

Ostensive Learnability as Criterion for Theory-Neutral Observation Concepts

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Introduction

Thesis of theory-ladenness:

popularized by Hanson (1958), Kuhn (1967), Feyerabend (1975) ...

already found in Wittgenstein (PU), Popper (LSD; new appendix X).

Nowadays taken over by majority of philosophers of science

(Fodor 1984 stylizes himself as "Granny that does away with postmodernism and graffiti...")

⇒ critical attitude against so-called "data" of science is important: these "data" are usually theory-laden, while what scientists have really perceived is concealed behind a veil of expertocracy.

⇒ yet in all disciplines of empirical sciences one can find theory-neutral observation concepts on which scientists may draw in cases of conflicts of opinion.

I will defend a weak version of theory-neutrality (weaker than Fodor's).

Part I: Theory-Dependency of Observation – Pro's and Contra's:

⇒ *A disentanglement of problems with the effect that contra's win!*

1.) *Pro: Observations are expressed as realistic statements* ("this thing is green"): so they imply the *hypothesis of realism* (subject-independent reality causes perception → fallible because could be hallucination) (Popper LSD, Chalmers 1986)

Contra: True – but this is not meant with theory-dependency of observation.

What is meant is that content of observation depends on content of one's theory / expectation / word-view

→ this is not the case here.

2.) *Pro: Observations are theory-guided* (-driven)

Selection of possible observation acts / experiments / scientific problems depends on one's theory and one's (epistemic) interests (Chalmers 1986; van Fraassen 1980; Albert 1980; Brewer/Lambert 2001, ...).

Contra: Yes, of course → but this doesn't imply theory-dependence.

Interest-guidedness of empirical research does not imply that certain observations *cannot* be made, but only that these observations are not *wanted to be made*, or that they are *ignored*.

Similar: *Attention-dependency* of perception → if wanted, attention can be re-directed, its under control

3.) *Pro: Perceptions (= observations in the narrow sense) are theoretical constructions.*

Visual perception is an unconscious construction of a mental 3D model from 2D retina stimuli (first: Helmholtz 1896).

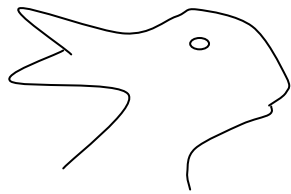
→ Demonstrated by:

Ambiguous stimuli (Kippbild)

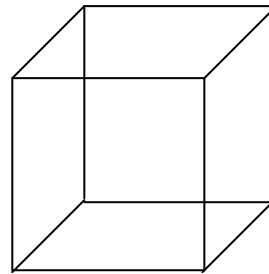
Deceptions / illusions (Ponzo-, Müller-Lyer-, Poggendorf-illusion)

Corrections (reversing goggles)

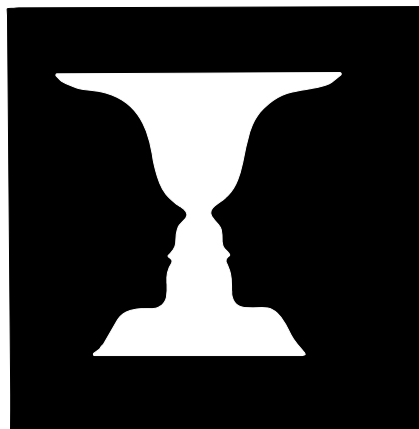
Supplementary constructions (lateral inhibition, figure-completion, 3D-formation)



a)



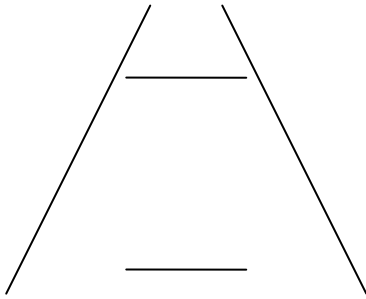
b)



c)

Kippbild – a: duck-rabbit, b: Necker-cube, c: Rubin-vase

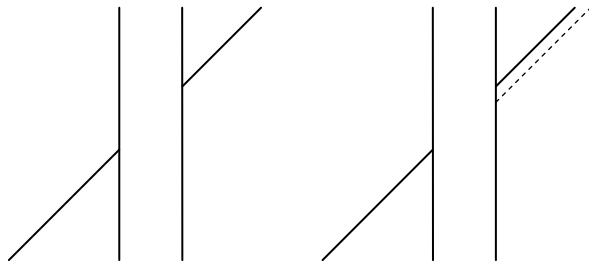
a)



b)

