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Physics and Metaphysics: a Sellarsian project ... sort of



Guiding principles

Metaphysics (ontology) is an essential enterprise, in particular in its relation to physics (science).

Ontological studies cannot be done in a piecemeal manner. It is a unifying project.

-> These lectures are an endeavor to show how it could be done.



Lecture 2

Dynamical laws, or the origin of modality

The nature of change understood on the basis of what does not change.

Challenges:

- The problem of time.
- The existence of meta-laws (?).



Lecture 3

Emergence, or changing laws

The nature of a change of change understood on the basis of what does not change.

Challenges:

- Emergence is generally understood in terms of levels. This is a problem in physics.
- How to extend a diachronic conception of emergence to a timeless world?



Lecture 4

Causality, or propagation and interaction

From common-sense causation to physical processes.

Challenges:

- Quantum physics is apparently hostile to causality.
- How to understand the notion of propagation and interaction in quantum physics?



Lecture 5

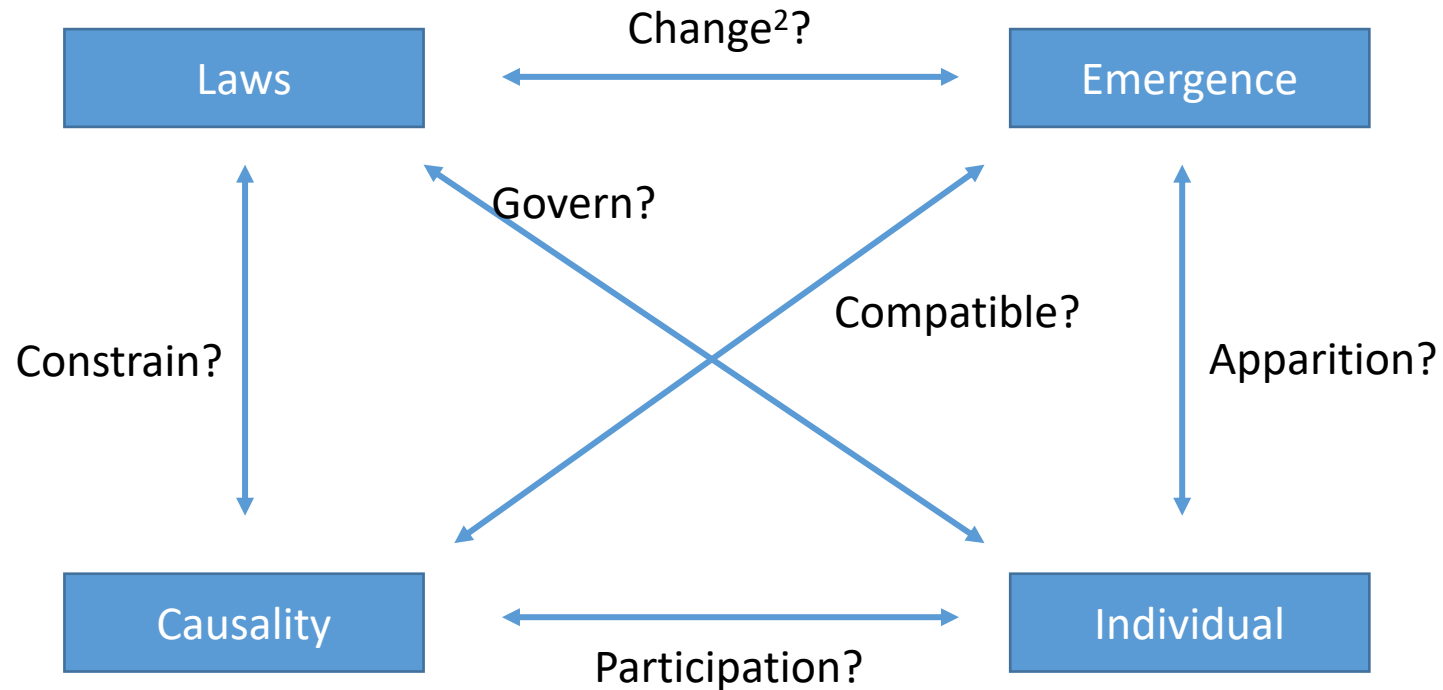
Individuals, or what is left

What can survive the previous analysis?

Challenges:

- What could be an identity criterium in a quantum timeless world?





1 - Metaphysics of science, or the quest for unity

What my students have in mind in 2019:

[...] Things fall apart; the centre cannot hold;
Mere anarchy is loosed upon the world,
The blood-dimmed tide is loosed, and everywhere
The ceremony of innocence is drowned;
The best lack all conviction, while the worst
Are full of passionate intensity. [...] W.B. Yeats

In our world, what is the point of ontological investigation of science?

Recently, I have tried hard to justify to myself what I do, but I am afraid I have failed to do so.

Still I will spend the rest of this lecture to talk about it.

Wilfrid Sellars (1912-1989)

*Philosophy and the Scientific
Image of Man*

(two lectures given in 1960)

“THE aim of philosophy, abstractly formulated, is to understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term.”



Philosophy and the Scientific Image of Man

Many discourses, like scientific ones, are better than philosophy at understanding details within a picture.

“For the philosopher is confronted not by one complex many-dimensional picture, the unity of which, such as it is, he must come to appreciate; but by *two* pictures of essentially the same order of complexity, [...]”

“Let me refer to these two perspectives, respectively, as the *manifest and the scientific images of man-in-the-world.*”

Philosophy and the Scientific Image of Man

Sellars uses the word “image” but these are not mere representations.

“I am, to use Husserl's term, 'bracketing' them, transforming them from ways of experiencing the world into objects of philosophical reflection and evaluation.”

“These images exist and are as much a part and parcel of the world as this platform or the Constitution of the United States.”

