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PHENOMENOLOGICAL DESCRIPTIONS AND PHYSICAL-GEOMETRICAL DESCRIPTIONS

Translated by Ugo Savardi

1. 1912, the year in which Wertheimer published *Experimentelle Studien über das Sehen von Bewegung*[1], the theoretical root of Gestalt phenomenology, is also the year when, according to Watson, behaviourism began "in overt form". Since then, many points of friction have emerged dividing the Gestalt method of direct observation from behaviouristic operationalism, in the realm of theory as well as in the application of experimental techniques. The two paradigms have undergone profound changes over the decades almost to the point of dissolution, and it is certainly not possible to say now, after so much work has been done, that the reasons for the conflict between them remain the same.

There is however one question that still pops up during discussions as it did in the past and it's a methodological question. It's a dilemma that is as old as the hills, inherited from a time when experimental psychology was still unthinkable and which in short can be summed up as follows: Is it or is it not possible to describe the immediate data of experience?

For a behaviourist, the immediate data of experience are not accessible by means of descriptions; the material on which scientific research has to be carried out is made up of the descriptions themselves, and these take on the form of a special kind of behavioural response, and so are considered as one of the terms of the "stimulus-response" relationship.

The facts directly under observation are excluded from scientific inquiry and remain nothing but good opportunities for poetry and metaphysics.[2] Behaviourism arose with the intention of eliminating introspection from among the tools used in scientific investigation. If we say that the directly ascertainable world is an object of introspection, that world ceases to be of importance as soon as the value of the introspective method is called into question.

2. On the other hand, if we want to study perceptual events as the units of analysis in a given context, that is, if we want to discover the laws of interconnection that regulate the perceptual structure of events being experienced here and now, then the object of investigation should be the observed events and their phenomenal characteristics (even though these are difficult to describe) rather than a group of "protocol propositions" linked to constellation of stimuli.

What should be of interest for the student of perception is the direct evidence of an event, which is itself always distinguishable from (and often largely independent of) the other facts that subsequently lead to the description of this event. The connection between an event and its description is, if anything, a different problem for psychologists to study.

It is true that I never see anything through another person's eyes (if this sentence even makes any sense) and I have to make do with what others tell me they see. But since there is no way I will confuse this sheet of paper in front of me with the description of this paper that I might give if asked, I'm not allowed to treat these two things as if they were one and the same.

If our task is to analyse the properties of perceptual events insofar as they cannot be confused with the properties of other concomitant psychological events (such as judgment formation or the search for an appropriate description), we must be allowed to consider the objects directly given to us as the starting point of a scientific investigation into the makeup of experience – regardless of the theoretical difficulties related to the concept of introspection.

3. In the course of this chapter I will try to focus on some aspects of the problem raised by those who are in doubt about whether it is possible to describe direct experiences.

Not only orthodox behaviourist have denied that, because of their essentially qualitative nature, the phenomenal data can be expressed, but so too have representatives of various quite different philosophical schools of thought. Bergson's point of view, for instance, seemed to imply that descriptions formulated in the language of physics and geometry are necessarily unfaithful because of the inflexibility of the words used relative to the plasticity of the "immediate data of consciousness" – but I suspect that Bergson was overestimating this plasticity. For radically different reasons, some influential members of the Vienna Circle argued that elementary statements about the facts, i.e. "protocol propositions", are the ultimate data for scientific experience.

It should be noted that this assumption does not simply consist of claiming that many aspects of an immediate experience are difficult to express with the words that dictionaries put at our disposal, which is so true as to be little more than a banal remark. It rather consists of saying that there isn't even a single aspect of what we directly experience that we can describe in a univocal, unambiguous way.

4. As regards univocality, according to this line of thought, language that describes objective things (as in physics) would constitute a much better basis. Indeed the language of physics can in all respects be made as precise as one wants it to be. The reason why it is possible to describe physical facts clearly is that they can be reduced to measurements and these measurements – which do not contain anything qualitative – can be connected to each other in relationships that are, in turn, univocally defined in terms of mathematical concepts. The concepts of mathematical physics have often been referred to as models of logical constructions that are capable of providing an interpretation of empirically ascertained facts and can at the same time describe their structure without ambiguity. Anyone who has sufficient mathematical training understands, for example, the formula that expresses the trajectory of a projectile in the same way as others with a similar training.