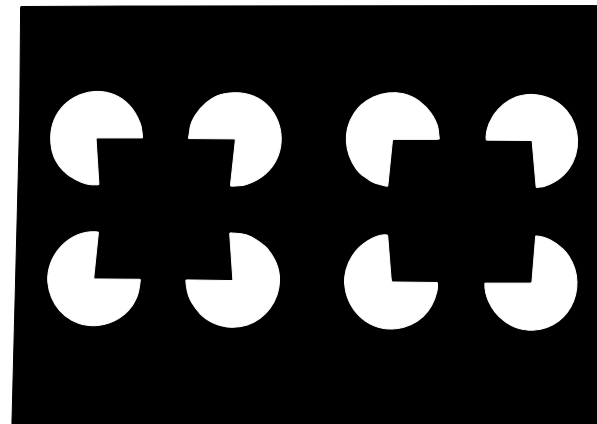


c)



*Deceptions: a: Ponzo-illusion, b: Müller-Lyer-illusion,
c: Poggendorf-illusion*

*Lateral inhibition, figure-construction, and
3D-image in one (Churchland/Sejnowski 1992).*



⇒ *Note*: Like these pro arguments, effective contra arguments have to be based on cognitive psychology.

Neither Vienna circle philosophers nor Popper had good arguments against these findings because according to their position of "logical purity", philosophy should be *independent* from psychology – what counts as an observation sentence was logically speaking matter of "pure convention" (Neurath 1934; Carnap 1932/33; Popper LSD).

Contra: The constructive nature of perception refutes merely *direct realism* (cf. Robinson 1994).

But it does *not* refute the possibility of theory-neutral perception, insofar as we mean with "theory" cognitive contents or processes that are *not genetically inborn but have been acquired* (learned).

One could call the genetically determined structure of our brain an "inborn theory" that all humans share – but that would be an overstretching of the concept of "theory".

Visual perceptions (also their illusions) are in a persistent manner *independent* from acquired information:

Fodor 1984: modularity (impenetrability) of visual perception

Rock 1984 (Helmholtzian): expectation-dependence takes place only in *exceptional* situations (see below)

⇒ evolutionary explanation for expectation-independence: the cave bear

Often-quoted experiments in favour of expectation-dependence of perception stand on "weak legs":

E.g. *experiment of Asch 1956* on apparent dependence of observation on the social pressure to conform to opinions of others
 → in fact, this experiment confirmed the independence of perception: 35% answered conformistically; only 5% began to doubt their visual capacities.

4.) *Pro: In some situations perceptions do depend on one's pre-expectations*

Contra: → Only in situations of stimuli at the *perception threshold*, i.e. at the limits of perceptual recognition capacities (Rock 1984, Brewer 2001) – for example because of

→ *Poorness of the stimulus:*

not enough light (seeing mysterious figures in the dark forest)

too small (ask "which is longer?" for two equally long strokes)

too short presentation time; high-speed-perception e.g. in reading (Martindale 1991, Estany 2001)

ambiguous stimuli (no unique "gestalt solution")

→ *Complexity* of the relevant stimuli pattern, training effect (chicken sexing, X-ray images)

Rock 1984: Depth perception uses different information sources that are preferentially ordered (1 > 2 > 3):

(1) *Binocular depth vision* (superposition of two monocular images; binocular angle) (unconscious)

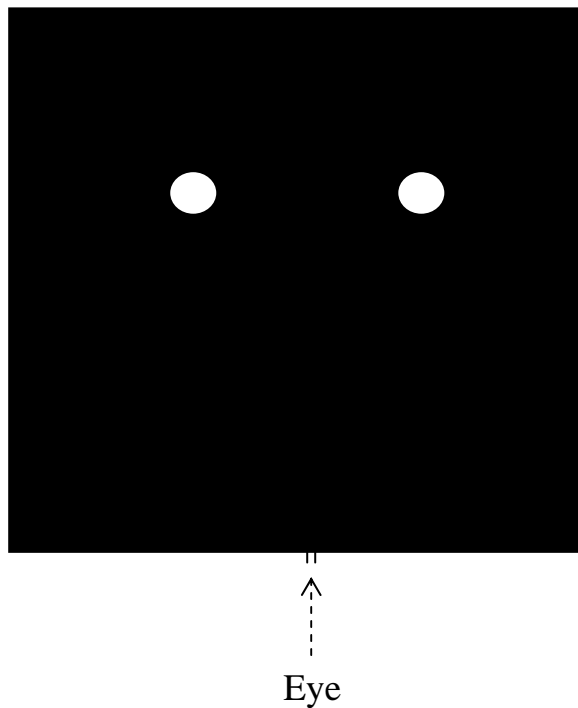
(2) *Monocular depth vision* (motion parallax, lense accommodation, shadow, perspective, fore-background) (unconscious)

(3) *Background information* (partly conscious)

1 overwrites 2, 1 and 2 overwrite 3; ⇒ 3 gets used only if all mechanisms at levels 1 and 2 fail.

