9. Full induction

Content

Educator:

- "Johnny, do you already know the letters of the alphabet?" - "Yes master."

- "What letters come after the 'A'?" - "All the others, master."

Where the teacher thought of listing the individual letters with the word "which," Jantje gets away with giving a summary answer.

9. 1 Summative induction (distributive and collective).

Bibl. st. Ch. Lahr, *Cours de philosophie*, Paris, 1933-27, 591; J.M. Bochenski, *Philosophical methods in modern science*, Utr./Antw., 1961, 145v. (Full or summative induction). Another name is "Aristotelian induction."

- *Induction* is sampling either in a collection (distributive) or in a system (collective) in order to form an understanding about the collection or system.

- *Summering*. This is the "summa" (sum or totality: all or whole) making of the samples done that one thus adds or enumerates.

- *Definition*: Done equal samples, if each noted separately, are summarizable in their sum which thus constitutes the summary induction. What one has established of each member of a

collection (or of each part of a system), - each member (or part) taken separately, that one summarizes by asserting it of all the members (or parts) together. The so-called "generalization" or "generalization" (4) here amounts to a summary.

Distributive summative induction.

Aristotelian induction. Aristotle, 1 Anal. 2: 3, gives the following example.

- Prephrase 1: Man, horse, mule - each taken separately - live long.

- Prephrase 2: Well, (in the then interpretation) they are (the only) animals without bile.

- final sentence: So all bile-free animals - taken collectively - live long.

We have supplemented Aristotle's text with "each taken separately" and "taken together." The term "summative" (Lat.: "summa", sum, summary) captures perfectly: one summarizes. The expression "the only animals without bile" has the same scope as "all animals without bile." Therefore, in preposition 2, the term 'd' only' can also be replaced by 'all'.

One sees that Aristotle takes three samples in the animal world, denotes these three as the full set of samples and sums them. He calls such' reasoning 'induction' without more. Hence the name. The reasoning stands or falls on the completeness of the enumeration.

Think of a teacher who, after reviewing 20 students' homework separately, grades them all together. The number is the sum of all individually. This is represented - 'pictured' - in the number 20.

- Pre-sentence 1. The homework of student 1, 2, 3, ... 18, 19, 20 has been reviewed.

- Pre-sentence 2. Well, those 20 students are the only (= all) students in this class.

- final sentence. So all the homework has been checked.

Bochenski 's formulation: This one comes to the same thing but in different words.

Prephrase 1. a, b, c, ... z, are elements of the class k.

Prephrase 2. Well, a, b, c, ... z are all its elements and they each exhibit the property e.

final sentence. So all its elements exhibit the property e.

In short, from each individually one reasons to all collectively which amounts to a summary induction which, as Aristotle rightly says, leads to an abstract (i.e. summary) understanding.

Collective summative induction.

So far the formulations gave only distributive examples (involving collections). Now a collective example (concerning a system).

- Pre-sentence 1. The first room, the second room, the kitchen, the seating area, the storage area and the basement were each tested separately for their cleanliness.

- Pre-sentence 2. Well, the first room, the second room, the kitchen, the sitting room, the storage room and the cellar are the only (all) parts of the house.

- final sentence : So all portions of the house were tested for their cleanliness.

9. 2 Amplificatory induction (distributive and collective)

The role of summering in amplifying or knowledge-expanding induction:

Summative induction is thus knowledge summative. However, amplificative induction extends summative induction to (all) other cases.

1. Distributive amplificatory induction.

- Prephrase 1.: If all water at sea level boils at 100° C., then this water and that water.

- Prephrase 2. Well, this water and that water boils at sea level at 100° C..

- final sentence: So all water boils at 100°c

Thus, one has reasoned from the tested fact that so far all water at sea level boils at 100° C to the expectation that all water at sea level will boil at 100° C. In other words, one extends to all testable cases. But this has no sufficient reason without the foundation, i.e., the tested cases summarized in a summative induction. So one does not scorn the summative or complete induction. On the contrary, one prepares from the tested cases to the testable cases. That is real positive science.

2. Collective amplificatory induction.

Take again the example already cited and supplement:

- Pre-sentence 1. The first room, the second room, the kitchen, the seating area, the storage area and the basement were each tested separately for their cleanliness.

- Prephrase 2. Well, the first room, the second room, the kitchen, the sitting room, the storage room and the basement are just a sample of even bulkier portions of the house.

- final sentence : So it may be assumed that all parts of the house are housebroken.

