

# Lay Assaying and the Scientific Citizen<sup>1</sup>

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I've been spending a few years now looking at an emergent industry in the information economy that I call the intellectual property defense industry. This is a rather shadowy but large enterprise that devotes itself to upholding trademarks, copyrights, patents, and the like against an equally large and equally shadowy set of forces that are called counterfeiters or pirates, fakers of various kinds.

As I've been looking at this, some things have come to mind. One is that increasingly, this industry sees itself as defending not just intellectual property but also information per se, so authenticity becomes a big deal for it. The second is that it really builds itself on a rather vertiginous fear that seems to be becoming increasingly common in the Information Age, which is that when we, as citizens, come up against any kind of substance—the classic example is cough medicine, but it could be butter, water, milk, wine, beer—we can't really be sure that we know what it is. The only reason why we might be sure that we know, or might be confident that we think we know, what it is is that we depend on these invisible but large institutional forces to uphold the genuineness of the substances that we encounter in the commercial world.

The third point is that increasingly, this industry is not separate from our everyday lives because we, too, have to partake of it—we have to contribute to it. A great example of this is an initiative called the Interpol Global Register that was announced by Google at a conference called INFO (Illicit Networks: Forces in Opposition) about 2 years ago.

The Interpol Global Register is a rather utopian informatics scheme that would attach to every commodity on the planet some tag, some kind of sign of authenticity, such that we as normal citizens—whenever we came upon a piece of medicine, or a piece of food, or a piece of electronics, or a car part, or whatever it might be—could point our cell phone at it, and by hooking into this tag and to the global information structure, the cell phone would tell us whether that piece of butter or

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cough medicine were genuine or not. It would do this essentially by tracking it back through supply chains.

That move to integrate a kind of invisible infrastructure of information authenticity with the everyday lives and concerns of citizens, and to make citizens, in a certain sense, players in that infrastructure, I think resonates with the rise of so-called citizen science, which is the epistemological endeavor to incorporate large populations of not exactly inexpert but differently expert people in major informational scientific research enterprises, such as the classifications of galaxies or protein folding or things like that.

I think that the juxtaposition of those two processes—the rise of citizen science and the rise of something like citizen authentication in the information economy—make visible to us a new, shared history to both of those processes that's always been there but that we haven't really noticed.

I want to give you a sense of what I think that history might be. It involves going back to the early modern period—to the fifteenth, sixteenth, seventeenth centuries—and to the emergence of a commercial consumer society. In that time, I want to say all substances that one encountered as a citizen of London or Amsterdam or Rome or Madrid were intrinsically and pressingly uncertain. Whenever you took a medicine, you went to see your apothecary; you had to trust your apothecary to make up the medicine to the formula that the thing was supposed to use. Whenever you ate bread, bread varied from place to place. So did beer. So did wine. There were no constants, there were no standards to which these substances might be held, and even if the standards had existed, there were no police forces that would have forced manufacturers to cleave to the standards.

A great example of this is something like spa waters. The problem is actually deeply epistemological. It's social and cultural and it has to do with things such as economic institutions, guilds, and things like that, but it's also, in the early modern period, epistemological. It has to do with what you think the nature of the substance itself is.

Spa waters are the great example of this. Spa waters by their very nature were supposed to vary from place to place. That was the whole point of their being spa waters. That's why you spent a lot of money to get water from Bath or from Evian or somewhere. That made them very problematic for any kind of system of authority of knowledge in the natural world because that kind of system was supposed to depend on universal experiences, typically in Aristotelian systems. And there were no universal experiences of spa water because it naturally varied. Moreover, most people who took spa waters, or actually the salts that came from spa waters when you distilled them, didn't take them at

their location—they took them somewhere else. So, you took Bath spa salts or some other waters in London.

