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Measuring the Everyday in Science: *Found Science* by analogy to Found Art

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Thinking with art can shine fresh light on a stubborn philosophical problem: measurement. Several thinkers, including contributors to this volume, have contested the proliferation of indicators, measures, and the like, that are quantifying public life. But measurement in science is usually accepted. Indeed, if we follow philosopher Nancy Cartwright's thinking, science *is* measurement (1983). And yet –or perhaps because of this– defining what measurement is is no simple task.

One question in particular arises in the context of philosophical debates about scientific realism (simply put, whether science represents reality, or constructs it). The question is:

Does a measurement operation really measure what it purports to measure[1]?

For example, does a thermometer really measure heat[2]? Does an IQ test really measure intelligence? In this piece I invite you to explore these questions with me, inspired by an art-making practice known as found art (*objets trouvées*, or readymades).

Merriam-Webster Dictionary defines *objets trouvées* as "objects … that were not originally created as art but are displayed as such." (see Fig. 1).

[1] cf. Chang and Cartwright (2006) for more detail on the problem of measurement. This formulation conflates the issue of the validity of measurement with that of realism. I do think one can in fact have a valid measure of something unreal, or not yet shown as real, so I do not wish to assert that this is impossible. But assuming a realist perspective, in this formulation, this would not be desirable.

[2] I am saying 'heat' in reference to how Chang describes measurement practices of De Luc (Chang 2004, 60)

Figure 1. ***Fountain*** (1917) is considered to be one of the first readymades, submitted for exhibition but never shown in the 1917 Society for Independent Artists show in New York. The piece was originally attributed to Marcel Duchamp, and more recently to Baroness Elsa von Freytag-Loringhoven. The photo shown was taken by Alfred Stieglitz and published in *The Blind Man* magazine, 1917, as part of a commentary on the piece.

Found art seems to be just 'found'; but in fact it relies on appropriately placing, angling, naming, situating –what I call 'founding'– everyday things within artistic contexts, in order for them to begin to be considered as art. Thinking about the measurement of everyday ideas by analogy to found art practices shines fresh light on the limits and possibilities of scientific measurement.

Science claims to measure everyday ideas, e.g. 'heat', or 'intelligence'. But measurement in science also relies on a prior process of fitting, or 'founding' these common ideas, in scientific contexts –contexts which will also differ from discipline to discipline. Founding an everyday idea in science may involve translating it into already accepted scientific terms, focusing on some possible interpretations of an idea as relevant for the scientific context in question, and doing all this following the accepted norms for working in this science domain. Science, then, is creative –and it should be held responsible for its creations. The effect of seeing everyday ideas, like 'intelligence', used in science should raise similar types of questions as would a urinal in a museum space. As with art, the place of the 'everyday' should be critically assessed in science. And, as also with art, 'found science' could be radical in bringing attention to common issues within an established and often exclusive practice.

I have laid out a way of thinking about science using everyday ideas as *found science*, by analogy to found art. Let's leave this proposal bubbling and come back to the question of measurement. Consider these questions again:

Does a thermometer really measure heat?

Does an IQ test really measure intelligence?

An answer should reflect on whether the particular measure we use approximates what we commonly think of as 'heat' or 'intelligence', but also whether this phenomenon exists to begin with. Is there such a quantity in the first place to be measured?

There are two general positions regarding the nature of measurement. One approach is to treat a measurement method as definitive of the everyday concept in question. For example, an IQ test is one definition for 'intelligence' and using a thermometer is one definition of 'heat'. The other approach is to assume that measurements are ways of finding out about quantities that are -so to speak- already 'out there', independently of anyone measuring them. Taking a temperature or an IQ test would then be (if correct) one way to find out about what concepts like 'heat' and 'intelligence' stand for, in the world.