“It is, first, the framework in terms of which man came to be aware of himself as man-in-the-world. It is the framework in terms of which, to use an existentialist turn of phrase, man first encountered himself—which is, of course, when he came to be man.”



The manifest image is *a refinement of the original image.*

The primary objects of the manifest image are persons.



Primary objects of the scientific image are theoretical entities.

How do both images relate?

Some possible answers:

- 1) Manifest entities are identical to systems of theoretical entities.
- 2) Only manifest entities exist. Theoretical entities are abstract or symbolic entities that represent manifest entities.
- 3) Manifest entities are appearances to the human mind of a reality constituted by the theoretical entities.

The main task of philosophy is to clarify these images in order to understand their relation.

Observations

1 – The scientific image originates from the manifest image.

2 – Most candidate entities seem image specific (quantum fields, persons...).

3 – Both images seem to share very general structural features: the notions of individual, the notion of causality...

The study of the most general ontological structures
is a part of metaphysics.

Metaphysics is the answer

In the next lectures, I will begin to elaborate the metaphysics of physics, a part of the scientific image.

I hope these ontology considerations will be useful in the further elaboration of the metaphysics of the scientific image itself.

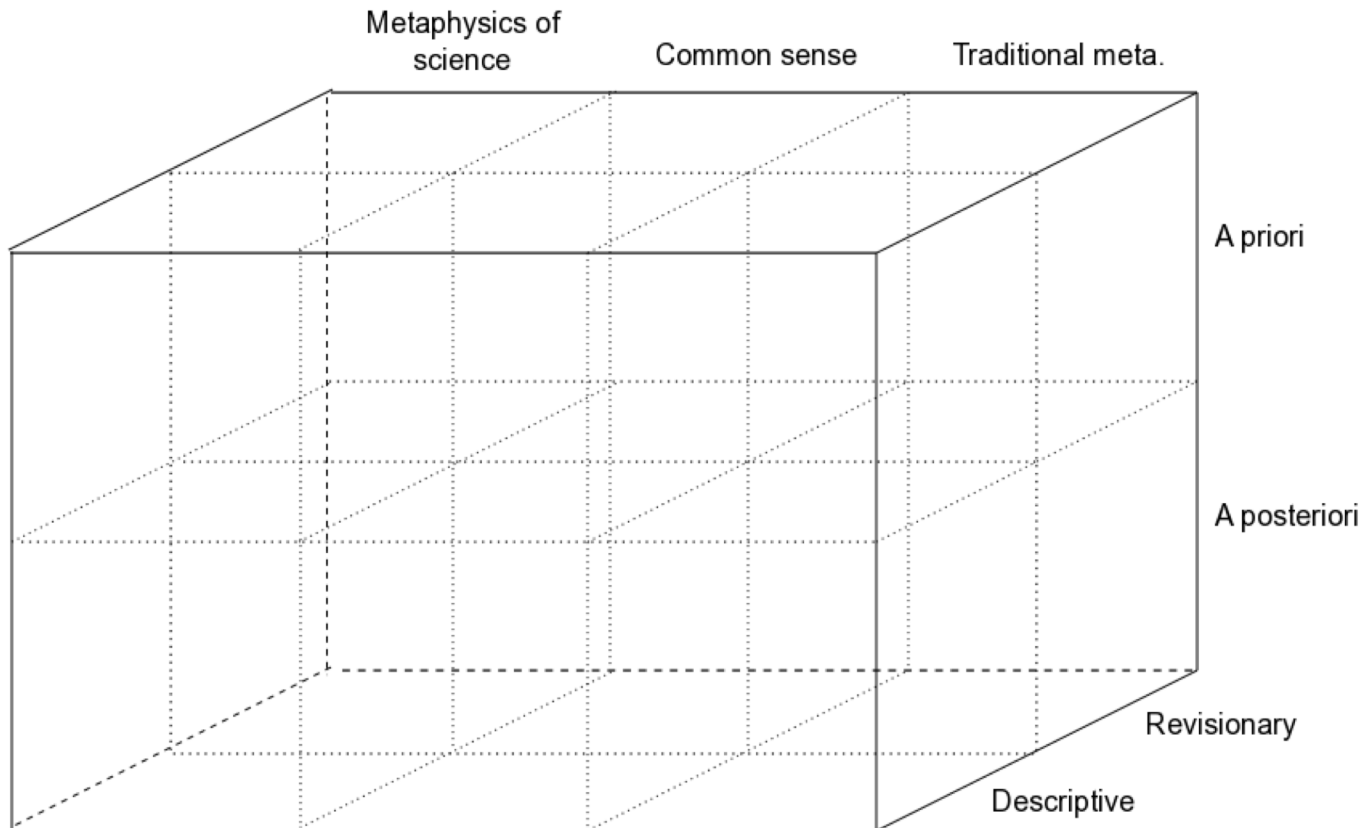
However, it should be understood that such an investigation cannot be done without looking at the ontological structure of the manifest image, since they share a common history.

