was anywhere from very strong to weak, but still 'significant'.

The remaining half or so of the models couldn't quite bring themselves to say 'No': they all still gave a tentative 'Yes', but said the relationship was not 'significant'.

You see the problem. There is, in reality, only one right answer, and only one strength of association, if it exists. That a relationship does not exist may even be the right answer. I don't know what the right answer is, but I do know only one can be. Yet the answers – the very confident, scientifically derived, expert-investigated answers – were all over the place and in wild disagreement with each other.

Every one of the models was science. We are told we cannot deny science. We are commanded to *Follow The Science*.

But whose science?

The fallacy of falsification

Now these models were from the so-called soft sciences: sociology, psychology, education and the like. It's not surprising there are frequent errors from these fields because of the immense and hideous complexity of their subject.

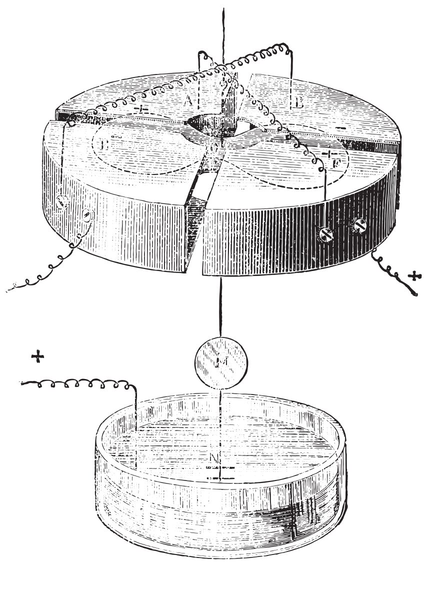
This is why we often turn to the so-called 'hard' subjects, like physics and chemistry, for 'real science.' These are fields in which the subjects under study are more amenable to control, and hence easier to examine. But this too is often an illusion.

Physicist Sabine Hossenfelder, in *Guardian* article, calls attention to a peculiar phenomenon in physics, the hardest of hard sciences:

> Since the 1980s, physicists have invented an entire particle zoo, whose inhabitants carry names like preons, sfermions, dyons, magnetic monopoles, simps, wimps, wimpzillas, axions, flaxions, erebons, accelerons, cornucopions, giant magnons, maximons, macros, wisps, fips, branons, skyrmions, chameleons, cuscutons, planckons and sterile neutrinos, to mention just a few.

None of these particles turned out to be real, but more are proposed constantly. Hossenfelder blames, in part, Popper's idea of falsificationism, which says that propositions are scientific if they are falsifiable. Any proposition that can be falsified is scientific. It follows that any proposition about anything that is measurable, from Bigfoot to gender theory to the existence of new particles, is scientific. So let's do science by proposing lots of falsifiable propositions!

This over-broadness was an early, even fatal, criticism to the philosophy of falsificationism. Another, even more damning, critique is that you almost never can persuade scientists to cease loving their actually falsified theories – theories which don't match Reality – especially when those theories are popular or lucrative. The physicist Max Planck offered a superior philosophy: science, he said, advances one funeral at a time. Still, few have had success in talking working scientists out of falsificationism. But that is a talk for another time.



A multitude of models

Another thing to emphasise in Breznau's experiment was the huge pile of models turned in. Over 1200. *Twelve hundred*. That's a lot of models! With that many, it must be true that making models is easy. Creating theories is simple. The researchers broke no sweat in producing this cache. And neither did the physicists who proposed all those new particles. In a very real sense, science – doing science – is too easy. Making models is too easy. Calling *X* a cause of *Y* is too easy.

And our examples – Breznau and particle physics – are only two small instances. Think about what this means extrapolated to every branch and field of science, the whole world over. People have thought about it. Enter the replication or reproducibility crisis.

The replication crisis

Major replications of what are considered the best papers – from the top journals such as *Nature* and *Science* – have been attempted by several groups over the last decade or so. These were large and serious efforts to duplicate original experiments in the social sciences, psychology, marketing, economics, medicine and others. What is stunning is that the results from these efforts were the same: only about half the replications worked, and half did not. And of the half that worked, only half of those – one quarter: that number we had to memorise – were of the same strength of effect size.