Since the beginning of psychophysics, students of the psychology of perception have often tried to express the results of their studies by means of formulas in which some of the symbols denote certain directly or indirectly ascertained facts and in which the symbols are connected to each other in well-defined relationships.

This use of formulas might go to show that students of psychology aspire to reach the same degree of clarity and univocality in the expression of the laws they have discovered as physicists do. However, if we try to analyse the meaning of any of these formulas, we will quickly discover that the interpretation of the symbols denoting some features of direct experience depends on our agreeing about the meaning of the symbols denoting the "objective" aspects. Leafing through the chapters on sensation and perception in any psychology textbook, all of the formulas we find contain at least one symbol which, rather than referring to a psychological event, refers to an operation applied to the stimuli.

5. Let's take the simplest example, that is, psychophysical formulas.

These may be of greater or lesser complexity, but in the end they always consist of a one-many correlation between certain values on a physical scale of measurement and those on an empirically based evaluation scale, which is based on the limits of differential thresholds.

Now, although our knowledge about the physical world always stems from measurements carried out on directly accessed realities in the phenomenal world, it is in effect the values of these physical scales of measurement that teach us something about differential thresholds and not vice versa. There must be agreement on what a centimetre, a gram or a second is in order to understand the results of an enquiry that evaluates the length of something, measures the duration of the phenomenal present or compares two weights.

After all, physical scales of measurement are much more fine-grained than the human ability to discriminate, both in spatial and temporal quantities as well as weights, brightnesses, pressures, etc., in such a way that a single value on the "psychic" scale corresponds to many values on the physical scale, while a single value on the physical scale corresponds to one and only one on the psychic scale. This implies that subjective estimates provide ambiguous information about the values of a certain event which can be operationally determined whereas an operationally measured value gives us unambiguous information about the amplitude of a differential threshold (that is, about an estimate referring to one fact of direct experience).

6. In phenomenological research the formulas used to represent systems of relationships are more complex, since the point here is not only to express a group of one-many relationships between changes affecting a simple distal stimulus and changes occurring in the domain of direct experience (as, for example, a "sensation" that has been purposely isolated from any functional context).

Relationships that appear in a formula summarising a phenomenological law are of either of two types: some of these relationships refer to the more or less complex characteristics of the constellation of stimuli, while others show how different characteristics of the perceived event are functions of each other.

Korte's laws[3] represent a good example of this. As is well known, they express the conditions for a stroboscopic movement to be perceived. If we analyse the structure of these laws, we realize that some symbols denote ratios concerning the "objective situation", or rather, the relative projective properties on a given plane that is ideally located at the observer's viewpoint. Here are few of these symbols:

s = spatial distance between stimuli
i = intensity of stimuli
e = exposure time of stimuli
d = differences in the intensity of the lights
t = inter-stimulus interval etc.

But others denote characteristics that refer exclusively to the phenomenal aspect, for example:

v = velocity of the movement
or the "opt" index which denotes the optimality of the conditions.

It should be noted though that some of these symbols are ambiguous. The intensity of the lights, for example, or differences in intensity, might be considered as much phenomenal as physical properties. According to Korte's study, it would seem that the author means the latter, i.e. physical. But this sounds a bit strange since it is the apparent intensity that is decisive in stroboscopic movement, and it is hard to believe that a change in the objective intensity, so long as it remains well below the differential threshold, could be responsible for a change in how one sees a stroboscopic movement.

A certain perplexity might arise from the consideration that Korte calculated the speed of a stroboscopic movement as one would for a physical object in motion; that is, as a function of the distance between the points of light which are alternately illuminated (the path) and the temporal interval between when the first light is switched off and the second light is switched on (time).

Leaving these rather obvious considerations aside, it is not difficult to see how the observations discussed above concerning psychophysical laws hold for phenomenological laws as well: also in this case, we need to agree on a certain number of concepts related to elementary physics to grasp the meaning of Korte's formulas. From a strictly phenomenological point of view, stroboscopic movement is a movement like any other. It is no less real than other movements which we call "real". It is our knowledge of the relationships between the phenomenal fact and some of the objective conditions that allows us to establish a system of functional interconnections among the phenomenal features of the event under examination.