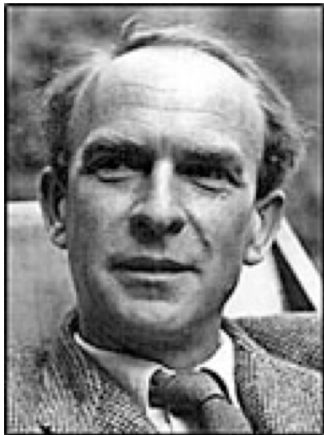
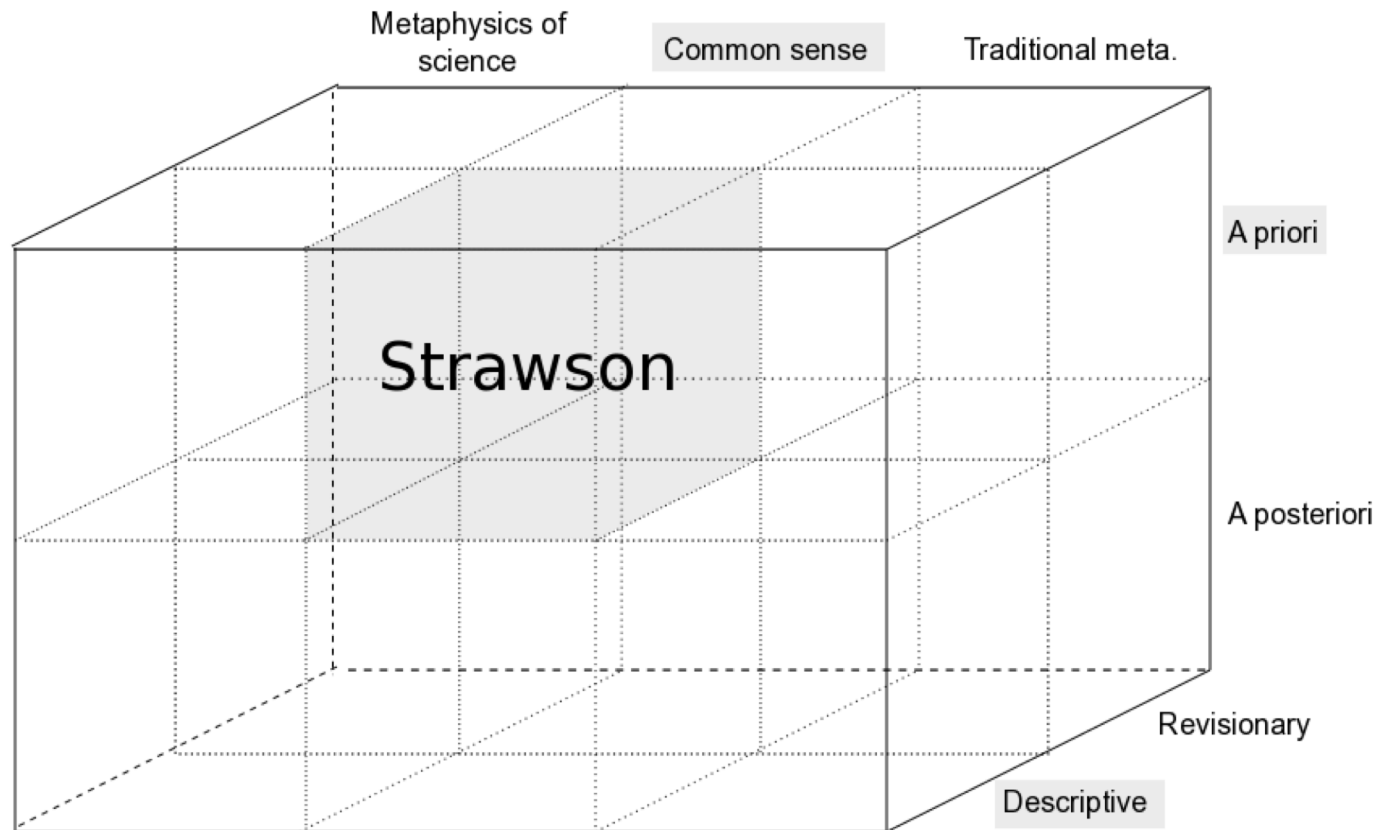
The imperial approach: scientific metaphysics

If metaphysics is to be part of the pursuit of objective knowledge, it must be integrated with science.

Genuinely naturalized metaphysics must go beyond mere consistency with current science; it must be directly motivated by and in the service of science (Ladyman and Ross 2013, p. 109).

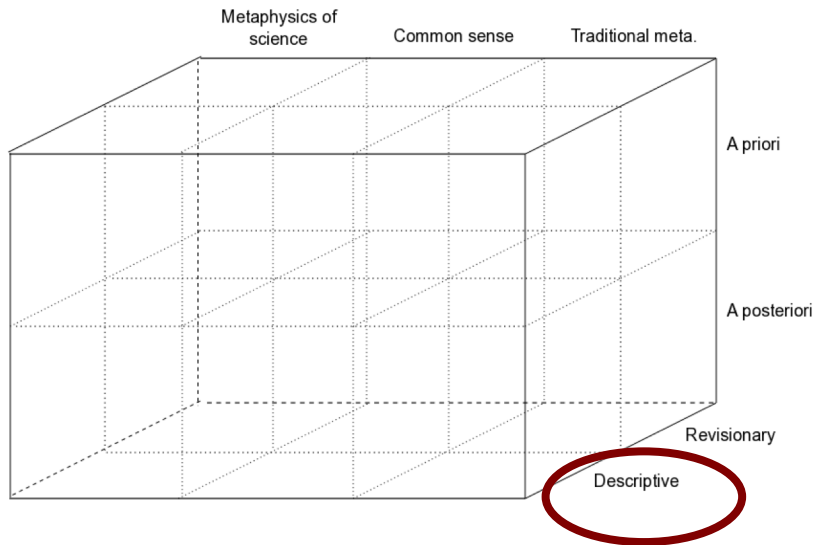
In order to clarify whether it is the only possible option, let us classify the metaphysical projects.





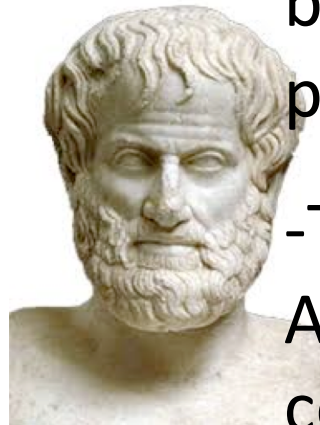
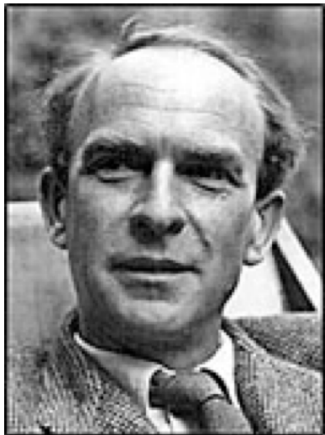
Descriptive metaphysics

-The opposition between descriptive vs. revisionary metaphysics is due to Strawson (1959).