Lets look at medicine. Medical scientist John Ioannidis, a name familiar to some of you, examined the *créme de la créme* of papers, which is to say, the most popular ones; the ones with over 1000 citations each. Scientists count their citations the way influencers count their 'likes.' Scientists – with their H-indexes, impact factors, source normalised impacts per paper and all the rest, and the way they eagerly share and scrutinise these 'metrics' – can be said to have invented social media.

Anyway, Ioannidis examined 49 top papers. Here's what he found:

> …7 (16%) were contradicted by subsequent studies, 7 others (16%) had found effects that were stronger than those of subsequent studies, 20 (44%) were replicated, and 11 (24%) remained largely unchallenged.

Twenty four percent. Only a quarter of papers! Doesn't that sound like Breznau's experiment?

The *British Medical Journal*'s 2017 review of new and improved cancer drugs found that for only about 35% was there an important effect, and that 'The magnitude of the benefit on overall survival ranged from 1.0 to 5.8 months.' That's it. An average of three months.

Richard Horton, editor of *The Lancet*, in 2015 announced that half of science is wrong. He said:

> The case against science is straightforward: much of the scientific literature, perhaps half, may simply be untrue. Afflicted by studies

> with small sample sizes, tiny effects, invalid exploratory analyses, and flagrant conflicts of interest, together with an obsession for pursuing fashionable trends of dubious importance, science has taken a turn towards darkness.

The half of science that is wrong is, I emphasise, the best science. Consider how bad it must be in the lower tiers.

On distruptive science

You might have heard of recent work by management scientist Russell Funk and others. They noticed that the production of what they call 'disruptive science' has plummeted since 1950. By this they meant genuinely new (and not just 'novel') and foundational work. It has all but stopped, and in all fields. Is this because science has already made most discoveries, and we're now in a wrap-up phase? Or is it because of a deeper problem?

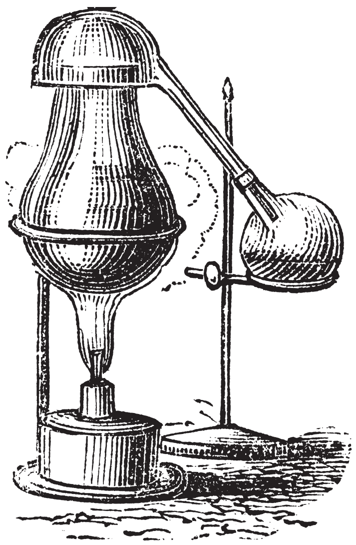
In any case, there is no possibility that all the papers produced by science today are correct, and even those that are correct seem to be of less and less real use.

On peer review

We have learned that something like three-quarters, or even more, of science is wrong or badly over-certain. And, of course, some is true science, but even this is increasingly of less value. There is no symmetry here. Even if half of science is true, the half that is wrong takes more time and resources to handle or counter, because the bureaucracy manages science, and our rulers are free to pick and choose 'The Science' they like.

Did you ever notice they always say 'The Science' and not plain 'science'?

Now the number of published papers has grown from about a quarter million a year in 1960 to about 8 million now, a number still heading north. Because most of it is wrong, and because of the



harms of bad science, we're forced to conclude there is too much science. There are too many scientists, there is too much money and too many resources being spent on science.

The solution to this glut is easy…in principle. Stop doing so much science! Alas, there is little hope we'll see any calls for less science education or lowered spending.

Let's instead explore why it's so easy to produce bad science, and what counts as bad science. Some of these reasons are easy to see. Such as peer review. Because scientists really must publish or perish, they are to large degree at the mercy of their peers, who act as gatekeepers to journals. Richard Smith, former editor of the *British Medical Journal*, in 2015 said:

> If peer review was a drug it would never get on the market because we have lots of evidence of its adverse effects and don't have evidence of its benefit. It's time to slaughter the sacred cow.

Again, alas, it won't be.

Peer review, added to the surfeit of papers, results in a system that guarantees banality, penalises departures from consensuses, limits innovation, and drains time – almost as much as writing grant applications does. For not only must you publish or perish, you must provide overhead for your dean. These factors, and activities such as fraud, which because of increasing money and prestige of science is growing, are all of known negative effect.

So let's instead think about deeper problems. Philosophical problems.

On philosophical problems

Finally we come to the philosophy of science. Unfortunately, we could not start with that subject because of the universal awe in which science is held. I had to at least attempt to show that this awe is not always justified. Now I hope to show that philosophy has something to do with this.