From the already tested rooms one prepares to the testable rooms, to the whole of the house. As already mentioned, this can be called a "generalization. Let us still mention that the house is seen as a set of rooms with different functions. If, for example, we were talking about an office building in which all the rooms were the same, the example would not be one of collective amplificative induction. Rather, it would be a distributive amplificative induction: no longer a system, but a collection of equal rooms of which only a part was tested in order to conclude that the whole building is neat.

Similarly: checking the checklist before a plane takes off. The pilot is instructed to check that the most vital parts of the plane - not all of them, that would be impractical - are working properly. If such is the case, then the plane may take off. From the proper functioning of some parts, the necessary ones, one decides that all parts are satisfactory. That all the parts together form a whole, and thus an aircraft is a system, clearly shows cohesion.

9. 3 Summering at Plato

E.W. Beth, *The Philosophy of Mathematics from Parmenides to Bolzano*, Antwerp/Nijmegen, 1944, 36v., cites a very important text by Plato (*Philebos* 18b/d) which we reproduce here.

Sound:

(1) "When someone (...) noticed that sound was infinitely diverse,

(2.1) he was the first to recognize that vowels in that infinity were not one but many and again that there were other sounds which, though not vowels, nevertheless possessed a certain sound value and that there was a certain number of these too (Note: semi-vowels). He further distinguished a third kind of letters which we now call "consonants. Thereupon he divided the consonants until he distinguished each of them separately, similarly the vowels and the semi-vowels until he knew the number of these also. He called "each" of these and "all together" "letters.

(2.2) But he recognized that none of us could learn 'one' of them 'separately' without 'all the others,' and he considered that this was a connection that made them 'all' into 'one.' Consequently, he assigned them one science which he called 'grammatikè'".

We italicize those terms that clearly indicate summative induction: first "each separately," then "all together" and "each separately" and "all others" (the latter betraying dichotomy or complementation). Summering indeed begins with individual constituents within him to then bring them out of that multiplicity into unity by uncovering connections, viz. 'likeness' and 'consistency'.

The text (2.1) envisions a universal collection of "letter sounds," which can be divided into three subsets (vowels / semivowels / consonants). This betrays distributive summering. However, what exactly was meant by the semivowels then is difficult to ascertain today.

Noting that sounds are infinitely diverse implies comparing them with each other. Indeed, such is the means of cognition par excellence and the basis of all ordering. Comparing leads to analogy, to establishing similarities as well as differences. A well-defined view of the didactics of initial reading lets children compare pairs of words. For example, the words "wheel" and "wheel" show total similarity, the words "wheel" and "window" total difference. Comparing both word pairs teaches children nothing new about the code hidden in a phonetic or phonological language system. However, it is different with word pairs like "hare"/"vase," "hare"/"rooster," or "hare"/"house. These show analogy: both similarity and difference. Such pairs, when carefully listening to the sound image comparatively and looking at the scripture, allow of these words to be broken down into what is similar and what is different. This ultimately leads to the discovery and identification of "each individual sound. Herein also lies a form of complementation: to recognize a sound (and its associated graphic sign) separately means to carry out a dichotomy in the collection of sounds (and signs): the separated sound (or sign) is considered on its own, as opposed to all other sounds (or signs).

Plato's text (2.2) also pays attention to coherence and sees not only the collection but also the system of letter sounds (one of them with all the others). This is collective summering. In other words: the multiplicity is brought to sameness and to coherence unity.

Also in any serious reading teaching, "the way back" is made. Loose sounds (letters) are put back together to form a word. Each meaningful word indeed forms a coherent system in itself in which the parts are given their proper place. If that place of each letter is not respected, the system that each meaningful word is also lost. The word then indeed loses its meaning.

The strong Greek philosophical traditions, in their relentless search for order in the totality of reality, have always looked for such similarities and correlations.

Pythagorean thinking consisted in discovering in a multitude of elements the unity, the common characteristic, or from different parts the whole. Parmenides, too, sought in the many, the one. About the whole of reality, about all that ever was, now is, ever will be, he spoke terms of "multiplicity/unity." Thus a doctrine of order or "harmology" emerged. This also refers to Plato's basic concepts of "all / whole" which are reflected in his interpretation of the "world" and the "idea.

The Platonic idea 'Narcissus': Let's illustrate this with an example that summarizes a multiplicity in a distributive and in a collective way and thus represents first summative and later amplificative induction: Let us take for instance a daffodil and examine attentively the structure of the one specimen I hold in my hand: I carefully observe e.g. the trumpet-shaped flower. I compare with a second specimen.

