

Hypothesis

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Hypothesis - Definition and Summary [208 words]

The word 'hypothesis' is of ancient Greek origin and composed of two parts: 'hypo' for 'under', and 'thesis' for 'to put there'; in Latin, this translated 'to suppose' or 'supposition'; made up of 'sub' [under] and 'positum' [put there]. It refers to something that we put there, maybe to start with, maybe to stay with us as an installation. Hence in modern English we say '*let us hypothesise, suppose, or let us put it that*', and then we start the argument by developing implications and reaching conclusions. The term 'hypothesis' marks a space of possibilities in several ways. Firstly, it is the uncertain starting point from which firmer conclusions might be drawn. Public reasoning examines how, from uncertain hypotheses, neither true nor false, we can nevertheless reach useful conclusions. Secondly, the hypothesis is the end point of a logical process of firming up on reality through scientific enquiry. Scientific methodology makes hypothesis testing the gold standard of enquiry. Thirdly, hypothesis is a point of transition that calibrates perception and social interaction. Psychological science turns hypothesis testing into a model of the mind. And finally, hypotheses might be part of a monological ritual of reasoning that distracts from reaching a common understanding about the world and its utopian possibilities.

Cross-references: see also abduction; dialectics; possible in logic; utopia.

In the *'Man Without Qualities'* the writer *Robert Musil* puts it into the title of Chapter 4 '*Where there is a sense of reality, there must be a sense of possibility*'. It seems that we cannot have reality without acknowledging other possibilities, without the imagination that things can be entirely different but for some reasons are not. Reality is framed by possibility, and it is imagination that opens this space of contingency. But we must then ask immediately, how do possibilities arise in the first place?

The word 'hypothesis' is of ancient Greek origin and composed of two parts: 'hypo' for 'under', and 'thesis' for 'to put there'; in Latin, this translated 'to suppose' or 'supposition'; made up of 'sub' [under] and 'positum' [put there]. It refers to something that we put there, maybe to start with, maybe to stay with us as an installation. Hence in modern English we say '*let us hypothesise, suppose, or let us put it that*', and then we start the argument by developing implications and reaching conclusions.

One can trace a term with Ngram viewer, which, based on millions of English books, visualises how keywords fall in and out of fashion. Figure 1 shows the relative salience of 'hypothesis' and 'supposition' since 1600. Both terms were in higher use between 1700 and 1850 and then fell out of

favour; later after 1950, only the 'hypothesis' regained currency and stabilised in the 1980s at a level of higher usage.

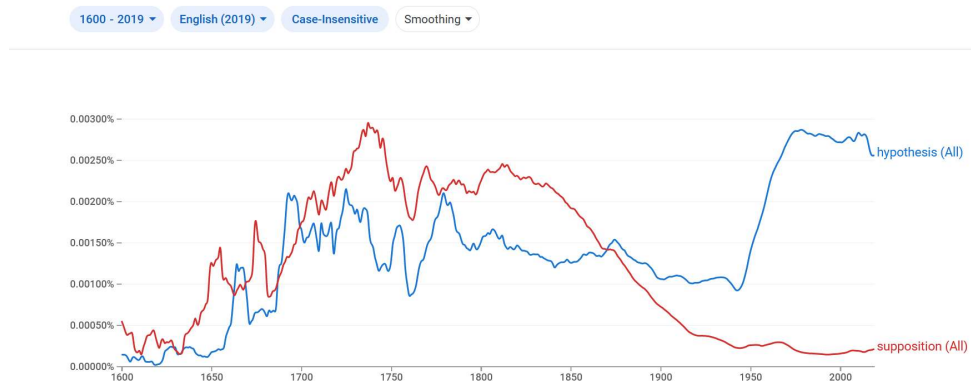


Figure 1: Ngram Viewer for keywords 'hypothesis' and 'supposition' as references in English books between 1600 and 2019 [accessed 15 Dec 2021]

In this essay, the notion of 'hypothesis' denotes a space of possibilities in three different contexts without any claim to being comprehensive.