7. At this point, we need to attempt a definition – at least by way of an initial approximation – of what we mean by "objective conditions". Although many people are led to think otherwise, the issue of the connections between the structures of transphenomenal reality and direct reality is no less important for psychologists of perception than it is for epistemologists or philosophers of knowledge. If an understanding of phenomenological and psychophysical laws, set out by investigators into sensations or perceptual organization, depends on our agreement on the definition of the concepts that describe physical reality, then this problem is extremely important for psychology.

Obviously I do not intend to resolve this now. I just want to make one point that may be of some interest and which will hopefully simplify the concept of an "objective situation" rather than make it more complicated.

I think we need to keep in mind that when we talk of an "objective situation" or use similar expressions, we do not really mean to refer to the type of facts that we imagine when studying physics, but rather to a group of operations that we perform on the phenomenal world. Suppose that we want to study the Aubert-Fleischel phenomenon, i.e. the apparent change in velocity that affects an object moving with an objectively uniform motion; this change occurs when, after letting the object pass across our visual field, we suddenly follow it with our gaze, or conversely. To perform this experiment, we need an objectively constant motion. The technical devices at our disposal allow us to obtain uniform motion with varying degrees of approximation: it is clear enough that we will not be interested in the most perfect device that an Institute of Applied Mechanics might provide us with. A fair approximation of uniform motion suffices for our purposes since any irregularities in movement will be much smaller than we can detect. Beyond certain limits, which are actually quite wide, no attempt at greater precision will lead to any advantages: for the purposes of our experiments, we can already speak of an objectively constant motion that is guaranteed to be such by certain operations.

We are fully aware of the difficulties of measuring the exactly the wavelength of a ray reflected from a surface with certain chemical-physical characteristics. But we can still work on various problems concerning colour perception using relatively simple objective measurements, which might not satisfy a physicist interested in photometry. In this case too, beyond certain limits, greater precision would not lead to any significant advantage.

Similar observations could be made about the production of sounds in studies on the perception of acoustic events.

For these reasons, the language and concepts of classical mechanics and Euclidean geometry suffice for investigators of perception to be able to describe the objective and projective correlates of the experimental conditions they are examining. It would never occur to anyone to represent the movement of an object with respect to an observer in terms of relativistic mechanics. In other words, an "objective situation" is an abstraction or rather an idealization of a concrete fact that can be measured, more or less precisely, by means of physical devices and appropriate operations. The symbols that appear in our formulas and that refer to particular features of this objective situation denote precisely concepts or abstractions of this sort. And we can accept these formulas without elaborating on them too much because we all implicitly accept that the notions of elementary physics and the rules, axioms and definitions of Euclidean geometry are univocally definable.

8. None of this, however, says anything for or against the impossibility of describing phenomenal data. I believe, in any case, that simply by bearing in mind what I have said so far, and by adding some further observations regarding the form of our experimental demonstrations, that we will be allowed to claim that some features of direct experience are genuinely describable, provided that it is admitted that we can understand those symbols that in our formulas denote the terms of the "objective situation". In short, I think that agreement on the meaning of these symbols (which basically means agreement on some concepts of elementary physics and the propositions of descriptive and projective geometry) implies also the describability of some salient features of direct experience.

Anyone who is familiar with research carried out in a laboratory will have noticed that experimental demonstrations frequently have a somewhat curious, even paradoxical, form. This pardoxicality may sometimes be emphasized, the experiment becomes a bit of a spectacle and those spectators who are not in the know are puzzled by the strangeness of what is happening to them. Those of us who work on perception are very familiar with the prejudices and resistances of individuals who are invited to take part in an experiment. They already imagine that they will see or hear something that "is not there" or something that nobody would expect.