-DM, the study of the fundamental conceptual framework of our thought. Universal for every human being (every time, every place).

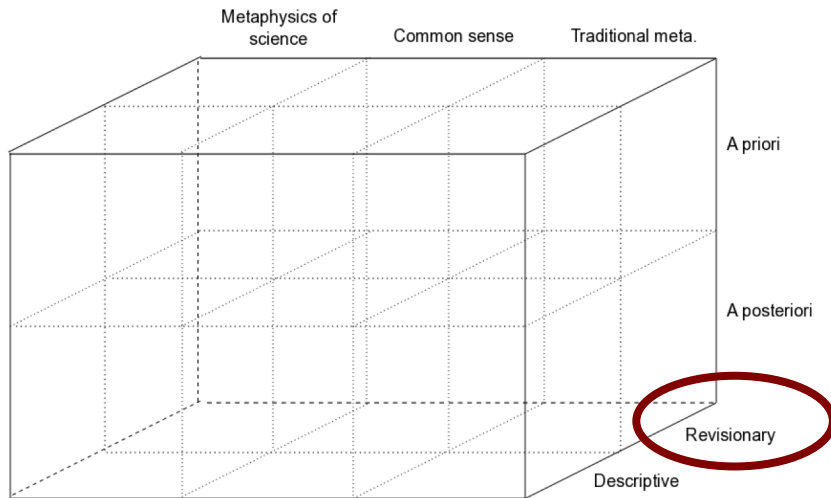
-The archetype is Kant. Another possible example: a certain reading of Aristotle.



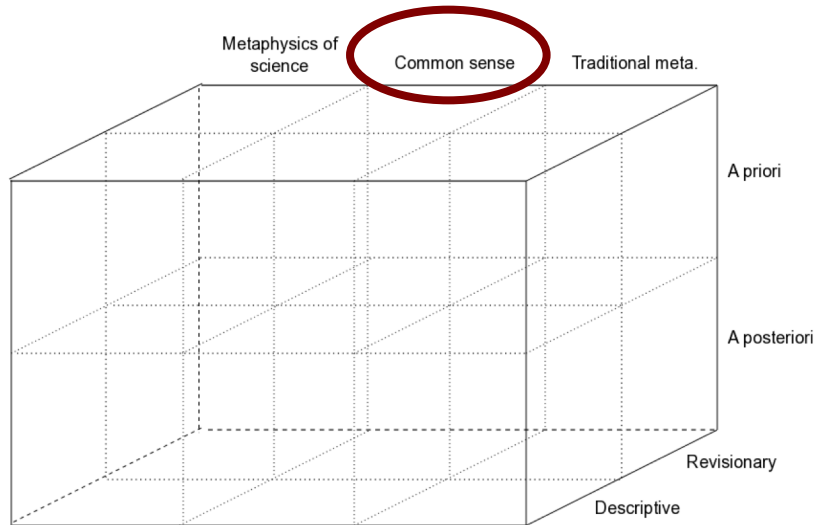
-Metaphysical project that aims at proposing a better fundamental conceptual framework (Strawson 1959).

-More generally: calls for a reform of existing metaphysics.

-Descartes, Leibniz, Berkeley.