And so on. In my mind (Plato speaks of the "nous") the human concept forms 'narcissus' that gradually evolves into a universal, all (possible) narcissist concept. Plato calls such a movement of thought 'stoicheiosis' and it does so as a collection of 'elements'

(= specimens, "images") that all exhibit the common characteristics of "the" daffodil (the abstract concept). At the same time, I note that daffodils prefer to occur in groups, e.g. via tuber expansion. That realization is again "stoicheiosis. Now, however, not as grasping the collection, but as discovering a system: daffodils mostly occur in groups and this via tuber expansion. We could discover many more 'parts' of the biotope or system belonging to the daffodil.

Conclusion: such movement of thought, such stoicheiosis leads to "generalization" the discovery of the general in the different specimens, and to what we have already called "generalization," the discovery of the whole of the system regarding the narcissus. Two complementary forms of totalization or formation of a concept of totality. That totality in its two forms is the idea (here: 'the' narcissus), insofar as it comes through in our concepts.

Notice the restrictiveness of the last sentence "insofar as the idea comes through in our concepts." For in the Platonic sense of the word, the "idea" is not the understanding we have of it. It is what makes our understanding possible.

We further explore the habitat of the daffodil. Suddenly we see a deformed specimen. How do we know that she is deformed? Because after all the previous, after generalization and

generalization, the universal concept : the happy daffodil (in Platonic terms : "the good daffodil") has appeared in our minds. If one wants : the ideal, perfect narcissus. That ideal also refers to "the idea" narcissus. Note : not our understanding of that ideal is the idea. The idea only makes that ideal understanding or design possible. Only thus do value judgments become possible.

In summary : general concept (all (possible) daffodils); (the interconnection of all (possible) daffodils among themselves); ideal concept (the perfect daffodil). Behold what the stoicheiosis of the natural phenomenon 'narcissus' gives us. We summarize this in the name (onoma, Lat.: "nomen") "daffodil. We summarize this in the abstract term "the daffodil." But the idea is neither. Why not? Because the idea is something that before any human intervention is always already at work in natural phenomena and that is ... as a "model" in the sense of paragon or "exemplary cause" (as it was also said in antiquity). Just as it is said that a girl "models" when painting a goddess or making a goddess statue. This is why Plato says that the idea is pre-existent (preëxistent). Returning to the narcissus: according to Plato, the "idea" narcissus existed before the flower of the same name could show itself on earth. The idea narcissus is the possibility condition, the model for the existence of the earthly specimen. All earthly daffodils form themselves after that ideal, tonal idea that somewhere in a transcendental world "was from the beginning, is now, and will be there forever."

'Holism' is a rather recent term for a very old thing. A definition: "A totality exists when some singular fact can be situated in a collection or in a system." Plato 's thinking is radically "holistic. The perspectives "all / whole" recur again and again, without his explicit 'theorizing' about it. One cannot think "all that is one" (understand: the unity in the multiplicity, i.e. the totality) without its "parts" and vice versa. In *Filebos* 15d / 17a, Plato confirms that statement: "Nothing can be thought unless as the well-defined number of its well-defined 'parts'." Reading Plato, one regularly has the impression that collection and system are somewhere intertwined Similarity and coherence, the basic concepts of collection (common property) ... and system (common whole), seem intertwined in such texts. Before examining the language (as a whole), he fathoms the words, for a language is "made up" of words. But words consist - are constructed - of parts, and so these must first be analyzed into the elements of the sounds laid down in writing. These are the starting point for linguistic fathoming.

Knowledge: Brief reference should be made to P. T. van Dorp, *Aristotle on two workings of memory (Platonic reminiscence)*, in: Journal of Philosophy 54 (1992): 3 (Sept.) 457/491, especially 478/489. Steller distinguishes with Aristotle and with his teacher Plato two types of knowledge and immediately of memory. Memory plays a decisive role and decays into:

- **(1)** 'mnèmè' (Latin memoria) which 'remembers' an accumulation of all sorts of unordered loose data and

- **(2)** 'mnèmosune' or 'anamnèsis' (Latin: reminiscentia) which organizes the multiplicity of memory of individual data according to similarities and coherences (and thus

summons). With the latter memory, the question arises whether one would not translate "mnèmosune" or "anamnèsis" (and even the ancient Greek term that we translate as "memory") much more correctly with "expanded consciousness," for both terms exhibit an all-encompassing "horizon" within which the day-to-day loose data are given a place as if that "horizon" were a kind of comprehensive configuration (collection and system of places).