- a) Public reasoning examines how, from uncertain hypotheses, neither true nor false, we can nevertheless reach useful conclusions;
- b) Scientific methodology makes hypothesis testing the gold standard of enquiry;
- c) Finally, psychological science turns hypothesis testing into a model of the mind.

Hypothesis in public reasoning

An ancient classification of reasoning is based on whether we start with premises that are true, or from premises that are uncertain, or even untrue, but nevertheless lead to useful conclusions. Aristotle identifies the latter with **dialectics** and **rhetoric**, two formats of communication which come natural so that '*ordinary people do this either at random, or through practice and from acquired habit*' (Barnes, 1984, Rhetoric, 2152).

Pure syllogism comes to true conclusions from premises that are already true, famously, 'All men are mortal' [Major, rule], 'Socrates is a man' [Minor, case], 'therefore Socrates is mortal' [Conclusion, result]. Such demonstrations are examples of deductive logic. Without any doubt on neither the Major nor the Minor, the conclusion is incontestable. From truth only truth can follow; the opposite is however not the case. **Hypothesis marks an uncertain starting point.** In order that from less than true, a truth can follow, some further considerations need to come into place. Dialectic and rhetoric seek to clarify in the case of everyday reasoning such conditions of **hypothetical reasoning**.

Dialectic is suited to the context of one person arguing with another, where the stronger argument shall prevail; we might recognise here the rationality that tends to prevail in a seminar discussion or a debate. Here interlocutors start with sentences such as '*let us suppose that*', '*let us assume that ...*', '*let it, for the sake of argument, be agreed that*', or '*let the hypothesis be made that....*' (Rescher, 1964, 3). What is supposed is not an established fact, not further investigated; to the contrary the claim remains doubtful, possibly true or false [God exists?]; it can be wrong in common belief [John Lennon is alive]; and it can even be definitely false [Napoleon has won at Waterloo]. Such types of uncertainty are the basis of hypothetical reasoning (Rescher, 1964; 4ff). Under the

heading of 'topics', Aristotle listed suppositions which can be safely made in general or in particular contexts and which carry credibility without further examination, i.e., *'those opinions are reputable which are accepted by everyone or by the majority or by the wise ... or by the most notable and reputable of them'* (Barnes, 1984, 167). Important in everyday life, with contingency planning we learn to remain prepared on how to shift to plan B if conditions are changing. In thought-experiments we trace the consequences of knowingly false assumptions. We might even play games with our imagination by extrapolating impossible assumptions in 'what if' stories as in science fiction. While politicians avoid hypothetical questions 'what if the PM resigns next week?'. Any answer to this question would reveal a position and give hostage to fortune; better wait until the situation arises. And modern public opinion research compares what are the common places of different strata of people; these sets of feasible arguments define at present **social representations** (Bauer & Gaskell, 2008) or a historical **mentality** (Lloyd, 1990, 135ff).

In rhetoric, by contrast, the hypothesis is unspoken, it is buried in the tacit communality that ground all rhetoric between speaker and listener/reader. Rhetoric takes place as civic discourse; speakers are addressing a larger audience in public. It is famously defined by Aristotle as *'observing in any given case the available means of persuasion'* thereby considering feasible arguments (logos), credibility of the speaker (ethos) and audience appeal (pathos; Barnes, 'Rhetoric' 2155). We recognise here the rationality of the public sphere. The **rhetorical argument** is called **'enthymeme'**, a truncated way of arguing by saying not as much as to bore people, but nevertheless saying as much as to persuade; we must consider people who *'cannot take in at a glance a complicated argument, or follow long chains of reasoning' ... (ibidem, 2157) 'common places to be embodied in them' and 'thus we must not carry its reasoning too far back, or the length of our argument will cause obscurity; nor must we put all the steps that lead to our argument, nor shall we waste words in saying what is manifest'* [ibidem, 2224]. Hence, somebody might seek to move people by claiming that smoking is dangerous to your health [minor], therefore stop smoking! [conclusion]. Whoever wants to move people to give up smoking needs to make sure that they work on safe ground that people want to live a healthy life and live longer. This is indeed the unspoken hypothesis [major, rule] which underpins the enthymeme urging you to give up smoking. The **common place** 'living a healthy life' is implicit, it is tacitly shared and mutually assumed in the discourse [I know that you know that I know ...]. The enthymeme builds on the hypothesis; no need to enquire any further, for the sake of brevity to sway opinions. Only the analysis of the rhetorical situation brings the implicit hypothesis to light as the common ground on which the speaker is successfully working. What is unconscious might be made conscious; however, stating the 'bleedingly obvious' could be irritating. Rather than challenging an explicit assumption, better to be left unexamined in order not to complicate an already pressing situation and a convenient framework for action.

