

Lena Kästner

Unknown Unknowns

Searching for a logic of knowledge and belief (epistemic logic), some philosophers have proposed systems including Lewis' axiom (.4):

$$(.4) p \supset (\neg K \neg K p \supset K p).^1$$

However, there is compelling evidence against this axiom. In 2002, Donald Rumsfeld claimed that there are *unknown unknowns*—things “we don't know we don't know” [1]. His claim might be rewritten as

$$(UU) p \wedge \neg K p \wedge \neg K \neg K p.$$

Let give a historic example to illustrate the plausibility of (UU) before I come to show how it conflicts with (.4). My conclusion will be that any epistemic logic containing (.4) has to be rejected.

Contemporary atom models use different kinds of subatomic particles organized in a certain way: electrons are moving around a nucleus composed of neutrons and protons. Thinking back to the old Greeks, the reader might recognize that this has not always been the case. Around 450 BC, Democritus coined the term “átomos” to refer to the smallest *indivisible* parts of matter he assumed everything to be composed of. What Democritus *did not know* was that he *did not know* anything about the atom's subatomic particles and their organization. These were, at that point, unknown unknowns.

With the discoveries of the electron (Thomson, 1897) and the atom nucleus (Rutherford, 1909), it became clear that we did not know how subatomic particles are organized into atoms. The unknown unknown turned into a *known unknown*.

Typically, unknown unknowns are identified in retrospect; often using current known unknowns or known knowns (things that we know we know). For we can obviously not identify something of which we do not (yet) know that we do not know it from our present point of view. But our inability to recognize unknown unknowns is no reason to deny their existence. On the contrary, I take it to be only plausible to assume them to occur in the present as they did in the past.

We have now seen that (UU) is true; hence, each of its conjuncts has to be true. But why is it incompatible with (.4)?

With $\neg K p$ being true, $K p$ is false. Thus, with $\neg K \neg K p$ being true, the consequent of (.4) is false. But since p is true, the antecedent is true which makes (.4) as a whole false. Hence, it is incompatible with (UU).

Since we have seen that unknown unknowns *do* exist, we should expect epistemic logic to capture them. Epistemic logic thus must not come with (.4).²

¹ see for example [3], [2]

²wordcount 394

References

- [1] Ezard, J. (2003). Rumsfeld's unknown unknowns take prize. The Guardian, December 2nd.
- [2] von Kutschera, F. (1976). Einführung in die intensionale Semantik. Berlin: deGruyter Berlin, 111-115.
- [3] Sobocinski, B. (1964). Modal system S4.4. Notre Dame Journal of Formal Logic, 5, 305-312.
- [4] Wikipedia: atom (<http://en.wikipedia.org/wiki/Atom>)