

# Kant's Epistemology

## Part II: The Synthetical *A Priori* In Mathematics

# Overview:

## ■ Kant Epistemology—the details

- Synthetical *A Priori* in Mathematics

- Basis of Mathematical Certainty

- Limitations

- Appearance and Reality

# Kant's Epistemology—the details

- The synthetic *a priori* in mathematics
  - Discussed in a section of Kant's *Critique* called the “**Transcendental Aesthetic**”
  - He used the term “aesthetic” because he believed the basis for this kind of knowledge to be immediate, nondiscursive and sensuous
  - He called it “transcendental” because such knowledge is not *in* experience but a necessary condition *for* experience

# Kant's Epistemology—the details

- Step 1 was to show that mathematical knowledge is **synthetical** (from experience)
  - $7 + 5 = 12$ , argued Kant, is not analytic
  - Rather it is synthetic. . .the subject 12 is not contained in the predicate  $7 + 5$ ;
  - His justification: one has to count up (on your fingers) 7 and then five and then find out it equals 12 (according to Kant and contra Hobbes)



# Kant's Epistemology—the details

## ■ Basis for Mathematical Certainty

- Part 2 of the argument: assuming that mathematics is synthetical, how can it be *a priori*?
  - In Newtonian view space is an absolute reality, independent of ourselves, a big box in which events occur
  - In the Leibnizian view space is not real (the monads are non spatial), but relational, a structure produced by sense and imagination
  - Neither of these 2 above views satisfied Kant

# Kant's Epistemology—the details

- If space were Newtonian how could we ever have the *a priori* knowledge of it claimed in geometry?
  - You could know a here and now triangle with 180 degrees in the interior angles, but how about knowing all the triangles in space everywhere?
- If space were merely relational (as Leibniz asserted) then superimposing a left handed glove on a right handed glove would (since all relationships between parts are identical in the relational view) they'd be identical gloves—which they are not
  - So there is more to space than the relation of parts

# Kant's Epistemology—the details

- Kant drew all these considerations together and came to the conclusion that space is simply a mode of the mind's apprehension of its world
- Space is a way of relating and organizing experiences
- It is not an empirical concept which has been derived from outer experiences
- In this sense it is *a priori*



# Kant's Epistemology—the details

## – Limitations of Kant's View

- Subsequent to Kant's analysis of geometry as a science which determines the properties of space synthetically and yet *a priori*, we have discovered that there are parts of space for which other non-Euclidian geometries give better accounts.
  - Non-Euclidian accounts seem to do better with large macro-spaces between say galaxies, etc.
  - This led people to think the applicability of any given geometry is determined by the kind of experience it is applied to
  - This makes it seem clear that Kant was mistaken in believing that specific forms of spatial putting together are *a priori*
  - But it doesn't follow that he was mistaken about space being a form of the mind's apprehension of its world
  - Space might be a mode of ordering contributed by the mind and the various geometries might be accounts of the various possible types of such ordering.



# Kant's Epistemology—the details

- So one may know that space can be sorted or ordered, but one may not know which of several possible ways of sorting or ordering space is to be used—you'd have to do an empirical study to determine which
- Appearance and Reality (transition to physics)
  - If space is a way in which the mind orders things, obviously things are not really (in themselves) spatial
  - Note: Or are they? Couldn't our minds be designed to correspond to the way things are in themselves?
    - We'd need some good reason to think this
    - Doesn't belief in God give us a basis for thinking our minds might be designed to know not only perceptions, but things in themselves?

# Kant's Epistemology—the details

- Kant asserts we cannot imagine how things are “in themselves” for we can imagine things only as spread out in space—this is the only form of externality that minds like ours can conceive of
  - Actually this looks to me like saying that we cannot imagine how things are in themselves if they are different from the way our minds must conceive of them; but we don't know *they are necessarily different* from the way our minds must conceive of them;
    - They could have either a designed similarity or an accidental similarity

# Kant's Epistemology—the details

- Kant also discusses an exposition of **time** in the “Transcendental Aesthetic” section of the *Critique*, but it is largely parallel to his analysis of space
  - He thought time, like space, is a “pure form of intuition”
  - That is, a mode of ordering (or of putting together) that is immediate and sensuous
  - It is not a matter of judgment
- Kant called what we experience as **spatial** to be the datum of “**outer sense**”
  - This is true of the materials of the five senses, all of which have this character of externality
  - Regarded as states of oneself, these same materials are experienced as having a temporal order
- Hence in contrast to space, “time is nothing but the form of “**inner sense**”—of our awareness of ourselves and of our own inner state—see diagram