While dialectic is concerned with epistemic truths, seeking to establish a plausible truth from uncertain, though explicit hypotheses, rhetoric has a practical remit of establishing what can be done under uncertain conditions and time pressures, whether somebody can be blamed for a state of affairs, or whether a person deserves our respect; and to achieve this, the hypothesis remains implicit. Modern rhetoric extends to the marketplace: **advertising** moves us to buy stuff in order to live a happier life of satisfied consumers.

Hypothesis in scientific methodology

The term 'hypothesis' is part of the core language game of science: theory, **model**, measurement, **data**, research question and hypothesis (Glass & Hall, 2008). Often hypothesis is confused with

model or theory, such as 'biological evolution as a hypothesis' or 'big bang as a hypothesis'. It is more useful to distinguish hypothesis derived from theory or model, which can be tested on data. A model represents the theory that gives rise to hypotheses (Frigg, 2010). The hypothesis then becomes the research question reformulated in data terms. All this struggle testifies to an historical anxiety of science vis-à-vis the **imagination** as a human faculty (Daston, 2005); it needs to be domesticated like a wild animal to extract utility.

Scientists working experimentally are taught to frame their designs on Nature with a hypothesis about the effect of a controlled intervention; for example the effect of a drug to treat an illness, or a training protocol to increase performance, can be tested statistically for significance. The experimental design of treatment, controls and outcome variables allows, *ceteris paribus*, to attribute causal efficiency from the intervention X to the outcome variable Y. The existence of an effect Y, and the strength of the relationship X-Y are subject to prediction, i.e., the hypothesis based on a causal mechanism X->Y. This type of **'causality hunting'** leads in the social sciences to a ritual of hypothesis testing; this frantic chase to reject **Null-hypotheses** of ill-defined effects has entered a 'replication crisis'; social and psychological effects are not replicable as drug trials are (Scheel et al, 2020).

Harre (1985, 62ff) distinguishes a fictionalist from a realist account of **hypothesis as knowledge**. For the **fictionalist**, theories and models are entirely imaginary entities that allow to generate useful predictions to be tested on data. When different models equally fit the data, the choice between models is done on endogenous criteria such as coherence, beauty, or simplicity. For the fictionalist, planets do not exist beyond words [nominalists]; these entities allow us to formulate a theory of moving light points in the sky under an observatory. This kind of reasoning can proceed from manifestly false propositions and deduce a conclusion that is empirically true, for example: all humans are rational (F), and all rational creatures behave like this (F, Bayesian updating); therefore rational humans behave like this (T) (see Harre, 1985; 84).

For the **realist**, however, theoretical entities are more than 'names' in the universe; they can be demonstrated by the gesture of pointing. The sun is not just the centre of a planetary model; it can be pointed at in the sky; the same might be true for 'behaving rationally', it can be pointed out. The realist adheres to three principles: a) some theoretical terms refer to hypothetical entities, b) some hypothetical entities are candidates for existence, and c) some candidates for existence exit (Harre, 1985, 99). This seems to be best illustrated by the microbial theory of bacteria and viruses. Bacteria and viruses infect and kill cellular organisms, they are not just convenient fictions predictive of infectious complications and excess deaths during a pandemic.

Some of the entities referred in a theory or a model, are hidden from sight, not (yet) directly observable, as **hypothetical constructs**. Famously, for a neo-behaviourist psychologist, minding is only a hypothetical construct producing a 'cognitive map', which explains how an animal successfully moves in a maze after reinforced trials. Such constructs mediate between observables, the antecedent conditions and the performance. Statistical models help by deriving probabilistically latent traits or latent classes of objects, so-called latent variable models. Given antecedents and performances, we infer a hypothetical level of 'intelligence'.