What is the nature or goal of science? I claimed earlier it is to understand the causes of observable things. Why and how and when *X* causes *Y*. Many, or even most scientists do not disagree with that, though some do. The agreement depends on which philosophy of nature one espouses, and which philosophy of uncertainty, and of what models and theories are. And here there is much dispute.

Some, calling themselves instrumentalists, are satisfied with statements like 'If *X*, then *Y*.' This is similar to 'X causes *Y*', but not the same. 'If *X*, then *Y*' merely says that if we know *X*, then *Y* will follow in some way. It doesn't say why, or say why entirely.

Instrumentalism can be useful. Consider a passenger in a jet. She has no idea how the engine and wings work together to cause the plane to fly. But she sees, and trusts, that the plane will fly. If *X*, then *Y*.

This happens in science, too, such as when experimenters try varying conditions just to see what happens. The inventor of the triode vacuum tube – called an 'audion' by Lee de Forest – had no idea how it worked. Nobody did, at first, and there were even many wrong guesses, but that didn't stop electronics firm RCA and others from using this obviously superior device in early radios.

But instrumentalism is never completely satisfying, is it? Just knowing 'If *X*, then *Y*'? If you plug the audion into a certain circuit, a louder signal emerges. Isn't it far superior proving that the grid, when similarly charged as the cathode, impedes electron flow to the plate, and when oppositely charged the flow increases, hence the triode amplifies the signal on the grid? *X* causes *Y*.

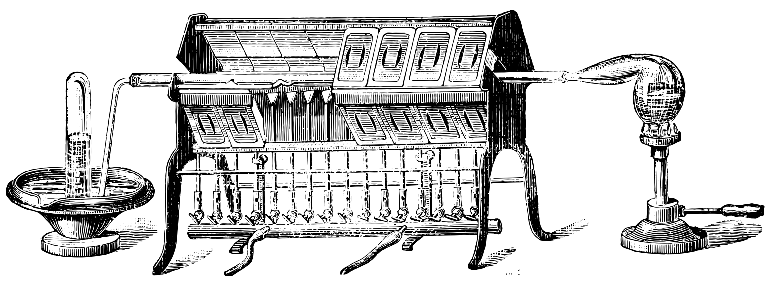
So cause is our goal in science, or should be. But that doesn't mean it's easy. There are many ways for this goal to be missed – or mistaken.

So here are some (but not all) of the ways science goes wrong in its fundamental task of discovering why and how and when *X* causes *Y*. I'll go from easiest to understand to hardest to explain.

On the ways science goes wrong

1. *X* is not measured, but a proxy for *X* is, and everybody forgets the proxy

This one is extraordinarily popular in epidemiology. So much so that without it, the field would be almost barren. This error is so common, and so fruitful at producing bad science, that I call it the epidemiologist fallacy, which combines the ecological fallacy – mistaking the proxy for *X* as *X* itself – with mistaking correlation for causation.



PM2.5 – dust of a certain size – is all the rage, and is investigated for all its supposed deleterious effects. There are a slew of papers saying PM2.5 is 'linked to' or 'associated with' heart disease or some such thing.

The problem is, the actual intake of PM2.5 is never measured; only rough proxies of 'exposure' are given. For example, zip codes can be used to determined one's recorded primary residence and its distance from a highway. Then you can construct a model of how much

PM2.5 is produced by that highway, and how much PM2.5 is thus available at your house, where it is assumed that availability is your exposure. And that exposure is your intake.

Understand that the error is not falsely claiming PM2.5 causes heart disease. It may, it may not. The mistake is over-certainty. Vast over-certainty. There are too many steps in the causal claim to know what is going on.

I can't resist telling you my all-time favourite instance of this fallacy. Someone from Harvard's Kennedy School claimed *X* causes *Y:* that attending a Fourth of July parade turns kids into Republicans. Parade attendance was never measured. Instead, they measured rainfall at the location on people's listed residences when they were children. If it rained, they assumed no parades took place, and so no kid went to one, even if that kid was at a parade at grandma's house. If it didn't rain, they assumed every kid did attend, even if they were away for camp.

They used causal language: 'experiencing Fourth of July in childhood increases the likelihood that people identify with and vote for the Republican party as adults.'

Thus San Francisco, which rarely sees rain in July, should be a hotbed of Republicanism.