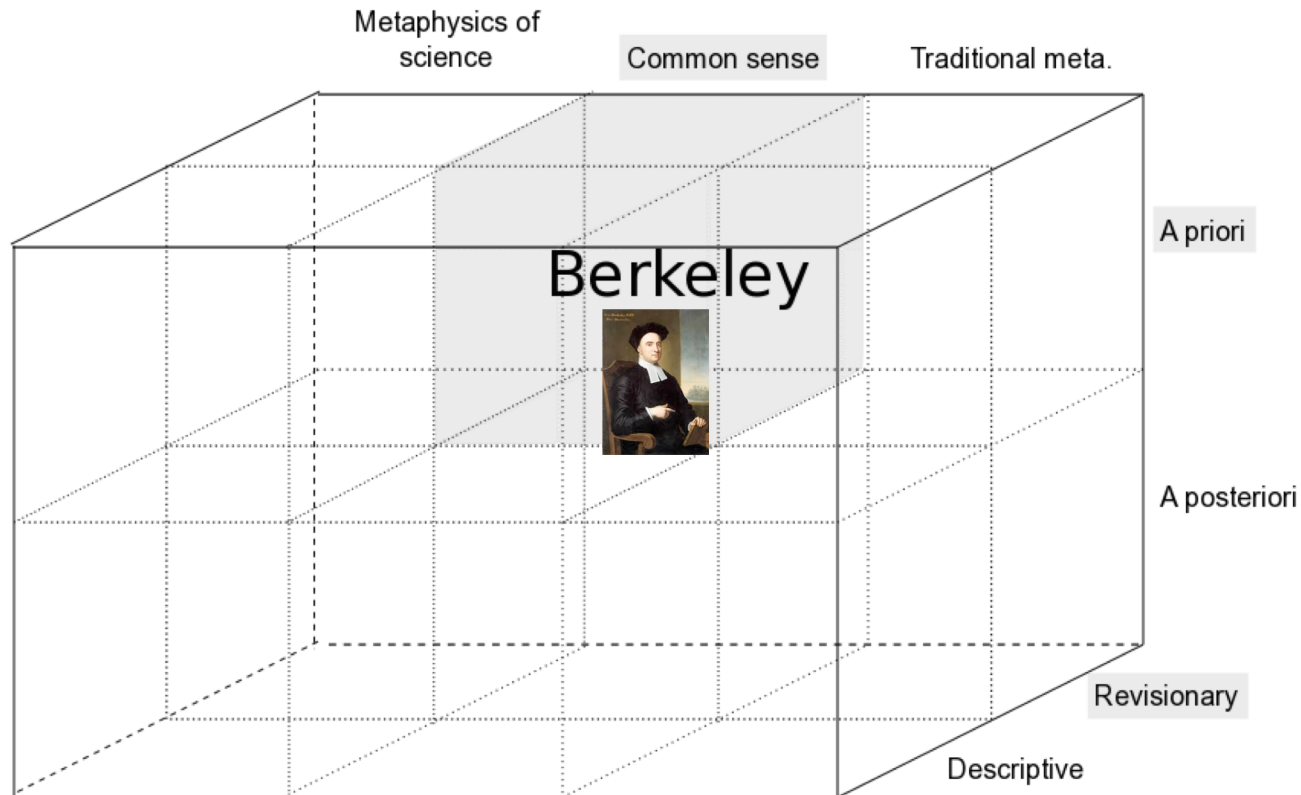


Common sense metaphysics

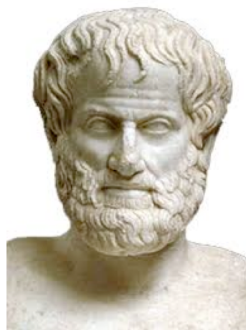
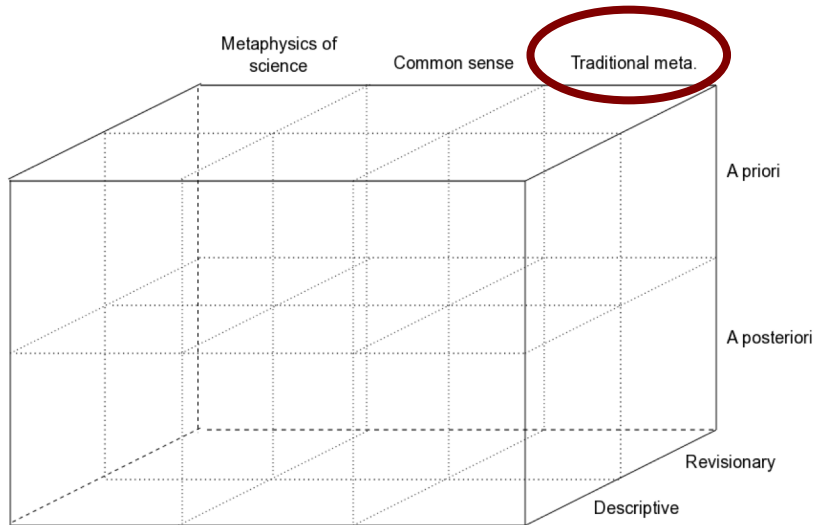


- The study of the categories of the conceptual framework that we use to navigate in ordinary life.

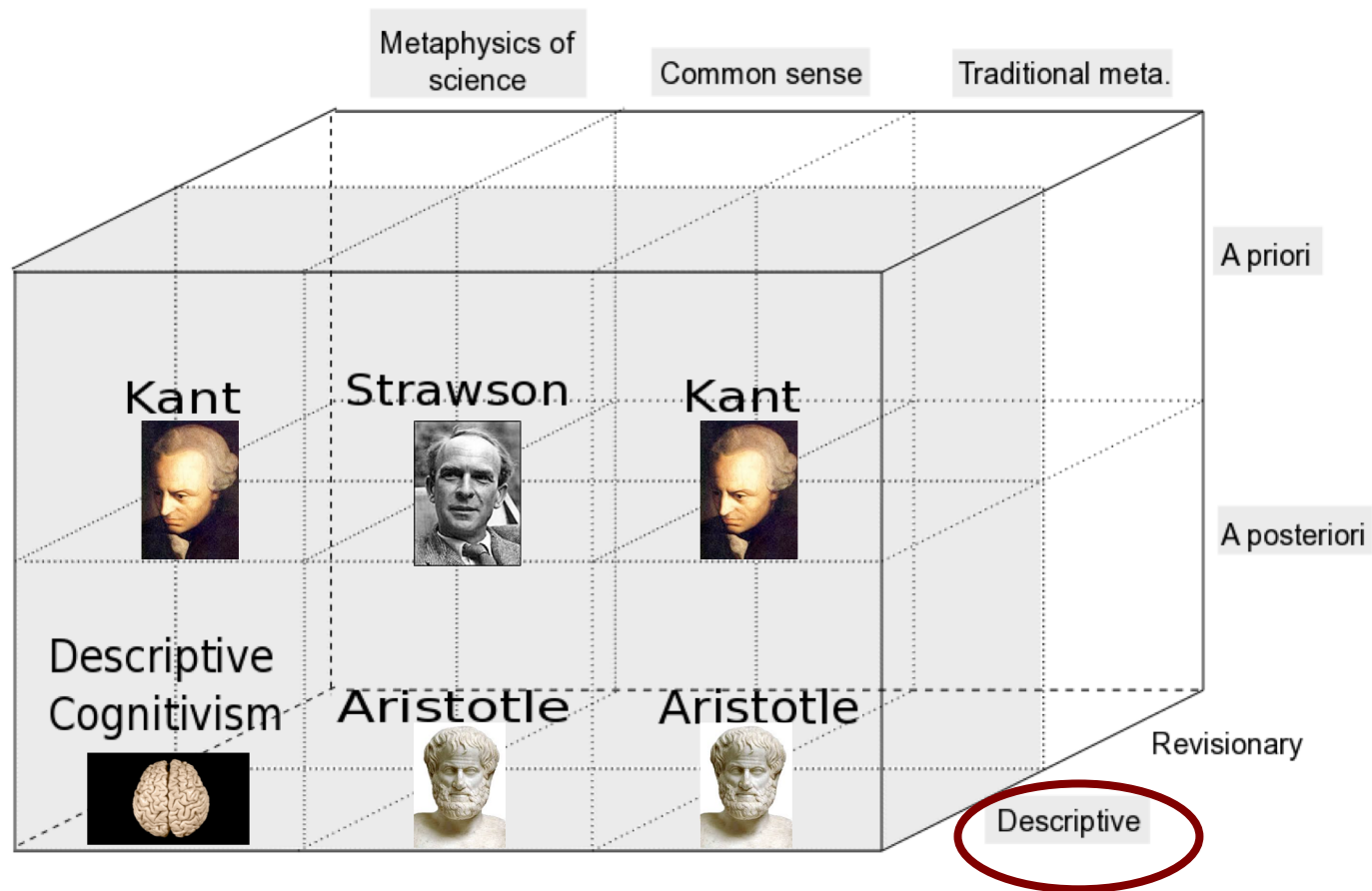
- Common sense metaphysics does not reduce necessarily to descriptive metaphysics. Some common sense categories could be culture-dependent, others not. Some can be related to the basic cognitive conceptual structure of all humans, others may depend on a certain kind of learning (scientific or otherwise).
- The manifest image metaphysics is a case of CS metaphysics.

