What are Natural-Kind Terms?

Proper Names pick out individuals

Natural-kind terms pick out kinds

What are *natural*-kind terms?

Science-relative conception:

(SNR) A natural kind is a kind about which some natural science is authoritative.

Real-kinds conception:

(RKN) A natural kind is a kind whose identity as a kind is fixed by reality, and not by human interests or concerns.

P.S. If you buy the scientific realism, then (SRN) and (RKN) are essentially the same thesis: they define the same kinds

What are natural-*kind* terms?

- From (SNR) and (RKN) we know that a natural-*kind* term corresponds to a grouping/classification that reflects the structure of the natural world such that
  1. the classification is not arbitrary;
  2. the classification does not reflect human interests;
  3. members of the classification have some *natural* properties in common
- Involves an ontological commitment that there are genuinely *natural* way to classify things/there are *natural* divisions among things

→ 4. Natural kinds should be categorically distinct
There cannot be a smooth transition from one kind to another, otherwise, the borderline would be drawn not by *nature* but by *human*.

All criteria listed here are necessary but insufficient conditions!

Mill on Criterion (3)

- The classification containing white objects, e.g. {white swan, white MacBook Pro, white PS5} does not form a *natural* kind

Reference: J. S. Mill, 1884. *A System of Logic.*

Example

Consider the classifications
{Cicero, Wisdom-teeth Removal Operation, North Star}
Is it a *natural* kind?
No!! Because the grouping is arbitrary, it violates criterion (1).

Example 2

Consider the classifications
{cars designed by Volvo, culinary vegetables, GTX3090-Titan}
Is it a *natural* kind?
No!! Because although the grouping is not arbitrary (it contains things I like), it reflects human interests and thereby violates criterion (2).

Example 3

Consider the classifications
{x: x is an instance of the element *Chlorine*}
Is it a *natural* kind?
Yes! Because it satisfies all four criterion:

- it's trivial that (1) & (2) & (3) are satisfied;
- (4) is met as well for the nucleus of an atom cannot have # of protons between 16 (sulphur) and 17, or 17 or 18 (argon).

Theses of Essentialism

- Individual Essentialism

(ToIE) If X belongs to kind K, then it is an essential property of X that it belongs to K.

- Kindhood Essentialism

(ToKE) For each kind K, there is some property ϕ of the kind such that it is essential to K that $\phi(K)$.

Case 1

Consider the nucleus of neptunium-239 undergoes a beta decay (a neutron emits an electron and leaves a proton):

$$^{239}_{93}Np \longrightarrow_{\beta} {}^{239}_{94}Pu + 1e$$

- If we buy (ToKE), we say that it is essential for the nuclei of neptunium atoms to have 93 protons and it is essential to plutonium that its nuclei have 94 protons;
- if we buy (ToIE), we have to admit that this nucleus persists through this transformation and retains its identity as a neptunium nucleus.

In this very case, we want to embrace (ToKE).

Case 2

Consider a person who previously had healthy extremities before a terrible accident. After the accident, he had his left leg amputated.

- By (ToKE), it is essential for members of *Homo Sapiens* to be bipedal;
- By (ToIE), we say that this person persists through this unfortunate transformation and retain its identity as a human beings.

In this very case, we want to embrace (ToIE).

Lockean view of language

Eight Significant Assumptions

- (L1) The nature of language is defined by its function
- (L2) The function of language is to communicate — though he agrees that language can be used "for the recording of our own thoughts"
- (L3) What language is meant to communicate is thought
- (L4) Words signify or mean the components of what language is meant to communicate
- (L5) The components of thought are 「IDEAS」(technical term)
  - What is an IDEA?
    - The Lockean IDEA is a kind of mental image
    - IDEA is "invisible and hidden from others"
    - IDEAS are representations of other things
- (L6) One person's IDEAS cannot be perceived by another
- (L7) The relation between words and what they signify or mean is arbitrary — no natural connection between sounds and IDEAS
- (L8) Words are not intrinsically meaningful

(LK) The meaning of a natural-kind term is determined by what is *believed* to be definitive of the kind in question.