2. *Y* is not measured, but a proxy for *Y* is, and everybody forgets the proxy

Sometimes neither *X* nor *Y* are measured, but everybody acts as if both were. This becomes the double-epidemiologist fallacy. You find this in sociology a lot. And in experiments allowing 'multiple endpoints' in medicine. The outcome might be the multiple endpoint, 'AIDS, or pancreatic cancer, or heart failure, or hangnails', and so if we hear a claim of some new drug that lessened the endpoint, we are not sure what is being claimed.

The US Centers for Disease Control and Prevention is a big user of this fallacy. This was how they talked themselves into mask mandates – in spite of a century's worth of studies showing masks did not work in stopping the spread of respiratory viruses.

During the Covid panic, one of their 'major' studies looked at 'cases' – by which they meant infections – in counties without mandates; or, rather, they looked at changes in rates of infections. But to tell whether masks stop respiratory bugs from spreading, one must measure the use of a mask and the subsequent infection or lack of it. If *X,* then *Y*. From which we might arrive at *X* causes *Y*. Measure odd things such as county-level changes in rates of 'cases' with and without mandates does not tell you this. Neither *X* nor *Y* has been measured. Cause remains vague to an extreme degree.

Incidentally, one study did it right. In Denmark, researchers taught one group how to use the best masks properly, and gave them a bunch of free ones, and another group went mask free. They measured individual infections afterwards. There was no difference in the groups. Anyway, if masks work, masks would have worked.

3. Attempting to quantify the unquantifiable

Thomas Berger's novel *Little Big Man* (eschew the movie) tells the tale of Jack Crabb, a white boy adopted into and raised by a Cheyenne clan around 1850. Years later, Crabb finds himself back among the whites, and is amazed at all the quantification:

> That's the kind of thing you find out when you go back to civilization: what date it is and time of day, how many miles from Fort Leavenworth and how much the sutlers is getting for tobacco there, how many beers Flanagan drunk and how many times Hoffmann did it with a harlot. Numbers, numbers, I had forgot how important they was.

Too important. Let me ask you, right now, how happy you are. You in the audience now. On a scale from –17.5 to e – the natural number e – cubed. I could have asked on a scale from 1 to 5, maybe, which allows me to scientifically put my happiness score on a Likert scale, the scientific name given to assigning whole numbers to questions.

Let's be serious, and do real science, and call my measure the 'Briggs Instrument'. Questionnaires are called 'instruments' when they are quantified, the language an attempt to borrow the rigour and precision of real instruments, such as oscilloscopes or calipers.

Suppose I polled the left half of the room, and then the right half, and there were differences in happy scores. Would I then be able to say, sitting on the left half of lecture halls causes less happiness in after-dinner speech listeners? I should be: that's how science is done.

It's not that the patented Briggs Instrument isn't telling us nothing about happiness. Take two people: one who answered the highest and one the lowest. There is probably a real difference in happiness between these two people. It's just that we're not quite sure what this real difference is.

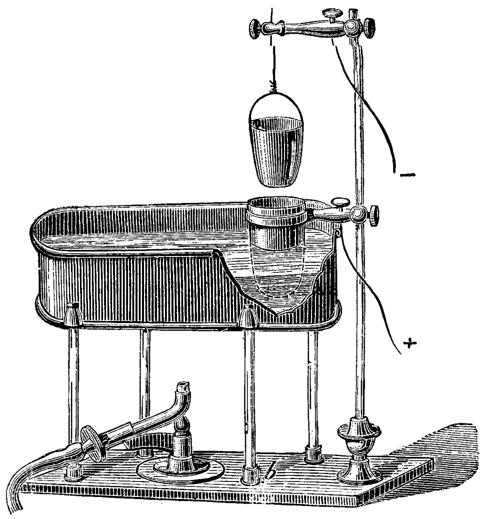
What does happy mean? The Thesaurus says: 'accepting, accidental, ad rem, adapted, addled, advantageous, advisable, applicable, apposite, appropriate, apropos, apt, at ease, auspicious, beaming, beatific, beatified, becoming, beery, befitting, bemused, beneficial, benign, benignant, besotted, blessed, blind drunk, blissful, blithe, blithesome, bright, bright and sunny, capering, casual, cheerful,' and on and on and on.

Each of these gives a different genuine shade of happy. How do we know those answering the patented Briggs Instrument mean the same shades? The typical response is to claim our instrument has been validated. And this means, roughly, that it was given to more than one group of people and that the answers came out about the same. That's not true validation – which isn't possible.