The awareness of  
ourselves and our own inner state

The material of the senses  
which have this character of  
externality

Casual Relation

Casual Relation

Inner Sense

Outer Sense

Noumena

Phenomena

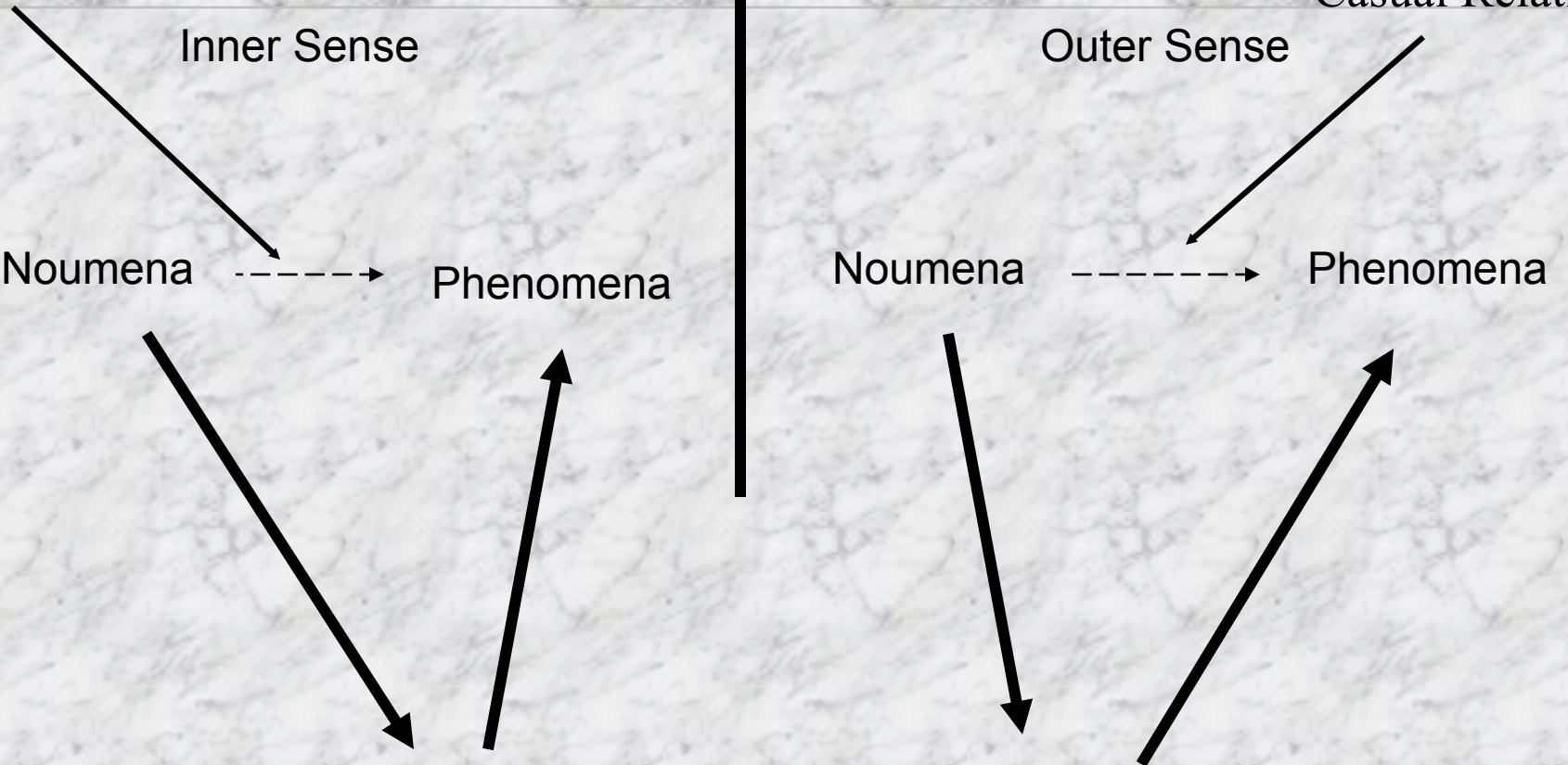
Noumena

Phenomena

*Time*

*Space*

Intuitive Forms



# Kant's Epistemology—the details

- Transition: So far (before the account of mathematics) Kant's account of the *a priori* properties of experience Kant has not reached anything like the level of ordinary human experience which consists in a knowledge of objects, that is of complex and relatively enduring structures
- It has been more like he has dealt merely with spatiotemporal ordering of contents, e.g., with experiences of colored patches succeeding one another

# Kant's Epistemology—the details

- Kant's point is that to have even this very elementary kind of experience there must be certain synthetic ordering activities of the mind
- To have experience of objects, still more complex types of putting together must occur
- This brings us to the natural sciences, which unlike mathematics are concerned with the cognition of physical objects
- Now to the synthetic *a priori* in physics presentation