There are actually some reasons for doing this. Since time immemorial the distinction between reality and appearance (even if this distinction is drawn in a way that would no longer satisfy anybody today) was based on appeal to cases where human observers had directly perceived something that subsequently – thanks to the application of some objective check (in the sense given above) – turned out to be different from what it initially seemed to be. Democritus and Aristotle emphasized the importance of "illusions of the senses" no less than the British empiricists or William James – even though they did not fully understand their importance. After all, the very distinction between reality and appearance seems to be possible thanks to the existence of these paradoxical situations: in a world where there were no "deception of the senses", a distinction between objects as described in the world of physics and objects as described in the world of psychology would appear artificial in theory and impossible from an operational point of view.

9. It is worth remembering, at this point, that the air of paradoxicality that invests the experimental situations I'm referring to can be understood in at least two different ways. And it is important to keep these separate. One might want to call paradoxical situations those situations where both the terms of an antithesis belong to the level of immediate experience. A suitable example of this is the apparent dilation of a rotating spiral. This phenomenon is well known: if a spiral rotates with a constant angular velocity in the opposite direction to the one in which it is coiled, it seems to expand ever outwards. At one and the same time, an observer sees a) that the spiral continuously expands; and b) that the area containing the spiral (e.g. a disk) does not increase in size.

However, other much more common events are also said to be paradoxical, when the phenomenological description of a certain perceptual experience differs, more or less substantially, from the description of the corresponding constellation of stimuli. Or – to put it in Musatti's words – when "the phenomenal result obtained contrasts with the situation of the stimulus".

Musatti[4] analysed in detail these types of "paradox", claiming that their paradoxical character plays an essential role in rendering the experiments carried out in the phenomenology of perception a form of demonstration. Musatti's remarks seem to be of great importance and so I will linger for a moment to summarise them.

In logic and mathematics there is a demonstrative procedure similar to those known as *reductio ad absurdum*. These allow one to obtain by deduction the affirmation of a proposition starting from its negation. This was used by Euclid in the demonstration of the twelfth proposition of the ninth book of the *Elements*, and by Cardano (in a different form) in his demonstration of proposition 201 in his *De Proportionibus*. It was also used by Saccheri and Leibniz. It is not easy to explain the structure of this form of reasoning in a nutshell without analysing some examples in detail. For the sake of our discussion it is enough to know that, under certain conditions, it is possible to start from a negation $\sim p$ to obtain the affirmation p.

Musatti points out that a somewhat analogous demonstrative procedure is used in many experimental studies on perceptual structures, and he cites the classic ones on the perception of identity and perceptual constancies.

10. It would be hard to convince a non-specialist interlocutor that the identity of an object is a question of the functional structures related to the phenomenal presence of that object, if we simply show him/her that an object, which remains materially the same while being subjected to some changes, continues to appear to be the same object. The interlocutor would react saying: "I see that it is the same because I know that it is the same".

For this reason, Musatti says, ever since the first studies on phenomenal identity, researchers have made use of stroboscopic movement or of other special conditions such as the tunnel effect. In these cases it cannot be said that the object is the "same" and thus it becomes clear that "sameness" (or "identity") is indeed a phenomenal property, which can be accounted for only in terms of perceptual organization.

He also mentions that perceptual constancies have been subjected to a similar technique: figural and kinetic transformations of physical objects and their projective properties do not correspond to the figural and kinetic transformations directly ascertained by the observer.

As happens with identity, in this way the structural nature of perceptual constancies becomes evident, and it is clear that these constancies cannot be interpreted by means of a complex system of one-one relationships holding between elementary physical events and "sensations", as it was tempting to imagine a century ago and as, in line with common sense, many are still tempted to imagine even today.

In common with Saccheri and Leibniz's logical procedure, this kind of experimental demonstration is characterized by the following pattern:

1) an event is set up operationally excluding the properties *x, y, z*; and the result is precisely
2) an event that observably possesses the properties *x, y, z*.

11. The theoretical importance of the paradoxical form of these demonstrations is, in my opinion, not to be underestimated. Experiences set up in this way demonstrate two things at once. First, they show the particular laws governing the phenomena we are interested in; and second they prove that those laws cannot be reduced to a set of elementary stimulus-sensation relationships. We can take this second feature of these demonstrations for granted if we assume that in any case all the laws that we find are like this. And this is true. But it would be better not to assume this – we should derive it instead from the very form by which the laws of a given phenomenon are proved.