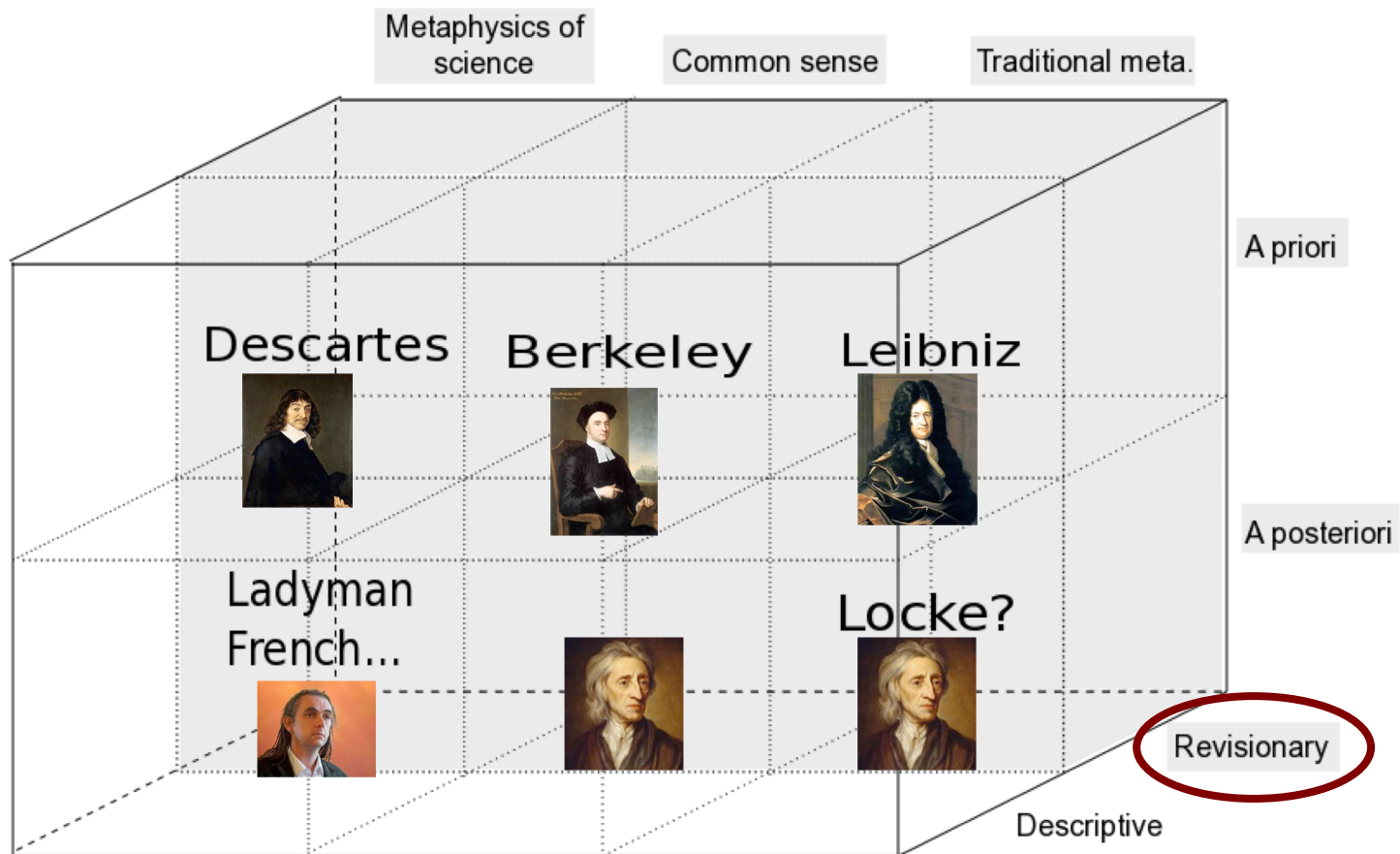


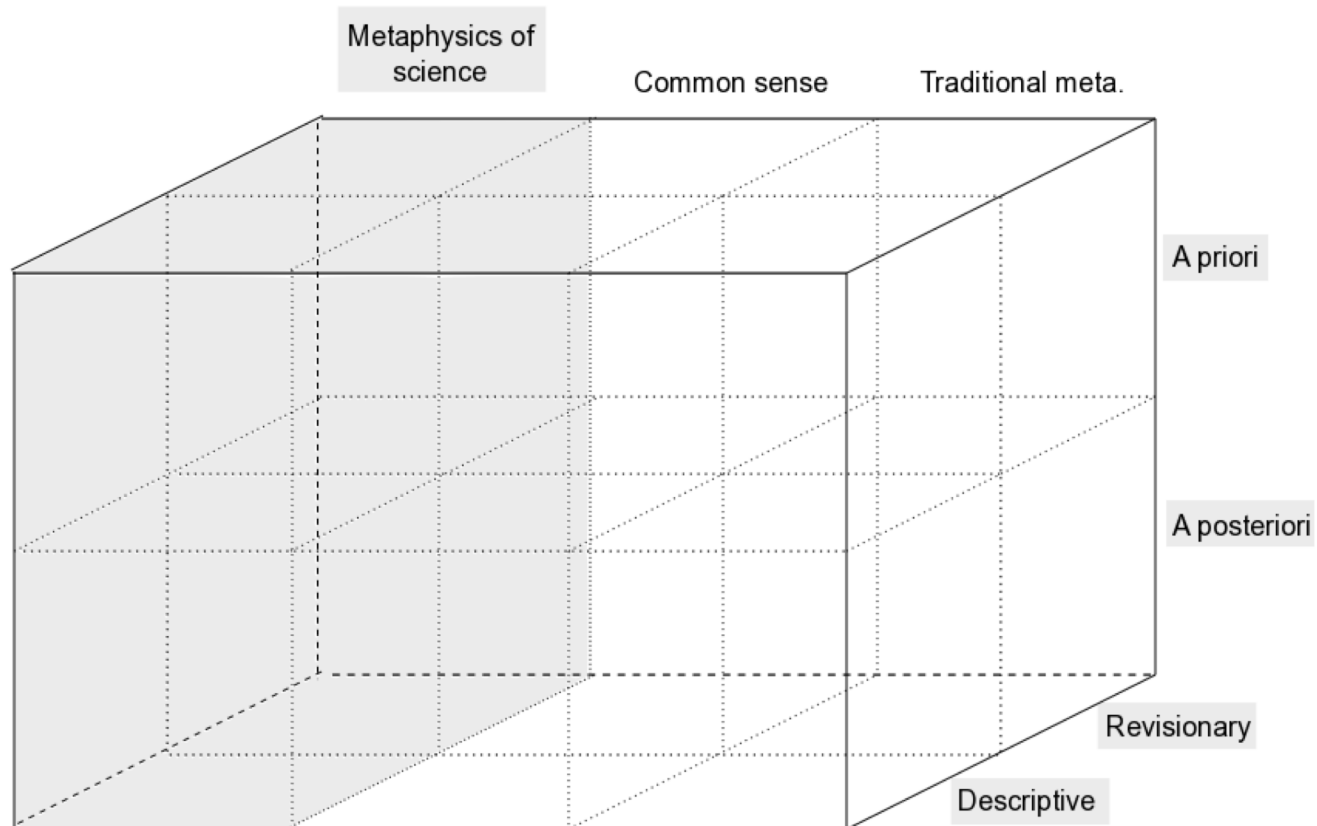
Traditional metaphysics



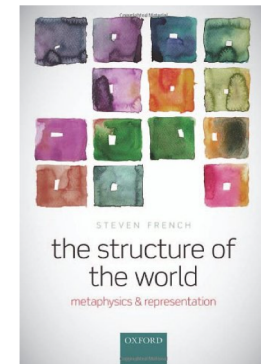
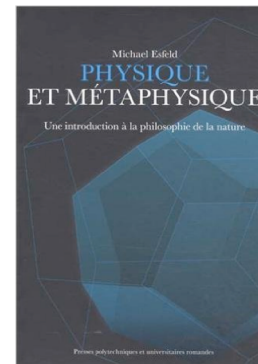
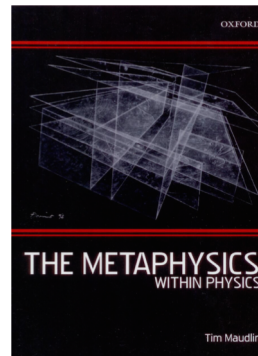
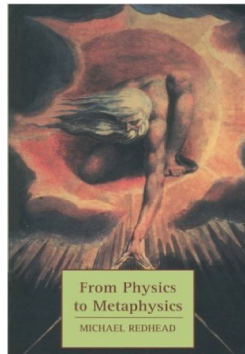
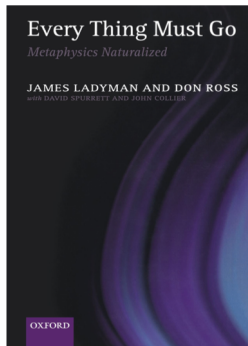
- The study of the most powerful metaphysical categories to describe the world and our access to the world.
- Historically constructed: incremental (and critical): builds on previous attempts.