4. Mistaking correlation for causation

Every working scientist knows the adage: correlation doesn't imply causation. Sadly, just like confirmation bias, that's for the other guy. Most cannot resist the temptation to say 'my correlation is my causation'. Why? The practice of announcing a measure of model or theory fit as proving cause. The *Lancet*'s Horton, whom we met earlier, also said, 'Our love of 'significance' pollutes the literature with many a statistical fairy-tale'. This 'significance' is a word with a definition bearing no relation to the normal English word. It means having a wee p-value, a bit of math with which there are so many things wrong we could take an hour detailing them.

So we'll leave it at this: significance, i.e. a wee p-value, is when a model fits a set of data well. It is taken, often, to mean cause has been found. This is always a fallacy. Cause may exist, but it can never be demonstrated by 'significance'. It is always a fallacy because this significance is only a measure of correlation. And we all agreed correlation does not imply causation.



It is only the laziest of researchers who cannot find 'significance' in some way for his dataset. For there are an infinity of models available to choose from; correlation can always be had. That number is not an exaggeration. The number of possible models is potentially infinite. At least one can always be found for any set of data to exhibit 'significance.' Which just means, remember, that the model fits the data well, that correlation exists.

There are endless examples to choose from. *Endless*. My favourite is the evils of third-hand smoke. You have heard of second-hand smoke: that smoke and whatnot that comes out of smokers, which somehow affects non-smokers. Third-hand smoke isn't smoke at all, but the byproducts of smoking that come off of smokers and leave traces, long after the smokers are gone, where unwitting non-smokers may stumble across them.

A team of researchers went into a theatre where smokers had once been, and where non-smokers had attended too, but later on, once the smokers had gone. They concluded, because of significance, that sitting in the chairs in which the smokers had once sat was like sucking in the 'equivalent of 1 to 10 cigarettes of secondhand smoke.' Which is about the same number of cigarettes heavy smokers go through during a movie.

The result is absurd. But believed. According to one report, 'The effects were particularly pronounced during R-rated films, like 'Resident Evil,' which the authors suggested was because such movies attract older audiences more likely to have been exposed to smoke.'

Significance is also why there exist conflicting headlines along the lines of, 'One egg a day "LOWERS your risk of type 2 diabetes"' and 'Eating just one egg a day increases your risk of diabetes by 60 percent, study warns.' I have a collection of these things: science says just about everything will both kill and cure you.

It's not only bad statistics. Those physicists inventing that particle zoo also measured success by how well their models fit anomalous data. That's why they made the models – to fit those anomalies.

Model fit is a necessary but far, far from sufficient criterion of model goodness. Models can always be made to fit. Not all can be made to represent Reality. This is why I stress no model that has not been independently tested against Reality can be trusted. Most models are not so tested. It depends on the field, but in some areas, usually the so-called softer sciences, models are never independently checked.

5. Multiplication of uncertainties

We all agree that the planet needs saving. Everybody says so. From global cooling.

When climatology was becoming a new field, they really did say a new ice age was coming. *Newsweek* in 1975 reported:

> There are ominous signs that the earth's weather patterns have begun to change dramatically and that these changes may portend a drastic decline in food production.

Time in 1974 said:

> Climatologist Kenneth Hare, a former president of the Royal Meteorological Society, believes that the continuing drought…gave the world a grim premonition of what might happen.

Warns Hare: 'I don't believe the world's present population is sustainable if [trends continue]'.

There are scores upon scores of these, the scientists and groups such as the UN warning of mass deaths by starvation and so on. Well, climatological science grew, and the temperature warmed, and then we got global warming. Caused, incidentally, by the same thing said to cause global cooling: oil.