(LK1) If '*K*' is a natural-kind term, there is a family of things associated with '*K*', *an appropriate part* of which *is believed to* be true of members of *K* and only members of *K*;

≡

(DN1) To every name or designating expression *X*, there corresponds a cluster of properties, namely the family of those properties ϕ such that A believes that $\phi(X)$;

(DN2) One of the properties, or some conjointly, are believed by A to pick out some individual uniquely;

(LK2) If '*K*' is a natural-kind term, then if *an appropriate part* of what *is believed* to be true of members of *K* is in fact true of something, then that thing is indeed a member of *K*;

≡

(DN3) If most, or a weighted most, of the ϕ's are satisfied by one unique object *y*, then *y* is the referent of *X*;

(LK3) If '*K*' is a natural-kind term, then it is ***a priori*** that *an appropriate part* of what *is believed* to be true of members of *K* is in fact true of members of *K*;

≡

(DN5) The statement, "if *X* exists, then *X* has most of the ϕ's" is known ***a priori*** by the speaker.

(LK4) If '*K*' is a meaningful natural-kind term, then it is ***necessarily true*** that *an appropriate part* of what *is believed* to be true of members of *K* is indeed true of members of *K*.

≡

(DN6) The statement, "if *X* exists, then *X* has most of the ϕ's" expresses ***a necessary truth*** (in A's language);

Three Issues

1. By ***"an appropriate part"***, we mean that not everything *believed* to be true of members of a kind is *believed* to be definitive of the kind; viz. that some features are more central than others, but how can we decide?
2. **Note that there is kindhood counterpart to (DN4).**
   What would happen if no entity answers to the natural kind term?
   Does it mean there is no such kind?
   Does it mean it is a kind with no actual members?
   This issue is unsettled.
3. ***Believed* by whom?**
   Speaker's belief. Within an individualist conception of language, each person is the authority over the use of her own terms: a word in one person's mouth can signify only that person's conception of things.

(DN4) If the vote yields no unique object, *X* does not refer;

Objection to (LK1)

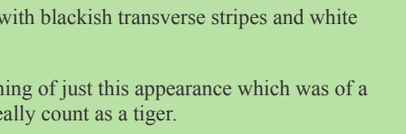
- Putnam's objection:
  I cannot tell the difference between elms (榆树) and beeches (山毛榉), therefore I claim that there is no difference between my concept of an elm and my concept of a beech. Therefore, (LK1) looks false.


Elm tree


beech tree

Kripke's Objection to (LK2)

- Kripke's objection:
  Suppose I believe that what is definitive of tigers is that:
  1. they are large carnivorous quadrupeds(四足动物)
  2. cat-like appearance
  3. tawny yellow in colour with blackish transverse stripes and white bell
- Plausibly, there could be something of just this appearance which was of a different species and does not really count as a tiger.


真正的老虎

虚假的老虎

Putnam's Objection to (LK2): *Twin Earth*

- Imagines that there is another planet somewhere else in the universe, which Putnam calls *Twin Earth*.
- Twin Earth is qualitatively indistinguishable from Earth, at least in relatively superficial appearance: that is to say, if you were instantaneously transported there, you wouldn't notice the difference.
- But, the chemical composition of the stuff in Earth rain, Earth rivers, and Earth lakes, which we call '*water*', is H_2O; the chemical composition of the similar stuff on Twin Earth, is *XYZ*.
- Putnam claims that the stuff on Twin Earth, despite being superficially indistinguishable from water – it looks the same, tastes the same, wakes you up in the night by dripping the same – is not really water, by dint of our modal intuition.
- What counts as *water* is not determined by what ordinary speakers know.

In Lecture 3 of Naming and Necessity...

- Kripke gives a lot of necessary *a posteriori* examples in the form of:
  $C = T$
  where C = common names
  T = technical identification
- E.g.

Millian View on Kindhood

- We have only *necessary but insufficient* criteria in determining *natural* kinds.

Reference: J. S. Mill, 1884. *A System of Logic.*

Advantages of (PE)

(PE) allows us to evade objections that follow the line of thought that **not everything with F is K**.

1. water is liquid, whereas a substance composed of H_2O can exist as a sloid or gas. Thus, water is not H_2O because they are not co-extensive.
2. A single molecule of H_2O cannot be an instance of water because it lacks the properties we can ascribe to instances of water (e.g. have a temperature)
3. Water is not just H_2O, it is a lattice comprised of H_2O molecules held together by hydrogen bonds and Van der Waals force.