- Often remote from common sense (e.g., substance, essence, entelecheia, tropes, etc.)



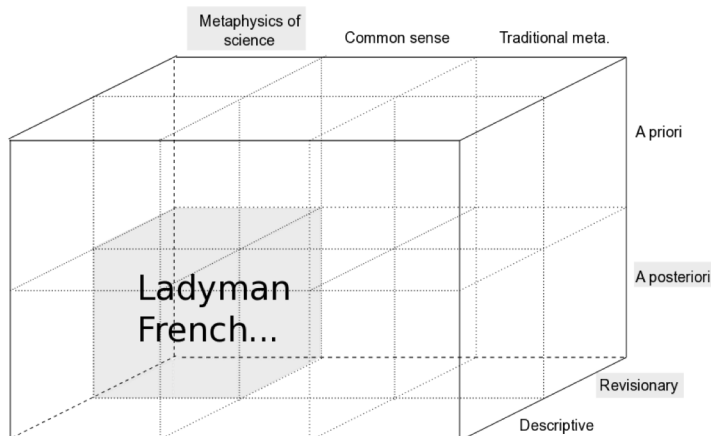




A better characterization of current “scientific metaphysics”:



- MoS + a posteriori + revisionary



But, the box suggests that it is not necessarily so. MoS could also be:

- A priori
- Descriptive

- MoS is too often considered as necessarily revisionary.
- Descriptive metaphysics almost always understood as a form of *a priori* metaphysics.