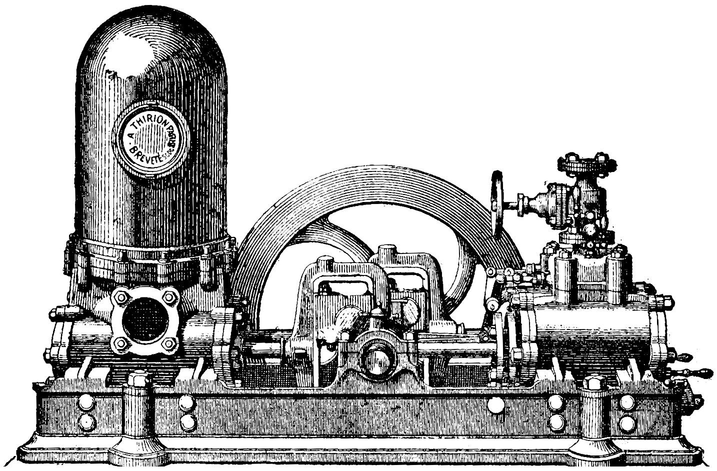
Global warming in time became 'climate change': a brilliant name, because the earth's climate changes unceasingly. Thus any change, which is inevitable, can be said to be because of 'climate change.' Correlation becomes causation with ease here.

'Climate change' was quickly married to scientism, where it came to be synonymous with 'solutions' to 'climate change'. Because of this error, doubt expressed about the so-called solutions caused one to be called a 'climate change denier' – an asinine name, because no working scientist, not one, denies the earth's climate changes or is unaffected by man.

US Secretary of the Treasury Janet Yellen recently said that 'Climate change is an existential threat' and that the 'world will become uninhabitable' if – you know the rest – if we don't act. Uninhabitable is a mighty word. Rode and Fischbeck in 2021 examined environmental apocalyptic predictions and discovered that the average time until The End, for those saying we 'Must act now', as Yellen did, is about nine years.

Predictions of 'only nine years left' started gradually, in the 1970s. They now happen regularly. Funny thing about these forecasts is that failure never counts against theory. Which is another strike against falsification.

That is a story unto itself. Let's instead peek at the science of 'climate change.' Not at the thermodynamics or fluid physics, which is too much for us here, but at the things which are claimed will go bad



because of 'climate change.'

Which is everything. There is no ill that will not be exacerbated by 'climate change', and there is no good thing that will escape degradation. 'Climate change' will simultaneously cause every beast and bug and weed which is a menace to flourish, and it will corrupt or kill every furry, delicious, and photogenic animal.

There is a fellow in the UK who collects these things. His 'warm list' total right now is about 900 science papers, an undercount. Academics have proved, to their satisfaction, that 'climate change' will cause or exacerbate (just reading the first few): AIDS, Afghan poppies destroyed, African holocaust, aged deaths, poppies more potent, Africa devastated, Africa in conflict, African aid threatened, aggressive weeds, Air France crash, air pockets, air pressure changes, airport farewells virtual, airport malaria, Agulhas current, Alaskan towns slowly destroyed, Al Qaeda and Taliban Being Helped, allergy increase, allergy season longer, [and my favourite] *alligators in the Thames!* And we haven't even come close to getting out of the As.

There is not one study, that I know of, that remarks on how a slight increase in globally average temperature will lead to more warm, pleasant summer afternoons.

That a small change in the earth's climate, whether caused by man or not, can only be seen as wholly and entirely bad, and can in no way be good, is sufficient proof, I think, that science has gone horribly wrong. It's not logically impossible, of course, but it cannot be believed.

Yet this doesn't say how these beliefs are generated. They happen by some of the reasons we've already mentioned, but also by forgetting the multiplication of uncertainties.

Given knowledge of coins, the chance of a head on a flip is one half. Two heads in a row is one quarter: the uncertainties are multiplied. Three in a row is one eighth; four is one in sixteen. If the event of interest is that string of four heads, we must announce the small probability of about 6%. It would be an obvious error, and a silly mathematical blunder, to say the probability is 'one half' because the chance of the last head is one half. And it would be outrageous if a headline were to blare 'Earth will see a Head on last throw.' Agreed?

But that's exactly how 'climate change' scare stories are produced. We first have a model of climate change, and how man might affect the climate. There is only a chance this model is correct. It is not certain. We next have a weather model, which rides on top of the climate model, which says how the weather will change when the climate does. This model is not certain, either. We then have a third model, about how some item of importance – the welfare of some animal or the size of coffee production or whatever – is affected by the weather. This third model is not certain. We finally, or eventually, have a fourth model, which shows how a solution will stop this bad thing from happening. This model is also uncertain.

In the end, it will be announced 'We must do *X* to stop *Y*'. This is equivalent to 'Earth will see a Head.' Causal language. Which we agreed was an error.

The chain of uncertainties must be multiplied. The greater the chain, the more uncertain the whole must be. This is never remembered, but must be, especially when the number of claims grows almost without bound.