That distance creates a whole extra realm of uncertainty about the authenticity of the substance because when you went down to your druggist or apothecary and you asked for some Epsom water or Epsom salt, how did you know that you were getting actual Epsom salt? It might have been at the time adulterated, which might mean any number of things. It might mean that other water had been added to it, different salts had been incorporated into it; it might mean that actually nothing had been done to it. It might be that substances would deteriorate over time if you didn't keep them properly. The category of adulteration included, in that sense, inaction as well as action. If you just put your stuff out in a warm room, then maybe it became unguine over time.

What that means is that a practical investigatory technique is ubiquitous in the everyday lives of citizens in early modern cities. I'm calling this "assaying" because the most prominent forms of it are the assaying techniques that are used on things such as metal ores to try to figure out whether they really contain the metals they're supposed to, or assaying of gems or gold or silver or coins, where assaying was a large-scale, rather secretive activity.

In a big sense, assaying was a key part of the Industrial Revolution. It's not an accident that people such as Matthew Bolton, James Watts' partner, spent years trying to wrestle control of assaying techniques from the authorities and bring them to where he was working. It was only if you did that that you could really profit from things such as brass manufacture.

But in a more lay distributed sense, citizens had to do low-scale assaying of their own. Every time you took a medicine, you had to look at your body and think how it was reacting. Was this medicine genuine compared to how you knew the medicine ought to act? If you look at the diaries of early moderns such as Robert Hook most famously, you can find them trying medicines all the time and investigating the reactions of their bodies to them.

So how did assaying actually happen in the early modern period? There are two or three key phenomena here. One is inspections and informers. All commodities loosely are produced under regimes of large guild control. One of the reasons for having guilds is to mount inspections of the premises of manufacture. So these inspectors who are themselves manufacturers—printers in the case of printing, brewers in the case of brewing, distillers in the case of distilling—go around to craft workshops and look at them and make sure that the conditions of manufacturing are what would produce a sound product.

So printers go to printing houses to see whether the pages that are being produced are typographically appropriate and that they're not pirated or counterfeited. That means that there's a kind of micropolitics to this and that the structure of a sound craft workshop is held to give rise to sound substances, taking substances very broadly to include things such as printed pages.

The second technique involves registers. All guilds had registers of some kind, in which you logged the characteristics of authentic substances. For example, in the case of printing, the Stationers Company, which was the guild in London that looked after this, kept a register in which all books that were printed legitimately were supposed to be entered. This is the deep origins of copyright systems. And then when you went out on your inspections, you compared what was being produced to what was in the registers.

One of the aspirations to produce a publicly validated system of authenticity for substances was to try printing the registers. This is what pharmacopeias are. Pharmacopeias are printed registers of medical recipes, which are then supposed to be followed by all makers of medicines—apothecaries, druggists, and the like—so that when you as a citizen go and get your whatever it is, Jesuit's bark or something, you could be confident that by following those rules, which are readable, your manufacturer will have produced what he claims to be producing.

It doesn't work, even though pharmacopeias of course proliferate through the early modern period, because the resort to print is, in fact, not a resort to a kind of system outside of this domain of guild control. Print, as I've just indicated, was itself subject to inspections, counterfeits, piracies, and so forth, and this was what happened to pharmacopeias.

So most famously, the first national pharmacopeia, which was the British one—English I should say—in the sixteen teens, immediately had to be recalled because it had been hijacked, as the physicians put it, out of their hands by the printing industry. It was then translated illicitly into English, at which point the physicians declared themselves horrified that lay people would take up the rules that were in this book and now legible to them and would, by misreading them, produce fatal fake medicines. So, pharmacopeias capture something of the paradoxes of these systems of trying to detect and regulate substances.

The third point is that there aren't really instruments for this until quite late on. The only instrument that you have is an instrument that's shared between expert and inexpert bodies, and that's the human body itself. So the standard thing that you do to regulate and detect fake or counterfeit or adulterated substances is what's called organolepsis—that is, you rely on your senses. So if you're looking for adulterated

food or medicine, you eat some, which might seem rather a destructive form of testing, but it's the only thing you can do. This is what you see people such as Robert Hook doing all the time.