These two broad positions can be called a nominalist and a realist position about measurement, respectively. And they come with variants. A more extreme form of nominalism is operationalism. This identifies the meaning of a concept (for example, 'heat' or 'intelligence') with the operations used to measure it –so each particular way of measuring (say using a thermometer, or an infrared camera) will be a definition of its own concept of heat. This is a safe way to make sure that every measurement operation is correct: an instrument, by default, will always measure its own concept. Still, the peace-of–mind afforded by operationalism bypasses questions about whether the things we measure are independent of measurement; calling such questions nonsensical really (what concepts would we have to express them in?). Operationalism then seems to counter a presumed interest of science in synthesizing knowledge obtained by different measurements to really know its objects.

A more moderate nominalist position is conventionalism. Conventionalism posits that though a measure defines a concept, there are principles for coordinating among different measures. There is still no fact of the matter regarding which of these measures to pick, but there are conventions which we can follow to synthesize different measures into some one definition of the ordinary idea. For example, observations and IQ tests measure intelligence differently, but they can be combined into some conventionally agreed way of measuring intelligence. This solution, however, would mean that convention is the authority on which our science operates –in contrast to the higher hopes of some that this authority be Nature. Both versions of operationalism can seem to be lacking then given the aspirations of science.

So, what about realism? Realism, views measurement as an activity aimed at discovering the true value of a quantity (or property), say of heat or intelligence. A realist assumes the quantity exists independently of how we measure it. But, of course, the question arises: on what grounds should this assumption rest? How can we know that these quantities are there if not by measuring them? A naïve realist, who assumes that measurements correspond straightforwardly to our ideas about these quantities, is not very convincing given the context of how science is practiced. Often both the ideas we start with and our attempts to measure these change, maybe 'correcting' each other, but surely not in some stable correspondence. If our way of knowing the world scientifically is via measurement, (a proposition that is extra compelling in the case of entities that would be otherwise unobservable, like those of particle physics), then how are we to know that we are not wrong?

I am not going to claim that thinking through art solves this problem! But I do think that art moves the problem closer to a solution. The point I want to make is that found science proposes a way of viewing measurement that differs from both realism and nominalism.

This happens because in the frame of found science, scientific measurement is not the operationalization nor the representation of some everyday idea. Rather it is a transfiguration (Danto 1981) an -often lossy- transformation of some rich everyday idea we start off with, which is needed to even propose that we can be measuring it *scientifically*. Found science posits that some everyday ideas can become scientifically measurable, if, and only if, they are transfigured appropriately, or 'founded' in a scientific context. That is, according to this view, it is premature to call oneself a realist, or a nominalist once it comes to measuring everyday ideas like 'heat', or 'intelligence' –it is actually not the case that we get to connect to everyday ideas in their full complexity in science at all. These ideas need to first get fit into existing assumptions, ontologies, interests and experimental practices of a scientific context, before they can be even possible to measure and for us to debate these measurements as real.

This process of 'founding concepts' may seem very bizarre, but I think it happens almost tacitly for professional scientists. So, for example, say we had a nurse and a physicist both interested in measuring heat, or the warming of things (liquids, metals, people, skin, tongues, etc.). The idea is that these people thinking about heat as a possible real quantity with real properties will be doing so

very differently to each other, and to an everyday observer, just by virtue of their training, scientific ontologies and interests. These founded concepts of heat (or temperature) would then be designed to facilitate their work in, say physics or medicine. Found science proposes that ordinary concepts like heat (often just) aren't scientific concepts until they are transfigured by introducing and fitting them—founding them—into a particular scientific practice. This is a minimum condition for them getting to be 'proper enough' to be measured.

Consider our second example, 'intelligence'. Intelligence can mean many things to different people and different societies may have different ways of capturing the quantity that in English we call intelligence. How do we study this idea scientifically? Psychologists might have developed a tool like an IQ test and scale. But would this tool actually pick out intelligence in societies where people are not educated to take standardized tests? And what about measuring nonhuman intelligence? Should we say animals have no intelligence because they cannot take an IQ test? Scientists, often without realizing they are doing it, invent new concepts of intelligence by founding everyday ones into already existing scientific domains. For example, one way of understanding intelligence in primatology (the study of primates) is in terms of social learning, tool use, extractive foraging and tactical deception (Reader et al. 2011). An everyday idea of intelligence is founded to understanding the behaviors and lives of primates. If the process of founding is done well enough these founded concepts can be measured by different methods *as if* they were real independent of measurement. This doesn't make the invented notions real of course. But the point is that the ordinary concept would not be what gets measured at all once we measure a so-labeled "common" idea in science. So, what results from this process need not be real; but it is not ordinary.