The **hypothetico-deductive method** is formally specifying hypotheses to reach explicit clarity and objective generality from a theory. This method was used by Johannes Kepler who had lots of observational data about moving planets, and he played in his mind with geometrical curves, where beginning and ends coincide. By thus playing with geometry, a deductive system of axioms, he came to consider an ellipsis rather than a circle, and he then derived predictions for elliptical orbits and

low and behold the data fit the model and simplified things at the top of it. Henceforth astronomers model planetary orbits in the geometry of ellipses rather than circles (Harre, 1985, p37ff). Based on the authority of astronomy, the psychology imitated this way of reasoning for theories of learning (Foppa, 1965, 33ff), **heuristics** and problem solving (Groner, 1978; Suppes, 1983) and behaviour (Lewin, 1931 and 1936). By contrast, behaviourists like Skinner utterly rejected hypothetical entities like 'cognition' or 'consciousness' as irrelevant and focussed on observables with reinforcing effects on behaviour. Intermittent reinforcement is most effective; the occasional 'likes' on Twitter or FACEBOOK will make us superstitious and crave for more.

A famous intervention in these matters, states that hypothetical constructs are necessary to break superstitions; but prone to self-fulfilling verification, they can never be verified, only falsified. For Popper (1972; 37) this demarcates what is and what is not 'science'. Science must generate propositions that can be falsified. According to the doctrine of **falsificationism**, what does not fall under this criterion is unscientific. Hypotheses can arise from any form of imaginary, belief or doxa, there are no rules or laws for their generation, but they need to be testable and tested. For this 'critical realism', Yoga, astrology, homeopathy, herbalism, Psychoanalysis, conspiracy theories or Marxism might contribute to knowledge provided they produce testable predictions in their area of observation, otherwise they are nothing but pseudo-scientific superstitions. Feyerabend (1981, p194) traces this idea to John S Mill, who in the 19th century advocated that the procedures of science are '*not to praise what is good, but to eliminate what is bad, or comparatively inferior*'; thus making a link to ideas of evolutionary selection and survival of the fittest in the test. However, not every falsification challenges a hypothesis; counter evidence must accumulate before it breaks the imaginary of the scientific community (Peters, 2013).

Another understanding of hypotheses arises from the philosophical programme of pragmatism. Pierce celebrates a third type of inference, the **abduction** (Psillos, 2011). This is different from **induction** - moving from the specific to the general rule - and from **deduction** - moving from the general rule to the specific case. Abduction is also called 'retroductive inference', or 'inference to the most plausible explanation'. Abduction specifies a methodical way of inferring a hypothetical explanation which, however, requires further investigations. As such it specifies the thinking by which Sherlock Holmes solves his cases (Eco & Seboek, 1988).

- [Rule, strong Major]: *dogs do not bark at their master;*
- [Result]; *there was a theft; the dog did not bark in the night.*
- [Case; weak Minor; hypothetical explanation]: *the master must be the thief;*

Sherlock Holmes solved the case of the 'curious incident in the night' as follows: the facts are '*there was a theft in the night and a dog that did not bark.*' Then comes the simultaneous intuition from rule and result: '*ah ... hey watch-dogs do not bark at their masters [rule, strong major], as there was no barking at night [result], the thief must be the master [case, potential explanation]. Let us confront the master, if he confesses, we have the decisive evidence.*' This intuition is facilitated by switching slightly from '*dogs do not bark*', to '*watch-dogs do not bark*'. Given what is known, an abduction is consistent with that evidence; but we need to exclude other persons the dog might not bark at. In rhetoric, this move of suggesting a plausible conclusion comes by the name of apagoge: an indirect proof that an explanation is well consistent with the facts by dismissing rival explanations. The facts are a start, the **hypothesis is but transitory** in the middle of the action.