Science for Plato relies on and elaborates what he calls 'stoicheiosis' (summative induction): only if somewhere a multiplicity is brought to similarity and coherence is there an object that interests science. Immediately it becomes clear that the term 'stoicheion' (Latin: elementum) denotes a loose data (which may be brought to preconceived loose data) and that the term 'stoicheiosis' (Latin: elementatio) denotes that activity which, paying attention to loose data, directs to their similarity and coherence.

9. 4 Dilemmatic closing speech

Bibl. st. W.C. Salmon, *Logic*, Englewood Cliffs (N.J.), 1963, 32/34 (The dilemma). In Ancient Greek "dilèmma," two lemmas facing each other, i.e. argument in which a preposition includes model and counter-model. Salmon cites two types.

1.The final sentence is either the same or a different one.

- 1.1. Same afterthought.

GG "Either p or -p".

GV: "What follows from that?".

SOL: "If p, then r. If -p (not p), then r". - Application. GG: a sentry failed to raise the alarm but it is unknown (not GG) whether or not he was on post. GV: "What follows logically from that?". SOL.: "If ye were (p) on post, then ye did not do your duty

(r). If thou wast not on post (-p), still thou hast not done thy duty (r)". In other words, guilty in all cases.

- 1.2. Multiple final sentence.

GG: "Either p or q".

GV "What follows from that?".

SOL.: "If p. then r. If q, then s".

Application.

GG: someone appears in court, accused of a void traffic violation in which he is not at fault, with a dual option, confess or not confess, with a problem in either case.

GV "What follows from that?"

SOL: "Either I confess (p), but then I am sentenced to a sum of money for a mistake I did not commit (r). Either I confess no guilt (q), but then I still have to spend the whole next day in jail (s)." Note: Whether the after sentence is so plural depends on the full wording because the man may conclude, "In any case: I am not so well off."

(2) "In any case.

A strict dilemma stands or falls with the summative induction on the matter: the enumeration of possibilities (in the case of a dilemma: two; in the case of e.g. a trilemma: three) must be complete. Otherwise, there is simply no "either, or."

- *Application.* Ch. Lahr, *Cours*, 528. Epicurus of Samos (-341 /-271; founder of Epicureanism) is known for his dilemma.

- Either with the dying body, man's soul also perishes. In that case, all feeling life ceases. So it feels nothing at death.

- Either she survives death. In that case, she escapes the woes of embodied life and is happier than before. So after death she lives through an increased state of happiness. "In any case" the soul need not fear death. Logical:

one same afterthought.

Lahr's rebuttal. Epicurus' enumeration (induction) of possible situations is incomplete (not summative), viz. (third possibility). "Either it survives death but so that, for reason of unscrupulous deeds, it is subject to regret and remorse. In that case the soul fears with reason death and what comes after". Instead of the same final sentence, there are now two!

Lahr was a Christian. But pagan contemporaries of Epicurus also believed within the axioms of their religion in a post-death judgment. A GG that apparently Epicurus did not want to take into account.

So one does not pronounce "in all cases" too quickly in cases of dilemmas! For that term expresses summering.

9.5. This chapter summarized:

Induction is taking samples in a collection or in a system in order to form an understanding about this collection or system.

- Reasoning in a collection from each element individually to all collectively one arrives at a distributive summative induction. One summarizes all elements together.

- Reasoning in a system from all parts separately to the whole system one arrives at a collective summative induction. One summarizes all the parts.

- Reasoning in a set from the tested elements to all testable elements, one arrives at a distributive amplificative induction. One extends the tested elements to the testable elements. One generalizes.

- Reasoning in a system from the tested parts to all testable parts, one arrives at a collective amplificative induction. One prepares the tested parts to the testable parts. One "generalizes.

Summering with Plato implies that he pays attention to both similarity and coherence. The multitude is brought to unity, both in terms of similarity and coherence.

Organizing reality involves seeking in the multiplicity of elements the unity, the similarity, and in the parts the whole, the coherence. Thus the Platonic idea "narcissus" summarizes a multiplicity in distributive and in collective ways. Distributive insofar as one specimen is compared to other specimens, collective insofar as it concerns its biotope and the connection of the narcissus with its wider environment.

Holism involves seeing the unity in the multiplicity. One does not think the whole without the parts and vice versa. A singular data is situated in a collection and in a system. And conversely, one sees the collection and system composed of singular data.

Similarly, the term 'mnèmosune' or 'anamnèsis' is much richer than the term 'mnèmè' because the former term, as "expanded consciousness," organizes the multitude of loose data in memory according to similarities and coherences. In this sense, the term "mnèmosune" is meaningfully related to the ancient Greek "stoicheiosis.

Another dilemma hinges on summative induction: the enumeration of the capabilities must be complete.