Partial Essence (PE)

- In Kripke,
  - the necessity of being T for being C, viz. $\Box\forall x(Kx \to Px)$ (where P is some properties)
  - and the sufficiency of being T for being C, viz. $\Box\forall x(Px \to Kx)$
- *is* decoupled.

Normally, when we used the expression ***"the essence of ..."***, it expresses a *necessity* and a *sufficiency*; Possession of the essence of K suffices for membership of K, and being necessary for it. Kripke & Putnam only establish (PE).

- Something that looks like gold but lacks the property of having atomic number 79 is not gold: having atomic number 79 is necessary for being gold; but the possession of this property is not sufficient for being gold.
- Putnam's ***Twin Earth*** also shows that, possessing water's superficial properties is not sufficient to make XYZ a sample of water and being composed of molecules of H_2O is necessary for something's being a sample of water.

(LK3) If '*K*' is a natural-kind term, then it is ***a priori*** that *an appropriate part* of what *is believed* to be true of members of *K* is in fact true of members of *K*;

- **(DK)** $\forall x$(x is an instance of the kind $C \leftrightarrow Dx$)
  where C = some natural-kind term, D = some complex set of readily observable properties that is equivalent to(constitutive of) the meaning of C (on a descriptive account)
- (LK3) = (DK) is *a priori.*

Epistemological Argument Against (LK3)

"(DK) is knowable *a priori*" can be wrong if ...

Case 1: Although one knows that something is of the kind C one cannot thereby come to know that it possesses the property complex D

- Possibility 1: Illusion
  - *Gold* might be blue but only appears yellow thanks to optical illusion (say we only come across gold in caves or burial chambers, therefore we've always seen gold in the yellowish light of artificial lamps)
  - *Tigers* do not normally have four legs, but only appears so thanks to an illusion
- Although we may reasonably be confident that *gold* really is yellow and not blue, and not just appearing that way, **this confidence** is not *a priori* but is instead a consequence of *a posteriori* experience of the conditions under which we have observed samples of gold. It is only *a posteriori* that we know that *gold* does not have white and grey allotropes, as *tin* does.
- Possibility 2: Members of the kind we have encountered were in fact abnormal.
  - We may encountered a three-legged tiger (due to a series of coincidental accidents or unnatural deformity). This tiger is then tripeds, not quadrupeds. Therefore, it is not actually a tiger but *a tiger-like animal*.
  - How can we guarantee that the quadrupeds tigers we encountered before are not *abnormal samples* of the kind?
- Kripke employs (ToKE) here where normally we tend to embrace (ToIE). Is it here an *ad hoc* use?

2. Although one knows that something possesses the property complex D, one cannot thereby come to know that it is of the kind C.

- If (LK3) is right, we can ***rule out*** *a priori* the possibility that something has all the superficial properties of gold, but is not gold. But we don't have such *a priori* knowledge.
  - E.g. jadeite(翡翠) is superficially similar to nephrite(软玉) but not of the same kind.

Putnam's *Division of Linguistic Labour*

- the referent of a term used by some individual may be fixed not by their own knowledge or beliefs, but rather by the knowledge of certain experts to whom that individual defers.

- Aluminium and molybdenum(钼) are different kinds, then according to (LK3) there should be some *a priori* knowable features that will distinguish between them for anyone who is capable of correctly using the two terms;
- There should be some mental difference between a speaker in $A_@$ who uses 'aluminium' to refer to aluminium and a speaker in w_1, where the instances of aluminium and molybdenum are swapped (pans and cans are made of molybdenum there), who uses 'aluminium' to refer to molybdenum.
- Putnam then contends that no such difference ***need*** exist: ordinary speakers have these differentiated referring capacities without any difference in knowledge of the referents. That is because those referential capacities are **parasitic** on those of the experts who do have the required discriminating knowledge.

(LK4) If '*K*' is a meaningful natural-kind term, then it is ***necessarily true*** that *an appropriate part* of what *is believed* to be true of members of *K* is indeed true of members of *K*.