If an experience does not involve a paradox and, for example, we simply show someone that when a square moves away from their eyes what they see is in effect a square moving away, then we can always explain this by introducing a postulate such as, for instance, Lotze's postulate of "local signs".[5] This easy way out however becomes impossible when an observer sees a square moving away from them but knows that in reality it is shrinking on a plane that is not moving relative to them.

But the paradoxical situations studied by Musatti teach us yet another moral which is relevant to the topic of our discussion.

In these situations the paradoxicality that allows us to demonstrate not only the laws regarding the phenomenon but also the phenomenological nature of these laws is due to the fact that some geometrical or physical characteristics of the objective event are not present in the domain of direct experience or are present in a different form. That is to say that some systems of geometrical or dynamic relationships, when applied to the event understood as stimulus, lead to true propositions; but when applied to the direct ascertaining, they lead to false propositions; and vice-versa.

The paradox, in short, is due to the fact that the same language – that of elementary physical geometry – is used to describe the structure of an experimental situation both from an operational point of view (the distal constellation of the stimuli, its projective properties and the corresponding proximal stimulation) as well as from a phenomenological point of view.

As occurs with a description of the physical characteristics of an event, where we do not literally refer to what "really", "materially" exists (because a physical-geometrical representation is an idealized model of a concrete fact), likewise a phenomenological description of physical, dynamic and geometric features (its phenomenal weight, how it moves, its speed, its shape, its apparent centre of gravity etc.) is a reliable and univocal representation of some aspects of a directly perceived fact. This representation, of course, abstracts the selected characteristics from among the other complex phenomenological features – normally – belonging to the event.

But the important point here is this: when referring to a direct experience of mine, I say "I see a square moving away from me", I say it with the same meaning as I might write a similar sentence in a text on mechanics. Phenomenological language in such a case is no more blurred or imprecise or "poetic" than is geometric language when it is used to describe transphenomenal events. Protocol propositions of this kind are excellent for describing the nature of a visual experience and have the same intersubjective communicability that must be attributed to geometrical propositions used to refer – for instance – to the bodies that are the subject-matter of mechanics.

12. There is a reason for all of this, and psychologists of perception should delve deeply into its nature.

In short: if we admit that we can understand each other about the meaning of the symbols that in our formulas refer to the physical conditions of the fact that is taken to be a stimulus (that is, if we accept some ideas from elementary geometry and physics), we cannot then say that we are unable to understand the meaning of the propositions that refer to the physical, geometrical and dynamic features of the objects around us, even if these features are accompanied by other less easily describable, because qualitative features.

As we have already seen, we do not need more elaborate geometry than Euclid's (or one based on a different axiomatic system). What we use in studies regarding psychology of perception is, in the final analysis, Euclid's geometry. Nor do we need more advanced dynamics or kinematics than those of Galileo and Newton in order to describe, for example, motion. But Euclidean geometry (the language of which is also used in elementary mechanics) is based on definitions – the *horoi* (definitions) of Euclid's *Elements* – which, despite being purely formal definitions, are also descriptions of how things appear immediately. I'm tempted to say that they are descriptions of how the "drawings" exemplifying the structures of elementary geometric entities appear. Right from the start, this geometry is a language based on phenomenal experiences.

Euclid[6] states that:

1. A point is that which has no part.
2. A line is a breadthless length.

6. The extremities of a surface are lines.
13. A boundary is that which is a limit of something.
14. A figure is that which is contained by a boundary or boundaries.

Although all more complex geometrical entities are derived deductively in accordance with certain rules from the simplest ones, these simple geometrical entities are sufficiently congruent with our visual experience of the corresponding graphic representations for us to be able to talk of the geometrical aspects of direct experience in a coherent geometrical language.

This might seem to many to be a bold claim. It has always been said that elementary geometrical entities do not correspond to experience because they are nothing but an audacious abstraction.