Thinking about science by analogy to art in the way I propose shows that we need not be committed to the nominalist nor realist position about measuring everyday ideas. Once these ideas are founded in a science, then the question can come up, but not before. While founding an ordinary notion, an operational definition for the founded concept could become available –say a combination of social learning and tool use, in the study of primate intelligence. But it need not. Founding a concept can be a matter of embedding it in theory via a set of assumptions, or it can be a matter of otherwise articulating its scientific relevance. What found science suggests is that measurements, even

if one wanted to be an operationalist about the issue, would not be operational definitions of some ordinary idea, but rather of founded, scientific concepts.

So, were we to debate the correctness or not of different measures for, say, "wellbeing" across economic or social policy settings, we would have to understand ourselves as possibly debating about measures for different founded concepts. As such, conflicts of this type can look for multiple grounds for settlement; first intra-theoretical ones –relevant to norms that are specific to what the founded concept is supposed to measure within its home context (say, should wellbeing measures in development economics consider per capita income, or also highest educational achievement), and then, inter-theoretical or inter-disciplinary ones (say, when deciding between economists' views of national wellbeing and gerontologists' analyses about the wellbeing of older people). With respect to a realist approach to measurement, again found science would suggest that what is being targeted as of interest to "measure" is not any ordinary idea of wellbeing but several new, transfigured ones, perhaps fictitious ones, but also ones that –should they be real –would serve our interests to find out about, as real. This account shows that once it comes to everyday phenomena of common interest, like wellbeing, or intelligence, there is no one straightforward authority on the matter because no one founded concept can capture the richness of how everyday ideas matter in different contexts. Rather, doing science on everyday ideas involves, to a greater or lesser degree, decisions about the inter- and trans-disciplinary coordination of research, figuring out what founded concepts are fit, and in what combination, in addressing a common problem. For a science-based, inclusive, democratic deliberation of wellbeing, then, several specialized ideas would have to be considered, alongside common understandings of wellbeing and the experiences of affected people.

Where we had to decide between multiple measures for some ordinary concept, found science posits we have multiple non-ordinary, founded concepts to consider, and then possibly multiple measures for each of these concepts!

Is this "proliferation" at all an improvement?

I think it is. First of all, it is not any sort of proliferation, but rather a target-specific articulation that occurs according to expressed scientific norms and interests, resulting in new scientific concepts. But at the same time this process does not thereby reduce founded concepts to a

measure. I agree with Nancy Cartwright that scientific concepts should be textured enough and interconnected with other theoretical knowledge to admit of and justify multiple measurements (1999). So I would be wary of thinking them as operationally reducible. But found science does not come with a view on the issue.

So,

Does a thermometer measure heat?

Does an IQ test measure intelligence?

Thinking with art shines fresh light on the philosophical problem of measurement. The answer found science gives to these questions is that the thermometer measures temperature –an invented concept (Chang 2004). And as for intelligence –it depends on who is asking. There are plausibly concepts of intelligence founded within different scientific or quasi-scientific contexts such as that an IQ test would measure and some that it will not.

I propose that everyday ideas must become transformed, founded, or appropriately installed in a scientific context before they get to be measurable in science, by analogy to how everyday objects become founded before they can be found as art. Found science does not solve the problem of measurement. But it offers another way to consider this problems. One that perhaps is less ambitious regarding what is to be achieved by science (as scientific concepts cannot but be laden with existing theory and interests and so always subject to revision) but perhaps a perspective from which Science as much as Nature can take credit for its imagination and artistry (and also responsibility for its failures).

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