So even the skilled investigators who go in and do these guild inspections are, in practice, typically relying on the same kind of responses that lay citizens had. Lay citizens did have to do this. They had to be their own organoleptic assayers of many different kinds of things—foods, medicines, and in some cases even books. You can find, in the world of print piracy, pirate book producers claiming to customers that the reason why you can tell that what they're selling is the genuine Thomas à Kempis, say, is that when you read it, it does to you what Thomas à Kempis's *Imitation of Christ* is supposed to do to you. That's an organoleptic way of finding that the books are genuine.

So there's a big need, and this is a realized need in the early modern period, for some kind of more systematic approach. The person who invents the first anti-adulterating instrument, apart from the body, is Robert Boyle. In a book called *Medicina Hydrostatica*, which came out in 1690, he proposed using precision balances to measure the relative density of particular substances—gems, medicines, foods, wines, vinegars—things like that.

Along with that, he suggested a kind of derived instrument, which was a little glass device that you could float in a liquid. It would float down to a certain level depending on the relative density of the liquid, and that would give you what he thought was a signature of the genuineness of that liquid. So if milk, for example, had a certain kind of floating level for this little machine (which later came to be called the lactometer), then if you adulterated your milk by adding water to it, it would float to a different level and that would tell you it was adulterated.

He proposed distributing very widely these kinds of simple instruments (that are not so simple in the case of the precision balance), such that everybody could become their own detector of adulterated, fake, fraudulent substances. Anybody who's ever tried experimental techniques will appreciate some of the problems that must have attended this and which Robert Boyle found attended such techniques before he even published the book, actually.

For example, using relative density involves a notion of a standard substance against which the relative density of something is measured. And that was going to be water. How do you know that water is a single substance? It was actually widely reported at the time that if you took water from the Ganges, it had a different density from water from the Thames. And Boyle had to try to seek out water from the Ganges to see whether that was true because otherwise the whole system didn't work.

If you had substances that had to be in solution, what kind of solution did you use? If they were not soluble in water, you had to use an oil. But oils are typically adulterated, so how do you know that the oil that you're putting your substance into is not itself corrupting the reading? You have to use an oil that's so cheap nobody ever adulterates it.

Adulterants have different effects on relative density, so you can make relative density go up or down depending on what adulterant you add. So what if people don't just adulterate once but adulterate twice, with counteracting reagents, so that you would add, say, water to milk and then add something else to milk that would thicken it up again, at which point you could produce what looks like real milk to Boyle's instrument but was actually doubly adulterated and much worse than standardly adulterated milk would be.

For all these reasons and probably more, these instruments never caught on, and through the eighteenth century, alongside a rapidly increasing public awareness and anxiety about counterfeit medicines and foods, organolepsis remained the key widely distributed technique for detecting fakery, as even Boyle thought that it must. His instruments, in fact, were only supposed to be used in conjunction with organolepsics, not as replacement for them.

At the development of modernity in the nineteenth century, this became a key issue in many western cities with the rise of chemical analysis of foods and medicines and the emergence of what were called public analysts.

What happens in the modernization process of the late-nineteenth/early-twentieth century and the rise of science as the kind of defining element of modern society is that in contrast with standard stories about the scientification of society in this period, when it comes to the everyday experience of the genuineness or adulteration of substances, it's not that science simply takes over and that this becomes the domain of laboratories and big institutions. On the contrary, the laboratories and the institutions and the instruments and the experts exist, but their existence actually gives a new importance to everyday household lay assaying. And lay assaying has to become quasi-scientific to continue to partake of this world.

You see this, for example, in New York in the 1870s when there was a famous milk trial at which the milk industry was accused of systematically adulterating milk. At this trial, scientists from MIT, Cornell, Yale, Penn, and Columbia came into New York courtrooms to argue for the importance of a science of the authentication of this everyday substance that people took into their bodies.