Example: Tp (test person) sees through a peephole with one eye two white shining balls of equal size and distance in an otherwise dark black box.

- Without any information, balls are perceived at equal distance.
- If one tells the Tp that one ball is a tennis and the other a ping pong ball, the tennis ball is perceived as being further away.
- Influence by background information disappears as soon as one allows Tp to see with two eyes, or to move their eye (etc.).



Two white balls in a dark chamber ...

5.) *Pro: Observations in science – scientific " data" – are theory dependent.*

Hanson (1958): Tycho Brahe saw (in the sun) a planet, where Johannes Kepler saw a fixed star.

Kuhn (1963): Lavoisier saw oxygen where Priestley saw dephlogisticated air.

Contra: Only true if one assumes the wide concept of 'scientific observation' as perception and interpretation of the measurement result: observations i.w.s. are dependent on the measurement theory.

Widely used conception in philosophy of science: Putnam (1962, 244), Shapere (1982), Giere (1999), Kuipers (2000),...

Not true if one assume the narrow concept of observation as human (visual) perception.

In everyday or scientific conflicts of opinions, perception in narrow sense is usually separable from interpretation by easy means

– example:

A says:

"I think this is a bear track"

"But it's a trace of something "

"At least, it's an impression in the ground"

B says:

"No, a bear track looks differently"

"Not necessarily, this could have been caused by something else,
for example a rolling stone"

"Yes, sure"

6.) *Pro: There is a continuity between observation concepts and theoretical concepts*

(Maxwell 1962, Carnap 1966, Hempel 1974)

Contra: It is true that there exists a continuous transition in the extent (or degree) of theory-ladenness of concepts

– just as there exists a continuous transition from white to black.

⇒ but this does not mean that one cannot distinguish between white and black !

Imagine what a member of a non-civilized tribe would *do*, without instruction, with more and more theory-laden optical instruments: glasses, simple telescope, electronic telescope, magnifying glass, light microscope, electronic microscope....).

7.) *Pro: Observation concepts (like all other concepts) are language dependent*

Whorf (1956): *linguistic relativity principle*

Kutschera (1976)

Contra: many of the relativistic theses of Sapir and Whorf have been empirically refuted (Brown 1991)

Different cultures have indeed developed different systems of (linguistic) concepts within which they describe their experiences (e.g. Berlin/Kay 1969: basal colour concepts).

⇒ but this does not imply that perception itself is language dependent.

This could only be inferred if members of a culture would not be able to learn foreign observation concepts of other cultures by non-verbal ostensive training (i.e. without learning the entire language and implicit 'ideology' of the other culture)

⇒ this ostensive learning ability is generally present:

– Zuni-Indians can learn the colour concept "orange" (which doesn't exist in their language) after a short time of ostensive training (this ... is orange, but not this...)

– Tiv (West Africa) and Dani (New Guinea) were able to learn in this way all foreign English colour concepts (Garnham/Oakhill 1994; Berlin/Kay 1969/99).

– Likewise a European can learn the Inuit's/Eskimo's concepts for kinds of snow by ostensive training (Pullum 1989).

"weak language dependence" (Davidoff, J. et al. 1999): ostensive learning of observation concepts of a foreign language is easier and proceeds faster if Tp's possess a simple word in their own language for this concept → not surprising

Part II: Definition of theory-neutral observation concepts (in narrow sense, i.n.s.)

Problem 1: Definition must not be based on introspective reports, because humans do not reliably separate their observations from interpretations or imaginations (e.g., people report to have observed an Ufo)

⇒ therefore I aim at an *empirical-psychological* definition, based on testable psychological behaviour.

Problem 2: The psychological behaviour that tests for observationf concepts must not presuppose knowledge of a specific linguistic concepts, because this knowledge contains information that goes beyond the observational realm (cf. Quine's problem of 'colateral information' in 1960).