Scheler (1960 [1925], 460ff), on knowledge in modern society, commented on this historical shift of meaning of 'hypothesis' from a potentially real entity to a purely fictional construct. Originally, hypotheses referred to constructs which explain existing facts and predict new facts. Such ideas

include 'viruses' or 'atoms' and 'aether' or 'phlogiston'. The former two were confirmed by future research, the latter become obsolete. In psychology the debate about consciousness as 'hypotheses' continues; some see it in the light of the Higgs-Boson, about to be verified at CERN; others make the analogy to 'phlogiston', about to be obsolete. However, a hypothesis is still hoped to refer to a real entity that one day can be pointed at, though not yet.

Under the influence of modern pragmatism, the meaning of 'hypothesis' shifted to that of a **convenient model** whose only function is to guide effective action. The model of various instantiations (visual, verbal, material, statistical; Frigg, 2010) is locally adjusted in response to the resistance of reality. The model assumptions are arbitrary as much as they have simplicity and lead to useful implications; e.g. the earth is flat; how far can we go? or humans are entirely rational; what is the level of inflation going to be? Any real experience that goes beyond verifiable sensations is a hypothesis, including the dark side of the Moon, which we will never see from the Earth.

This leads Max Scheler to distinguish ironically between the idealist, the pragmatic and the 'wise'. The idealists are fixated on the 'true reality' against appearances; they thus tend to ignore or dismiss the resistance of the world. The **pragmatists** are lost and disoriented in random worlds and busying themselves with fixing locally operative models; for them the world is a local construction that is temporarily useful. For the 'wise' (i.e. phenomenologists like Scheler confessed to be), who sense the need for firmer orientation in a random world and for whom pragmatism is too short term, both the images and the world are eminently real and neither is to be taken lightly, and the moon really has a dark side.

Hypothesis in psychological science - the once 'New Look'

Psychology classically deals with thinking and subjective experience related to social interaction and the body; cognition is dually embodied, socially situated and organically incarnated. When Brentano clarified the trichotomy of minding into intentional acts of representation, judgement and feeling [cognition, evaluation, conation], a hypothesis seems to fall into the limbo between representation, the intentional minding of an object, and a judgement about its existence; a **hypothesis remains suspended** without any conviction whether the object exists or not. In addition, we might feel attracted or repelled by this object (Brentano, 2015 [1874], 295). The unicorn comes to mind, it is intentionally inexistent, but widely liked.

Behaviourists dismissed all this as drivel and focussed their research dogmatically on how habits form from effects. Classically, an innate response of salivation in the sight of food gets associated to the sound of a bell; henceforth, the dog salivates when the bells rings. In the operant mode, any behaviour, however superstitious, can become frequent if reinforced, thus behaviour becomes fit for circus performances, and social media.

Neo-Behaviourism, imitating the physical sciences, postulated hypothetical constructs for learning theories; it was argued that hungry animals form 'expectations' and 'cognitive maps' of where to find food. To these laws of effect, **Gestalt psychologist** juxtaposed the spontaneous learning by insights. Human and other animals do not always follow a random path of trial-and-error littered with reinforcements. Much learning occurs in sudden bursts of 'insight'. After some trying without progress and calm examination of the situation, Samson the chimp suddenly grabs the stick and steps on the table to reach the banana dangling from the ceiling. Stick and table, lying about, suddenly acquired functional value for his problem: a banana out of reach. Samson displayed **mentality** and spontaneous behaviour, motivated but not shaped by consequences (Koehler, 1925).

What is being learned? The cognitivists' answer includes not only habitual behaviour, but **mental structures** as well: stimulus expectation, motor image, causal attribution, determining tendency, disposition, attitude or a conditional expectancy mind-set of the kind *if-X then do A, then you will reach Y*. This mind-set is not accessible by introspective experience, it is only a hypothetical construct, a condition on the side of learners which modify the selection and processing of information (Foppa, 1965; 186). This leads to the once 'new look' on perception as a process going beyond the information given: perceptual cues are ordered into meaningful patterns, cues are recognized in the light of a schema that affords perceptual readiness (Bruner, 1974, 114ff); learning becomes **problem solving**.