6. Scientism.

Pascal commented on 'The vanity of the sciences':

> Physical science will not console me for the ignorance of morality in the time of affliction. But the science of ethics will always console me for the ignorance of the physical sciences.

Scientism is the mistaken belief that science has all the answers, that all things should be done in the name of, or justified by, science. Yet science cannot tell right from wrong, good from bad. I wish we had time to thoroughly dissect scientism; its effects are vast and devastating. I'll mention only the gateway drug to serious scientism, which I call 'Scientism of the First Kind'. This is when knowledge that is obvious or has been known since the farthest reaches of history is announced as 'proven' by science. This encourages belief in the stronger, darker forms of scientism.

Examples? A group researched whether laptops were distracting to students in college classrooms. The Army hired a certain corporation to investigate whether there are sex differences in physical capabilities.

Guess what they both 'discovered.'

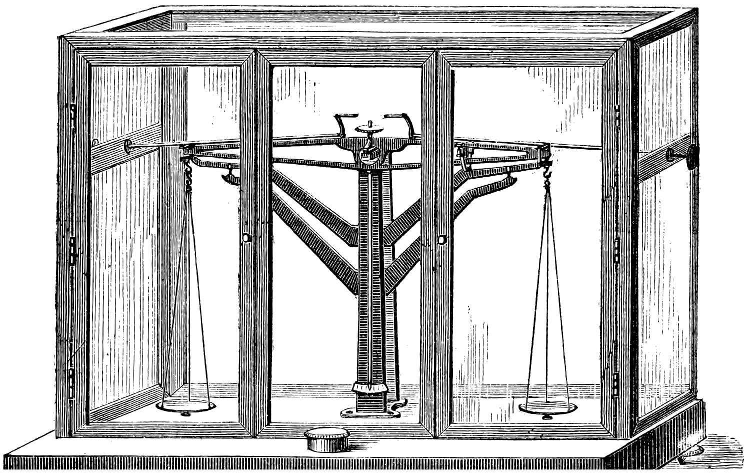
7. The Deadly Sin Of Reification: Mistaking models for Reality

We are in rugged territory here, for the closer we get to the true nature of causation, which requires a clear understanding of metaphysics, the subtler the mistakes that are made, and the more difficult they are to describe. Plus, I have detained you long enough. So I will give only one instance of the Deadly Sin, in two flavours.

It would, I hope you agree, be an obvious fallacy to say that *Y* was not or cannot be observed, when *Y* was in fact observed, because some theory *X* says *Y* is not possible. Yes?

This error abounds. *X* is some cherished model or theory, and *Y* an observation which is scoffed at, dismissed, or 'explained' away, because it does not accord with theory.

This happens in the least sciences, like dowsing or astrology, where practitioners reflexively explain away their mistakes. But it



also happens with great and persistent frequency in the greatest sciences, like physics.

The most infamous example of *Y* is free will. There are, of course, subtleties in its definition, but for us any common usage will do. We all observe we have free will: choices confront us, we make them.

Yet certain theories, like the theory of determinism, which says there are only blind particles obeying something mysteriously called 'laws', proves free will is impossible. It does, too. Prove it. If we accept determinism. Which many do.

Because scientists are caring people, and want what's best for man, saying determinism makes free will impossible leads to an endless series of papers and articles with this same profound, and hilarious, message: if only we can convince people they cannot make choices, they will make better choices! I promise you will see a version of this sentence in every anti-free will article.

It also leads to the current mini-panic over 'AI', or 'artificial intelligence.' Which it isn't: intelligence, that is. All models only say what they are told to say – a philosophic truth that when forgotten leads to scientism – and AI is only a model. AI is nothing more than an abacus, which does its calculations at the direction of real intelligence in wooden beads, with the beads replaced with electric potential differences.

But because the allure and love of theory is too strong, it is believed that computer intelligence will somehow 'emerge' into real intelligence, just like the behaviour of large objects is said to 'emerge' from quantum interactions.