⇒ therefore my concept tests are *nonverbal*, based on *ostensive learning*.

Structure of an ostensive learning experiment:

Setting: the concept to be tested for observability is presented to the Tp by an unknown artificial word "X" so that the Tp doesn't associate any pre-determined meaning with this word.

Training phase: Concept "X" is illustrated to the Tp at hand of a set of positive instances ("X") and negative instances ("not X") – instances may be presented by photos, movies or real objects.

Test phase: New instances and non-instances of "X" are presented to the Tp, and she is asked "is this an X?". The Tp has to answer with "yes" or "no". The Tp's success in correct answers indicates whether the Tp has successfully abstracted from the training instances the perceptual property cluster that corresponds to the concept "X".

⇒ if "X" can be learned by ostension (from a small set of instances) by (almost) all humans, this is a strong reason to assume that the concept "X" is a theory-neutral observation concept – via a "no miracle" argument:
 the successful transition from training to the test phase can only (?) be explained by a process of abstracting a common perceptual content from the training instances that is common to all humans, independent from their acquired background information.

Definition: A concept is a (theory-neutral) observation concept (i.n.s.) iff all humans can acquire this concept via ostensive learning under normal conditions of observation, independent from their background information, language and culture.

Normal conditions of observation (visual perception):

(i) physical normal cond. (appropriate light conditions, etc.),

(ii) biological normal cond. (no defect of sense organ, etc.),

(iii) psychological normal cond. (normal state of awakesness, no drugs, etc.)

– linguistic normal conditions are not needed, because language is circumvented in ostensive learning experiments.

Consequence of the definition: If O_1 and O_2 are systems of observation concepts of two different cultures K_1 and K_2 , there exists a superordinate system of observation concepts O_{12} that contains all concepts in O_1 and O_2 and can be acquired by (almost) all members of K_1 and K_2 by ostensive learning.

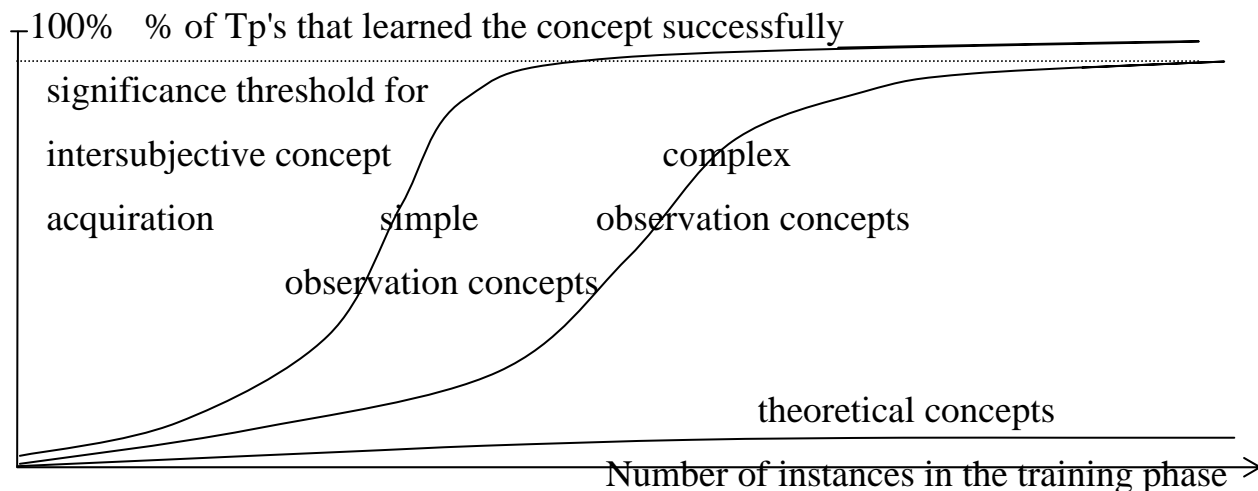
Presupposition of ostensive learning experiments:

- Tp's must be fairly mixed in their cultural background
- if one performs ostensive learning experiments in only *one* culture, then one has to invent examples of fictional theoretical concepts, to avoid that Tp's are already familiar with the concept to be tested and guess it from their memory.

In general, success in ostensive learning experiments depends on number of instances in the training set; result is a gradual *learning curve*.

Hypothesis: learning curves will be significantly different between (a) simple observation concepts, (b) complex observation concepts and (c) theoretical concepts

Expected learning curves:



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