The trouble was that the milk industry pointed out that lactometers, the descendant of Boyle's instrument which float in milk and give you a

measure of its relative density, were completely unreliable. As *The New York Times* put it, they betrayed our trust, these instruments. They couldn't tell even whether something was milk or not, never mind whether it was adulterated. And when in the courtroom these very prominent scientists from major U.S. institutions tried the lactometer in samples, they found that they split 50-50 about whether the lactometer told that this milk was adulterated or not.

So the process of a move to science, to instrumentations and laboratories, I think did happen with respect to the authenticity of substances, and it couldn't and didn't mean a fundamental shift away from the citizen and the home.

Where you see that most clearly is in, of all places, the magazine *Good Housekeeping*. As many people will know, despite being part of the Hearst empire, *Good Housekeeping* has built its reputation on a kind of alliance with especially female household consumers. In the early twentieth century, it hired Harvey Wiley, who'd been head of the Department of Agriculture's Chemical Analysis Laboratory and was famous for putting together a group of people called the "poison squad" who would test foods and medicines by simply taking them organoleptically. This gave rise to the Food and Drugs Act for pure foods in the early twentieth century.

*Good Housekeeping* hired Wiley to set up its own widely distributed domestic science of authentication. This was quite explicitly a process to try to make housewives into, as it were, lab scientists producing little micro-societies of rationality and method to guarantee that in their households only pure substances would be taken in by their children and their husbands.

So *Good Housekeeping's* readers were told to buy test tubes, to buy chemical reagents; they were given rules for testing butter, milk, rice, bread, grains, and so forth; they were told the rules of what was called scientific food keeping; they were encouraged to go out and produce a universal American survey of what were called model food stores that would sell only the best authentic food.

This was quite clearly a kind of micropolitical enterprise. Wiley's wife announced, as she put it, that "[w]e are going to raise the suffrage flag on the tallest mast of the pure food ship." She was a suffragist, so she was arguing here that the authentication of women's voices in the wider polity would hang on this, their role as authenticators in the household. The woman of tomorrow, as *Good Housekeeping* called it, would be a scientist of the household, testing all of these substances all the time because nobody else could be trusted to do it.

It's interesting that before *Good Housekeeping* set up its own laboratories, which it's famous for doing even before that, it wanted to

distribute to every household that subscribed, free of charge, a set of standard weights and measures keyed to the National Bureau of Standards that would allow housewives to judge, as it put it, in a strictly scientific way, the qualities of everything that was going into their premises. And also, this would be a scientific movement that would imitate the circulatory information flows of a real science.

So letters, experiments, and observations came through *Good Housekeeping's* offices. Wiley and his staff would reply to doubts about things such as the genuineness of vanilla, for example, by giving out chemical rules for how you would test for the genuineness of vanilla, which would then be practiced by American housewives across the country.

This was projected in contrast to the official science of the time. Wiley in particular denounced MIT, which was said to be in hock to corporations and thus couldn't be trusted, almost by virtue of its very institutional character. As *Good Housekeeping* put it, when doctors disagree, the judgment of authenticity lies in the individual. And the judgment of official science did disagree.

So here was a true citizen science in the very midst of the scientization of modernity. And it had to exist, because the very things that one takes into one's body on an everyday basis depended on it, and the character of the commercial society that produced those things meant that big industrial authentic laboratory science couldn't provide every answer.

In that light, I think that it's interesting that the strategies of authentication today, such as the Interpol Global Register, are melding these kinds of citizen science ideals of that period with the kinds of registration and inspection regimes that existed in early modernity. It's very significant that the Interpol Global Register is, in the end, a register. And these are necessarily recreating not only some of the advantages that those methods have but also some of the problems and some of their political character, too. I think we're at a point now where we can appreciate this as a new kind of historical visibility, and we can see that we can actually learn from this forgotten history of the everyday necessity of citizen science.