- **(DK)** $\forall x$(x is an instance of the kind $C \leftrightarrow Dx$)
  where C = some natural-kind term, D = some complex set of readily observable properties that is equivalent to(constitutive of) the meaning of C (on a descriptive account)
- (LK4) = (DK) is *necessary* and *analytic.*

Textbook's Objection to (LK4)

- Kripke:
  - We fix the reference of a natural-kind-like term, e.g. *"heat"*, using contingent properties of it, e.g. the property that it's able to produce such-and-such sensations in us.
  - These properties, however, are contingent because we, the experiencer, might not have existed; or we might have been insensitive to *heat*.

Modal Arguments Against (LK4)

Nathan Salmon, 1982. Reference and Essence. pp.24-7.

- **(LK4)** will be wrong if ...

1. There are metaphysically possible instances of C that do not possess the property complex D;
2. There are metaphysically possible items that do possess the property complex D without being instances of C.

About Possibility (1)

- Some argues that (1) can only be true iff the Laws of Nature is contingent. It goes like this: if the Laws are necessary, then the melting point of gold will be necessary just like the atomic number of gold is.
  - This view is wrong because not all observable properties are consequences of the Laws of Nature alone.
- Example.1. If the perceived color of gold, *looking yellow*, is a component of D, then a possible world in which gold does not look yellow due to unusual atmospheric effects would be a good example of (1)
- Example.2. Allotropes are distinct types of a single chemical kind that may differ considerably in superficial properties. Graphite and diamond are both of the kind *Carbon*, but they diverge on observable properties. Thus, irrespective of the necessity of Laws of Nature, members of a kind might be manifested in two or more superficially distinct species.

About Possibility (2)

- Fool's gold (*Iron Pyrites*) possesses the same set of *D* as real gold (they only differ in chemical composition)
- Jadeite is often referred as an example of nephrite.

(LK5)

- Converse of (LK4)
- If '*K*' is a natural-kind term, then nothing is necessarily true of members of *K* as members of *K* other than an appropriate part of what is believed to be true of members of *K*, or what follows logicall from that.

→ (LK5) is a general thesis held by empiricist.

→ Humean Claim:
"We cannot literally perceive (see, hear, smell, etc.) that something is necessary. [....] Necessity derives from ***our way of thinking*** of the world, [...] not from the things ***themselves***." [Textbook, p.101]

→

- Thus, what is necessarily true of a natural kind can only be derived from *the way we think of the kind*;
- The modality **depends** on the speaker's belief.

Kripke & Putnam's Response

(1) Gold is the element with atomic number 79;
(2) Water is H_2O.

Kripke & Putnam allege that (1) & (2) are necessary *a posteriori* truths not because they depends on our beliefs but because the natural-kind terms (*gold* and *water*) are rigid designators [Textbook p.102]

- If (1) is true, then the followings ***must*** also be true:

(1a) The predicate 'x is the element with atomic number 79' applies to ***that stuff*** in all possible world;

→ Giving the chemical constitution of some stuff tells us something which is essential to the stuff.

(1b) The term '*gold*' picks out ***that stuff*** in all possible world

→ (1b) simply states the fact that natural-kind terms are like proper names such that they are rigid designators.

Question

- Did Kripke & Putnam's claim (as represented here by the textbook) successfully respond to the Humean Claim/(LK5)?

A Lockean Response to Putnam's *Division of Linguistic Labour*

- Lockean theory can accommodate different layers of users by redefining what is meant by the unspecific phrase *is believed:*
  - there are beliefs held by ordinary competent speakers (layman/linguistic parasites);
  - there are beliefs held by experts.
- Revised notion of *is believed:* only the beliefs of experts define the natural-kind term.
- Problem of revised Lockean theory:
  It requires the existence of such experts. Then, how can we talk about the kinds that can only be defined by future scientists?

An Example

Consider the following scenario:

- Assume it is essential to gold that it is the unique element with atomic number 79;
- The kind *gold* is the same kind as that referred to by the Greek word used by Archimedes in 3^{rd} B.C.
- For Archimedes, it is essential and distinctive of gold that it has the same density as a certain sample of gold bar, *B*.