Gregory (1980) formulates a theory of **perception as unconscious hypotheses construction**, defined as '*selections of signalled and postulated data organized to be effective in typical and some novel situations*' (ibidem, 184), '*fiction generators which may hit upon truth by producing symbolic structures matching physical reality*' (ibidem, 182). Perceptual hypotheses are coded signals with predictive power, and they can be confirmed and disconfirmed though not with certainty; percepts are tied up with language that codes signals, which depend as much on what is as on what may be the case. Compared to scientific hypotheses, perception is from a vantage point and in real time, of instances not generalisations, about concrete objects, predictive not explanatory, and aware as percept. We are conscious that we see a dog. However, the perceptual field is full of ambiguities, distortions and paradox features, and we recognise them as false hypotheses arising from best fit. The perceptual field is not Euclidian, in the sense that parallel lines never meet; this is only the case in the near visual field, wider afar lines converge. According to this account, perception moves from signal and data to hypothesis which periodically misfires when the physical reality diverts from the experienced one. The hypothesis is the **end point of the process of coding signals**; the percept offers the best fit.

For others, the problem becomes, how psychological dispositions (attitudes, cognitions, schema, perceptual or effective hypotheses) change across time and situations. Piaget (1972) explores an **ontogenetic development theory of schemata** which temporarily stabilise by equilibrating between phases of assimilation and accommodation. In the assimilation phase the child is working from a temporary hypothesis as if '*X[animal] is wowow*', thus until further notice the current schema X[cat] absorbs various acoustic cues in the expected category [cat]; this works up to a point until accommodation set in and extends the schema to '*X[animal] is miao*', introducing a differentiation between [cat]miao and [dog]wowow. The 'as if' assimilation can be widely off the mark; it allows for playful engagement with reality when the child rides a *broom* as if it were a horse. A sinister function of assimilation arises in the wilful extension of a category to a wider range of things simply because one can. A famous Chinese story tells of court officials calling the present offered to the Emperor 'what a marvellous stag!', while being a horse. Insisting on calling a horse as 'horse' then becomes an expression of disloyalty in the face of power that is punishable by death. Insisting on the power of imagination can be a power game.

For Miller, Galanter & Pribram (1960) the hypothesis became the image that guides perception as well as the action. The action scheme offers structure in both directions, thus **framing perception and action**. The image guides the perception of relevant cues; the plan offers behavioural choices towards the goal. In regulating **goal-directed behaviour**, hypothetical results are feeding forward as goals which are continuously compared to current affairs through **feedback**, until the gap of 'is' and 'ought' closes; if it ever closes as the 'ought' is part of a self that moves in co-ordination with others (Prinz, 2012). Competent social activity involves the flexible matching of percepts with plans of behaviours from a stock of proven 'if ...then' observations. This allows to recognise different ways of

why peoples make mistakes: category errors on X, planning errors on Y, and lack of skills, i.e. percept-motor schemata X-Y.

What for science is a tool, became for psychology the theory: **humans are intuitive statisticians**. Minds work by testing hypothesis to make causal attributions, judgements under uncertainty and risky decisions (Geigerenzer, 2020). The computer as a calculating machine becomes the core metaphor of this theory. The subjective mind is benchmarked against 'formal-objective calculation' and characterised by its various deficits and biases against the norm of reaching conclusions in one best way. For some this wins a Nobel Prize in Economics (Kahneman, 2011), for Gigerenzer et al. (1989) this amounts to unjustified **intellectual imperialism**.

Groner (1978) had earlier offered a different example of this looping modelling: a hypothetico-deductive theory about ordinary people solving problems by using **heuristics** (Groner, Groner & Bischof, 1983). Cognition is modelled mathematically as **progressive hypotheses reduction** along different paths of problem solving. This involves strategies for focussing, testing and discarding rivals within sets of possibilities. It also deals with the storage of falsified or confirmed hypothesis in memory. The theory involves three entities: hypotheses, input information, and an evaluation criterium. For a problem task, the space of all possible hypotheses H is larger than those relevant for a person Hp. Equally, all available information I is larger than the relevant information for person Ip. Thinking is progressing across sets of Hp/Ip and reducing the number of relevant hypotheses. Different paths of problem solving are mathematically formalized to make predictions about type of solution, response latency and attention focus. Problem solving is an embodied but subconscious process for the study of which specific techniques of eye movement tracking were developed [ibidem, p177]. This theory postulates nine ways of hypotheses processing, thus working against the ritual of testing against only one best way (Groner, 1978; 174).