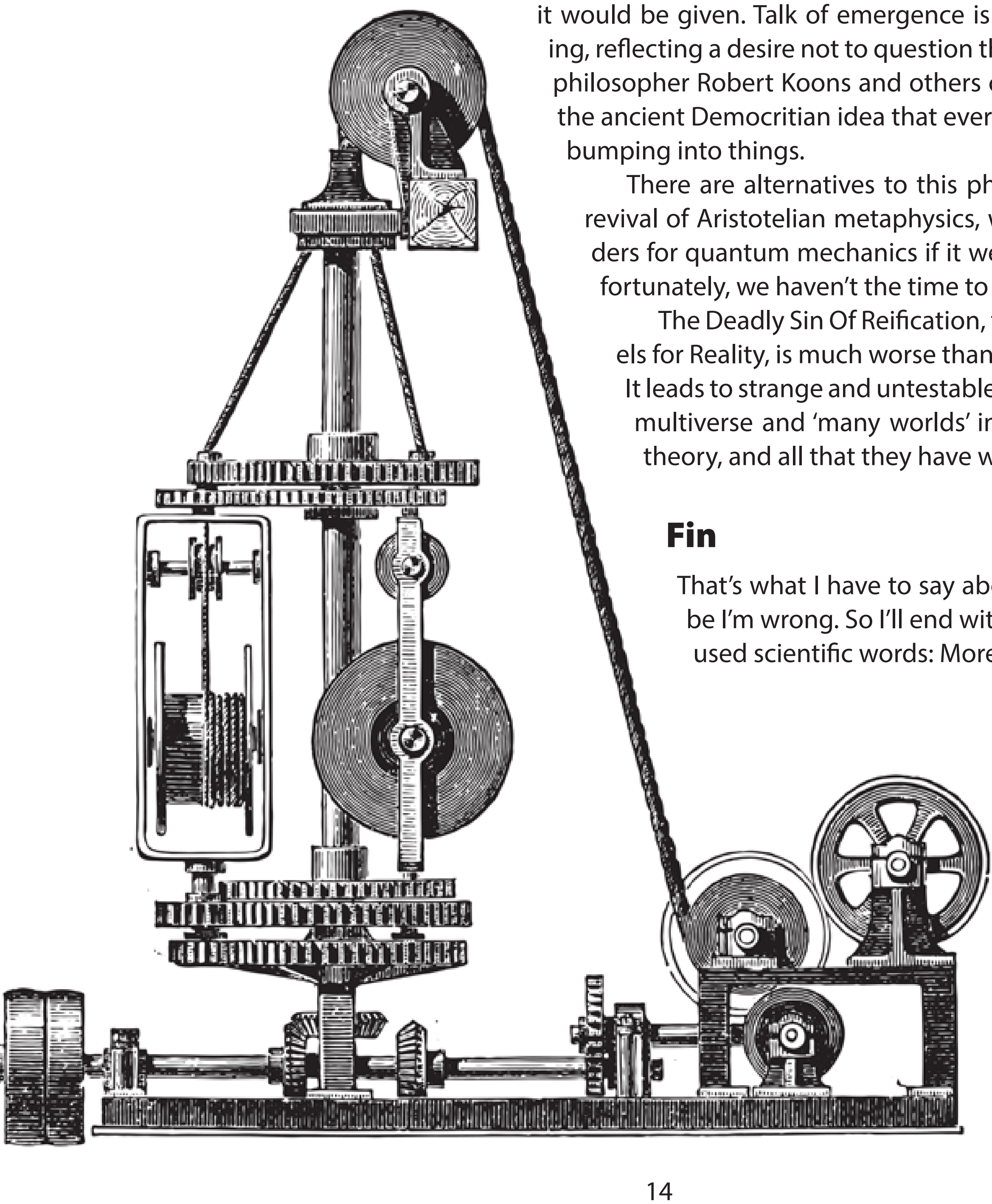
I will upset many when I say this is always a bluff, a great grand bluff. There is no causal proof of 'emergence': if there was, it would be given. Talk of emergence is always wishful thinking, reflecting a desire not to question the philosophy of what philosopher Robert Koons and others call 'microphysicalism', the ancient Democritian idea that everything is just particles bumping into things.

There are alternatives to this philosophy, such as the revival of Aristotelian metaphysics, which would do wonders for quantum mechanics if it were better known. Unfortunately, we haven't the time to cover any of them.

The Deadly Sin Of Reification, the mistaking of models for Reality, is much worse than I have made it sound. It leads to strange and untestable creations, such as the multiverse and 'many worlds' in physics, and gender theory, and all that they have wrought.

Fin

That's what I have to say about bad science. Maybe I'm wrong. So I'll end with the most frequently used scientific words: More research is needed.



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