Shadow measurements

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Abstract

Numerical values have the power and appeal to substitute the 'original' reality being measured. That is, if we let them.

1 Introduction

Mainstream science holds that 'we know something only if we can measure it'. While this may be true for the so called 'exact' or quantitative sciences such as chemistry or geometry, it is not necessarily true for very complex situations such as Life (Perdicoúlis, 2012c). Complex objects or situations are often known by means other than measurement, such as experience (Perdicoúlis, 2013b). In such cases measurement may even create a false sense of security, or a sense of absurd — as illustrated by Douglas Adams (1979) with the meaning of life being equal to '42' (Figure 1).

42

FIGURE 1 The alleged meaning of life

2 Measurements

Measurement implies a comparison with a reference (metron [Gk]) in appropriate standardised units — although various standards may co-exist, such as the 'imperial' and the 'metric' system (*Système International*, or 'SI'). Consequently, 'metrics' represent collections of measurement results in the form of data — that is, factual information, free of (subjective) assessments such as classifications (Perdicoúlis, 2012b).

Simple measurements establish 'indicators', which can be combined into 'indices' that represent more complex objects or situations (Perdicoúlis and Glasson, 2011). For relatively simple objects of interest such as car engines or domestic electrical installations, measurements provide important information regarding the system's function and/ or state, with implications for its use — for instance, whether it is immediately ready for use or it needs repairs.

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3 Shadows

Sometime in the 6th C. BC, Thales of Miletus managed to measure the height of the Egyptian pyramids through an easy and reliable indirect method, employing their shadows and trigonometric properties of 'similar triangles' (Perdicoúlis, 2011) — Figure 2. Since then, many scientific and professional fields have adopted indirect measurements for their overly large or complex objects of interest, resulting in indicators and indices. Those who value measurements and metrics as paramount for knowledge, and science in particular, may find great interest in the shadows of the objects, as Thales did with the pyramids — and perhaps greater interest than in the objects themselves.

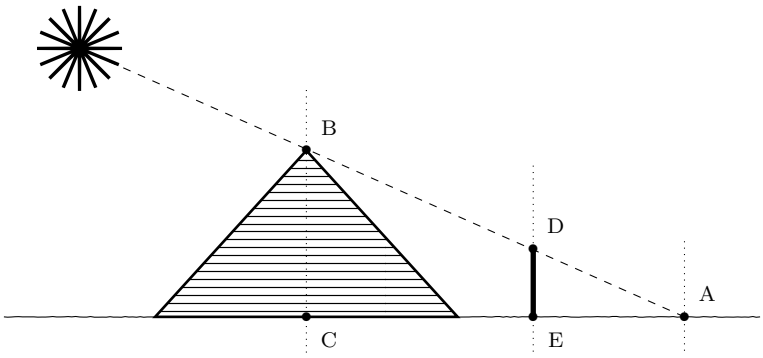

FIGURE 2 Thales' shadow measurement setup

Shadows — and, by extension, measurements — are a kind of 'meta-reality', or information about reality, which gain real existence in their own right. Plato used the shadows in his famous 'den' parable (Plato, 360BC, Book VII) to encourage people to get to know the original objects instead of surrendering to an artificial reality (Perdicoúlis, 2010, pp.14–15) — Figure 3.

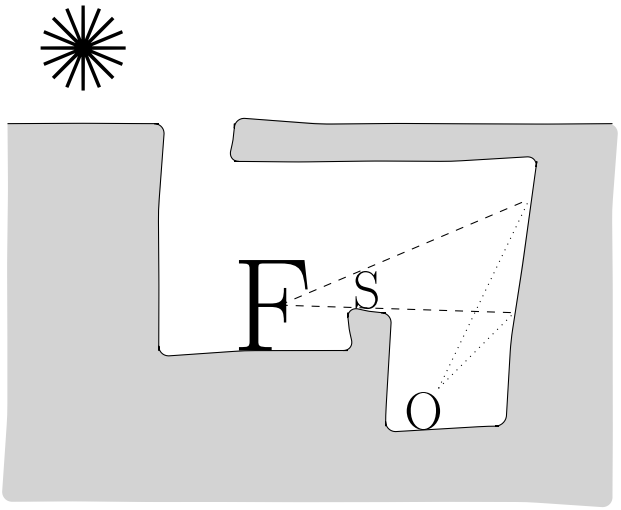

FIGURE 3 The main setting for Plato's 'den' parable; F=fire, S=statue, O=observer

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4 Examples

Measurements as shadows of reality can be intriguing, revealing interesting patterns in the new artificial or invented reality. Money is an example of 'shadow' of goods and services, representing their 'market value'. According to external conditions of the market or geographic location — equivalent to the height of the sun in the horizon —, the price of goods or services elongates or shrinks, just like a real shadow. 'Bibliometrics', one of the latest scientific fads (Perdicoúlis, 2013a), is another example of an artificial reality of shadows purporting to measure scientific contribution.

Let us see how measurement can represent reality in the case of a complex concept, *efficiency*, in three different circumstances. We could accept the efficiency of an electrical transformer — a machine — to be 42% in terms of energy input and output — and this would be a very good machine. In another context, the financial efficiency of a country could be calculated to be 42%, but this would be practically meaningless because a country is so multi-dimensional that the funnelling of all these dimensions into none (i.e. the percentage) loses all of the important information about a country, such as 'what takes place there?', or 'how would life be there?'. Finally, let us consider the efficiency of a car driver: in an indicator and measurement approach, driver A has had 0.042 accidents per thousand miles; in a knowledge-oriented approach, driver B is known to prepare adequately for every trip, stop to rest, and drive smoothly. Which approach provides more understanding about efficiency?

5 Discussion

In a wider cultural context, shadows have had entertainment value at a global scale for many centuries — for instance, as *shadow play* (or puppetry), an ancient form of visual storytelling (Plato, 360BC, Book VII). In its attempt to represent life, art creates a representation of reality — the shadow play —, as much as science creates measurements. And as life tends to imitate art stronger than art imitates life (Wilde, 1891), something similar can happen in science: life can start following shadows such as money or bibliometrics.

There is also a more sensitive issue. Measurements attempt to reconstruct characteristic parts of the original object of interest, and thus create a *model* of the object of interest — a selective abstraction. Selectively abstracting a 'live' reality though — such as a person or knowledge, for instance — is possible indeed but reduces that reality so much that somehow it becomes devoid of dignity: it becomes a mere object of study (Perdicoúlis, 2013b).

6 Challenges

The ingenious paradigm of Thales has indeed some glamour, working in the meta-reality or abstraction of 'shadows', but both classic and modern advice conjure a strong reminder: it is the reality that is important and we must always keep this in view; if we must view its measured 'shadow', then this should be only as a complement — not a substitution. We can measure reality, discover patterns, gain insight, have fun, but should never lose sight of the 'original' reality. Science is not meant to create a parallel reality, but to elucidate the one we live in. Few challenges are bigger than this.

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