But, a project in DM can be *a priori* or *a posteriori*:

- *A priori*: we can get access to the fundamental structure of our thought using transcendental inquiry or pure introspection. No relation to science. (e.g., Strawson 1959).
- *A posteriori*: the basic study of the human cognitive conceptual structure given by the evolution of our species. A ‘naturalized’ DM. Cognitive sciences (e.g., Chomsky; Dehaene 2006, 2008).

DM can be (a posteriori, and even) scientific.

Core Knowledge of Geometry in an Amazonian Indigene Group

Stanislas Dehaene,^{1,2*} Véronique Izard,¹ Pierre Pica,³ Elizabeth Spelke⁴

Does geometry constitute a core set of intuitions present in all humans, regardless of their language or schooling? We used two nonverbal tests to probe the conceptual primitives of geometry in the Mundurukú, an isolated Amazonian indigene group. Mundurukú children and adults spontaneously made use of basic geometric concepts such as points, lines, parallelism, or right angles to detect intruders in simple pictures, and they used distance, angle, and sense relationships in geometrical maps to locate hidden objects. Our results provide evidence for geometrical intuitions in the absence of schooling, experience with graphic symbols or maps, or a rich language of geometrical terms.

Through natural selection, our mind has adapted to the conditions of the external world, [...] it has adopted the geometry most advantageous to our species; or, in other words, the most convenient.
—Henri Poincaré, *La Science et l'Hypothèse*

of geometry are inherent in the human mind, by studying the spontaneous geometrical knowledge of the Mundurukú, an Amazonian indigene group (7). The present data were collected by one of us (P.P.) during a field trip in 2004–2005 to remote sites along the Cururu river. Most of the children and adults who took part in

Science, 2006

Log or Linear? Distinct Intuitions of the Number Scale in Western and Amazonian Indigene Cultures

Stanislas Dehaene,^{1,2,3,4*} Véronique Izard,^{1,2,4,5} Elizabeth Spelke,⁵ Pierre Pica⁶

The mapping of numbers onto space is fundamental to measurement and to mathematics. Is this mapping a cultural invention or a universal intuition shared by all humans regardless of culture and education? We probed number-space mappings in the Mundurucu, an Amazonian indigene group with a reduced numerical lexicon and little or no formal education. At all ages, the Mundurucu mapped symbolic and nonsymbolic numbers onto a logarithmic scale, whereas Western adults used linear mapping with small or symbolic numbers and logarithmic mapping when numbers were presented nonsymbolically under conditions that discouraged counting. This indicates that the mapping of numbers onto space is a universal intuition and that this initial intuition of number is logarithmic. The concept of a linear number line appears to be a cultural invention that fails to develop in the absence of formal education.

Science, 2008

Descriptive metaphysics applied to the scientific image

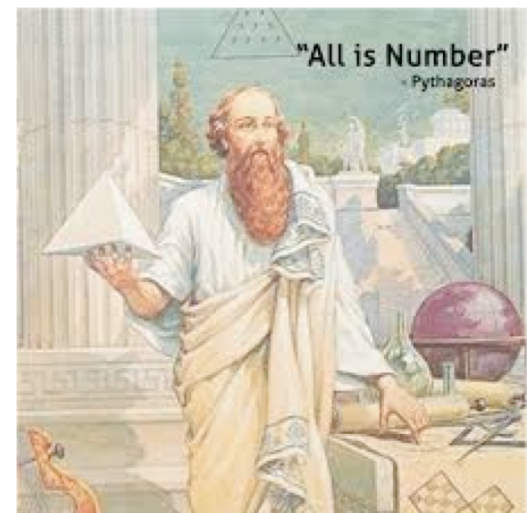
According to descriptive cognitivism, someone could claim that the basic concepts that structure the scientific image should not be searched for in physics or biology, but in neuroscience.

- “Scientific metaphysics” (Ladyman and Ross) presents itself as anti-*a priori*.

E.g., Ladyman & Ross (2007: 7), against Lowe (2002):

“we have no good reasons for thinking that *a priori* metaphysical knowledge is possible.”

- But: MoS can also be *a priori*, in particular when it aims at reforming our conceptual structure on the basis of the formal sciences, in particular mathematics.



The interesting comparisons are not the most obvious ones

- Comparison of scientific metaphysics to a priori, common sense, descriptive metaphysics.
 - This opposition is based on an oversimplification of current conceptions in metaphysics.
- Among the interesting questions:
 - How to articulate the *a priori* and *the a posteriori* in a MoS project?
 - How to relate common sense and MoS? E.g., Morganti M. (2013). *Combining Science and Metaphysics: Contemporary Physics, Conceptual Revision and Common Sense*.
 - Which role does our cognitive structure play (DM) in the way we construct our experimental sciences (MoS)? (Largely neglected question).

I will argue, in lecture 4, that we have good reasons to believe that causality as understood in the manifest image is absent from the scientific image.

Nevertheless, the production of scientific results, integral parts of the scientific image, necessitates the use of causality relations.

In what way is the scientific image really independent of the manifest image?

My hypothesis is that it is a case of non reductive dependence.

We will start from common sense: movement, laws, causality... and traditional metaphysics.

But scientific results will be the ultimate source of authority. The resultant ontology will challenge common sense.

To resolve these tensions, a revision of basic ontological concepts will be provided.

Unfortunately, I am afraid that the tension between revisionary and descriptive metaphysics of science will not be resolved.



Pierre-Alain Braillard,



Thomas Pradeu,



Cyrille Imbert

Thank you for your attention.