Possibilities beyond hypothesis

This chimes well before its time with recent calls in psychology to limit the vacuous ritual of statistical testing and to spend more time on conceptual developments and measurement (Scheel et al, 2020). Debruwre & Rosseel (2021) go even further and suggest ditching the hypothetico-deductive method all together, and to reduce the experimental efforts in favour of collecting more data, from more populations and across more situations. The model science is no longer astronomy or subatomic physics, but meteorology and biological taxonomies where local observational data precede mathematical modelling (see earlier already Fassnacht, 2000; Bruner, 1974; 462).

Another glance beyond hypotheses arises from the experience of **hermeneutics**, the science of text interpretation, which avoids altogether the monological-operational language of hypothesis testing (Gadamer, 1975; 3ff). All text interpretation is guided by **prejudice** and **a cultivated attitude of openness**. This allows expectations to be frustrated and the reading to be inspiring. The need for prejudice arises from the impossibility of a prejudice-free approach; all reading starts from a lived pre-understanding, not something you put there [i.e., hypo-thesis]. The hermeneutic circle moves from a naïve start and what seems very strange reading to a second step, where the unfamiliar is assimilated and rendered familiar; only a third cycle opens to the text on its own terms as if in dialogue with another person. New understanding arises from a **fusion of horizons**, when the reader experiences the text as an enriching encounter with transformative effect. The initial prejudice can be inhibiting and reproductively confirming your prejudices; or reading a good book can inspire and turn you into a different person. The hermeneutic experience rehabilitates tradition and authority as

productive constraints (ibidem, 277ff). The interpretive enthusiasm must chisel away at the canon of tradition and the dogmas of authority in order to avoid the madnests that arise when working without constraints and under the guidance of 'anything goes'.

While hypothesis testing is a monological strategy seeking ego-centrally effective interventions in the world through control and predictions, hermeneutic efforts are oriented dialogically towards reaching a common understanding among people who engage the world as if it were a text that speaks (Habermas, 1989; Blumenberg, 1986).

In summary, we can say that the term 'hypothesis' marks a space of possibilities in several ways. Firstly, it is the uncertain starting point from which firmer conclusions might be drawn as in public reasoning. Secondly, the hypothesis is the logical end point of a process of firming up on reality through scientific enquiry. Thirdly, hypothesis is a point of transition that calibrates perception and social interaction. And finally, hypotheses might be part of a **monological ritual** of reasoning that distracts from reaching a common understanding about the world and its utopian possibilities.

References

- Barnes J (1984) The Complete Works of Aristototele – the revised Oxford translation, Princeton, PUP, vol1 and vol2.
- Bauer MW and G Gaskell (2008) Social Representations Theory: a progressive research programme for Social Psychology, *Journal for the Theory of Social Behaviour*, 38, 4, 335-354.
- Blumenberg H (1986) *Die Lesbarkeit der Welt* [the readability of the world], Frankfurt, Suhrkamp Wissenschaft
- Brentano F (2015 [1874]) *Psychology from an empirical standpoint*, London, Routledge Classics.
- Bruner JS (1974) *Beyond the information given – Studies in the psychology of knowing*, London, George Allen & Unwin.
- Daston L (2005) Fear and loathing of the imagination in science, *DAEDALUS*, Fall, 16-30.
- Debrouwere S and Y Rosseel (2021) The conceptual, cunning, and conclusive experiment in psychology, *Perspectives on Psychological Science*, 1-11. Doi: 10.1177/17456916211026947
- Eco U and T S Sebeok (1988) (eds) *The sign of three – Dupin, Holmes and Pierce*, Bloomington, Indiana University Press.
- Fassnacht G (2000) Bemetology – towards continuous (self-)observation and personality assessment, in: Bauer MW & G Gaskell (eds) *Qualitative Researching with Text, Image and Sound – a practical handbook*, London, Sage [pp108-129].
- Feyerabend PK (1981) *Problems of Empiricism – Philosophical papers vol 2*, Cambridge, CUP.
- Frigg R (2010) Models and fictions, *Synthese*, 172, 251-268.
- Foppa K (1965) *Lernen, Gedächtnis, Verhalten* [learning, memory, behaviour] – Ergebnisse und Probleme der Lernpsychologie, Koeln, Kiepenheuer & Witsch
- Gadamer HG (1975 [1960]) *Truth and Method*, 2nd edition, London, Sheed & Ward
- Geigerenzer G (2020) How to explain behaviour? *Topics in Cognitive Science*, 12, 1363-1381.