(LK1) If '*K*' is a natural-kind term, there is a family of things associated with '*K*', *an appropriate part* of which *is believed to* be true of members of *K* and only members of *K*;	TRUE	Given the revised account of *is believed by experts*
(LK2) If '*K*' is a natural-kind term, then if *an appropriate part* of what *is believed* to be true of members of *K* is in fact true of something, then that thing is indeed a member of *K*;	FALSE	Counterinstance: Sample bar *B* is in fact not pure, e.g. it is a heavy metal with a galvized layer of gold.
(LK3) If '*K*' is a natural-kind term, then it is ***a priori*** that *an appropriate part* of what *is believed* to be true of members of *K* is in fact true of members of *K*;	FALSE	Expert's (Archimedes's) knowledge involves the empirical question of whether *B* is a good sample of pure gold.
(LK4) If '*K*' is a meaningful natural-kind term, then it is ***necessarily true*** that *an appropriate part* of what is *believed* to be true of members of *K* is indeed true of members of *K*.	FALSE	Archimedes's belief presumes that *B* is pure gold. If *B* is in fact not pure, then his belief is not even true of gold. [Textbook, p.104]
(LK5) If '*K*' is a natural-kind term, then nothing is necessarily true of members of *K* as members of *K* other than an appropriate part of what is believed to be true of members of *K*, or what follows logicall from that.	FALSE	*It seems to be essential* to gold that it has atomic number 79. But that gold has atomic number 79 is clearly not something believed to be true of gold by Archimedes, so it's natural to follow the Kripke–Putnam view in denying (LK5). [my emphasis, p.104] 没太懂

My Question:
But aren't we only care about the case that something being necessarily true *if true at all?*

Kripke-Putnam's Difficulty

How can our present use be deferential to the views of experts who don't even exist yet?

Author's Suggestion: A Functional Accoint (大雾)

- We should ask instead:
  - What is ***the point*** of singling out a particular liquid as *water* in the way we did (in the 17^{th} century)?
  - Why does it ***matter to us*** that something is water?
- A possible answer: it quenches thirst in humans and animals, and helps plants to grow. It matters to us because it's the liquid that produces these particular beneficial *biological* effects.
  - *Water* is a **biological kind** in this 17^{th} century sense.

Twin Earth (on a Functional Account)

- If we want to know whether the liquid in the lakes and rivers (on Twin Earth) is water, the natural question to ask now is this:
  - What happens if (Earthian) human beings and Earthian animals drink it, or we try irrigating Earthian plants with it?
- If it has the same effects on Earthian animals and plants as the water on Earth does, it's quite natural to count it as water. [p.106]
- If the Twin Earth liquid poisoned you, you would not count it as *water*.
- Water was, in effect, defined as ***that liquid which produces such and such effects***; and the production of effects is precisely something for science to investigate.

Question:
Does the term *water* in the 17^{th}-century's sense refer to a wide variety of chemical compositions?

→ (i) Do we think that *'water'* referred to the liquid which **in fact / actually** quenches Earthlings's thirst and nourishes Earthian plants? → *Water* is H_2O.

→ (ii) Do we think it is just any liquid which is capable of doing so (quenching thirst and nourish plants)? → *Water* is H_2O, or XYZ, or anything that produce the so-and-so effects.

Can *water* still count as a natural-kind term?

- Surely *water* in this sense cannot count as a **chemical kind** because it allows XYZ and H_2O to be its instances;
- *Water* in this sense can be regarded as a **biological kind** for producing uniform biological effects;
- Similarly, *jade* can be regarded as a **jewelry kind** but not a **chemical kind**.
- We are allowed to do this because science at different levels have certain autonomy:
  - **Biology** might provide explanantions by grouping together things which are dissimilar **chemically**;
  - **Chemistry** might provide explanations by grouping together things which are dissimilar **physically**.

→

Science-Relative Conception of Natural Kinds

- Denies that science are authoritative over natural kinds [p.107];
- Accepts that real-kinds conception
  - Viz. that natural kinds are fixed independently of human interests;
- † The success of natural science is evidence that they deal with uniformities which are independent of human interets [pp.107-8];
  - I AM NOT CONVINCED!

Naming Acitivity

Baptism

- In Kripke, there is a hypothetical but admittedly artificial naming ritual, viz. baptism.
- During the baptism, a declaration is made to fix the reference of *gold:*
  - 'Gold is the substance instantiated by the items over there, or at any rate, by almost all of them'

Ostensive Definition

- In Putnam, we ostensively define the term *water* by uttering 'This liquid is water' while point at that liquid
- Alternatively, we can give an **operational definition** of water by using relatively superficial properties, e.g.
  - 'the liquid which has such-and-

Three Objections

1. The supposed **baptism** and **definitions** are clearly entirely artificial. Such artificial ritual presupposes the identity of the kind being defined.