- Geigerenzer G, Z Swijtink, T Porter, L Daston, J Beatty and L Krueger (1989) *The Empire of Chance – how probability changed science and everyday life*, Cambridge, CUP.
- Glass DJ and N Hall (2008) A brief history of the hypothesis, *Cell*, 8 August, 378-381.
- Groner, R, M Groner and WF Bischof (1983) Approaches to Heuristics: a historical review, in: Groner R et al. (eds) *Methods of Heuristics*, Hillsdale NJ, Lawrence Erlbaum Associates Publishers, [pp1-18].
- Groner R (1978) *Hypothesen im Denkprozess [hypothesis in thinking processes] - Grundlagen einer verallgemeinerten Theorie auf der Basis elementarer Informationsverarbeitung*, Bern, Hans Huber Verlag.
- Gregory RL (1980) Perceptions as hypothesis, *Phil. Trans. R. Soc. Lond. B* 290, 181-197.
- Habermas J (1989) *The theory of communicative action (two volumes)*, Cambridge, Polity Press.
- Harre R (1985) *The philosophies of science – an introductory survey*, Oxford, OUP [2nd edition].
- Kahneman D (2011) *Thinking - fast and slow*, London, Penguin.
- Koehler W (1925) *The mentality of apes*, NY, Harcourt Brace.
- Lewin K (1931) The conflict between Aristotelian and Galilean modes of thought in contemporary psychology, *Journal of General Psychology*, 5, 141-177. [reprint in Gold M (1999) *The complete social scientist - a Kurt Lewin reader*, Washington, APA, pp37-66]
- Lewin K (1936) *Principles of Topological Psychology*, NY, McGraw-Hill.
- Lloyd GER (1990) *Demystifying mentalities*, Cambridge, CUP.
- Miller GA, E Galanter & KH Pribram (1960) *Plans and the Structure of Behaviour*, London, Holt, Rinehart & Winston.
- Piaget J (1972) *The principles of genetic epistemology*, London, Routledge & Kegan Paul.
- Peters D (2013) Resistance and rationality: some lessons from scientific revolutions, in: Bauer MW, R Harre & C Jensen (eds) *Resistance and the Practice of Rationality*, Newcastle, Cambridge Scholars Publishers [pp11-28].
- Popper KR (1972) *Conjectures and refutations*, 4th revised edition, London, Routledge & Kegan Paul.
- Prinz W (2012) *Open minds: the social making of agency and intentionality*, Cambridge MA, MIT Press.
- Psillos S (2011) An explorer upon untrodden ground: Peirce on abduction, *Handbook of the History of Logic*, vol 10, 117-151.
- Rescher H (1964) *Hypothetical reasoning*. Amsterdam, North-Holland Publishing Company.
- Scheel, AM, L Tiokhin, PM Isager and D Lakens (2020) Why hypothesis testers should spend less time testing hypothesis, *Perspectives on Psychological Science*, 1-20.
- Scheler M (1960[1925]) *Wissensformen und die Gesellschaft [types of knowledge and society]*, *Gesammelte Werke Bd. 8*, Bern & Muenchen, Francke Verlag.
- Suppes P (1983) Heuristics and the axiomatic method, in: Groner R. et al. (eds) *Methods of Heuristics*, Hillsdale NJ, Lawrence Erlbaum Associates Publishers, [pp79-88].

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