2. Asymmetry between natural-kind terms and proper names: there are debates about what it is for something to be *gold* or *water*, but there aren't any genuine debate about what it is for a person to be J. Edgar Hoover.

3. In order to solve the difficulty of how could we refer to kinds that only future scientists are authoritative, we accept the patch that we characterize the natural-kind term by using the *point* of the use of the terms, e.g. water is *the stuff which quenches our thirst and nourishes our plants*.
→ It seems that this patch *gives meaning* to the natural kind term.

1. The supposed **baptism** and **definitions** are clearly entirely artificial. Such artificial ritual presupposes the identity of the kind being defined.

→ As in Kripke, the baptism of *gold* presupposes a notion of *substance*. (since we fix the reference by saying 'gold is the so-and-so *substance*.')

→ As in Putnam, the ostensive definition of *water* presupposes the notion of *liquid*.

→ **Problem of Infinite Regression**

- If *gold* and *water* are introduced based on these presuppositions, what about the baptisms of *substance* and *liquid?*
- At some point this regression needs to stop, and we have to reach terms which are not introduced by explicit baptism or definition, but by some kind of practice and training.

2. Asymmetry between natural-kind terms and proper names: there are debates about what it is for something to be *gold* or *water*, but there aren't any genuine debate about what it is for a person to be J. Edgar Hoover.

→ "So we can ask what it is for someone identified on one occasion to be the same person as someone identified on another occasion, and this debate turns on the question of what it is to be a person. There is no such debate about what it is for someone to be J. Edgar Hoover, for example." [p.109]

→ My Question:
But there are such a question!
When we are asking what it is for someone to be Aristotle, we are after his origin/parenthood.

→ "[...] [T]here does seem room for genuine debate about what it is for something to be *gold*, or *water*, and this is not just a matter of what it is for something to be a substance, or a liquid. [....] [T]hese are the issues which are settled by the scientific discovery that gold is the element with atomic number 79, and that water is H2O. This is why a baptism, or explicit ostensive definition of the kind imaged by Putnam, **is not really credible** as an account of how most natural-kind terms **get their meaning**." [my emphasis, p.109-10]

→ My Question:
This is sheerly wrong!
Baptism (at least) *is not meant* to **give meaning** to the natural-kind term, it is only *meant* to **fix the reference**!

3. In order to solve the difficulty of how could we refer to kinds that only future scientists are authoritative, we accept the patch that we characterize the natural-kind term by using the *point* of the use of the terms, e.g. water is *the stuff which quenches our thirst and nourishes our plants*.
→ It seems that this patch *gives meaning* to the natural kind term.

→

The description here should be read as actualized description.

(Suppose XYZ is capable of quenching our thirst and nourishing our plants)
There are two readings of the descriptions:

1. the description is equivalent to "any stuff which is capable of quenching our thirst and nourishing our plants, with the laws of nature, and the constitution of ourselves and our plants, as they actually are."
2. The stuff which is ***actually responsible*** for quenching our thirst and nourishing our plants.

Both reading are rigidified descriptions. Therefore they are rigid designators.

But people like Putnam who cannot distinguishes between elm and beech cannot produce the above reflection on the natural kind term, *water.*

We end up with a form of description theory of natural-kind terms. This form of description theory is not vulnerable to Kripke's objection because

1. it is not an individualist theory
2. the description is not supposed to be something *in the mind of* speakers.
3. the description are *actualized* descriptions, they are rigid

Two Principles of obtaining Essentiality

- Essential by Origins【pp.111-114】
  - If a material object has its origin in a certain hunk of material matter, then it could not have existed without having that origin in any other matter.【p.114 footnote.56】
  - For humans, this origin is our parenthood【hinted in Lecture 1 in example of "Aristotle" and "Nixon"】
  - Table out of a different block of wood, or out of ice from Thames River would be a different table!【pp.113-114】
- Essential by Material Constitution【pp.114-115 footnote.57 & pp.126-127】
  - Q: Could an object composed of molecules have been that very thing without being composed of molecules?
    Kripke: No!
    Putnam: Yes!