But I think that a few considerations will suffice to make us change our minds about this scholastic prejudice. With respect to points (understood as visible entities without parts), there is a passage in Hume which in effect constitutes an experiment in the phenomenology of perception:

> Put a spot of ink upon paper, fix your eye upon that spot, and retire to such a distance, that, at last you lose sight of it; it is plain, that the moment before it vanished the image or impression was perfectly indivisible. It is not for want of rays of light striking on our eyes, that the minute parts of distant bodies convey not any sensible impression; but because they are removed beyond that distance, at which their impressions were reduced to a minimum, and were incapable of any farther diminution. A microscope or telescope, which renders them visible, produces not any new rays of light, but only spreads those, which always flowed from them; and by that means both gives parts to impressions, which to the naked eye appear simple and uncompounded, and advances to a minimum, what was formerly imperceptible.[7]

The distinction between physical ingredients (rays of light) and visibility is very clear here and according to Hume's line of argument the fact that something may not have parts and yet exist in perception becomes self-evident. This analysis dates back to 1737 and in fact was contained in the first part of the *Treatise* – too old and stuffy to be useful in a discussion involving scientific psychologists.

But this argument as it stands was taken up again in 1921 by Rubin (the discoverer of figure-ground organization) in a little-known pamphlet called *Die Flechenfigur, die Kontur und der Strich*.[8] In this case it was applied to a line, which, according to Euclid, is a length without breadth. Draw a line on a piece of paper and then move the piece of paper away from you. Just before the line disappears you will discover that you can no longer distinguish the right hand edge from the left hand edge (if the line is vertical) or distinguish the upper edge from the lower edge (if the line is horizontal). If you look at it close up, the line actually has a thickness, but when it is far away it in fact appears to be a length without breadth.

The phenomenological basis of Euclid's definition number 13 can be found in the analyses of the properties of contours carried out by Gestalt psychologists, in particular by Koffka in the *Principles*. These properties relate to the unilateral function of a margin that separates an area from its background and the bilateral function of a margin that connects two shapes with a boundary in common.

If in the end the meaning of geometrical propositions is based on some specific features of direct experience, then it is clear that geometrical language (as well as being suitable for describing a constellation of stimuli) will also be suitable for the physical-geometrical features of directly experienced objects.

Thus, although some qualitative features of the perceived world are difficult to describe (such as, for instance, expressive qualities or the "meaning" of perceptions), it cannot be said that direct experience can never be a subject for description.

If the foregoing considerations are correct, I do not think we can endorse the view of orthodox behaviourists as being the only one that is acceptable and capable of satisfying the requirements of an unassailable research method.

Insofar as the objects that we experience directly possess geometrically and physically well-defined and stable characteristics they can be the starting point of our investigations without this implying that we will run into the spectre of introspectionism. The very language of geometry and physics allows us to talk about these experiences without ambiguity and so guarantees the intersubjective validity of our descriptions.

Notes

1 Wertheimer, M. (1912). Experimentelle Studien über das Sehen von Bewegung. *Zeitschrift für Psychologie*, Bd. 61, Heft 1 (1912), pp. 162-265.
2 Tolman, E. C. (1951). Psychology versus immediate experience. *Collected Papers*. Berkeley, CA: University Press.
3 Korte, A. (1915). Beiträge zur psychologie der Gestalt und Bewegungserlebnisse, *Zeitschrift für Psychologie*, *73*, 193–296, at p. 277.
4 Musatti, C. (1958). Di alcune analogie fra problemi della percezione e problemi logico-matematici. *Rivista di Psicologia*, *52*, 1–20; reprinted in Musatti, C. (ed.) (1964). *Condizioni dell'esperienza e fondazione della psicologia*. Firenze, Italy: Giunti-Barbera.
5 Translator's note: "The concept of a local sign is similar to that of 'positional information' in developmental biology. Rudolf Hermann Lotze (1817–1881) put forward the theory of local signs to explain how positional information was transmitted from the retina to the motor system. Under the influence of Kant, he thought that local signs could not, in themselves, be spatial. He therefore postulated that they were qualitative properties of the nerve fibres themselves. Later, he modified this theory in favour of the notion that local signs were related to the sense of effort associated with eye movements" (Morgan, M.J. (2002) Lotze and the theory of local signs. ECVP '02 Abstract: *Perception* Lecture, p. 3.)
6 Euclid, *Elements of Geometry*, Book I, Definitions.
7 Hume, D. (1737). *A Treatise of Human Nature*. D. Fate Norton and M.J. Norton (Eds). Book I, Part II § I. Oxford: Oxford University Press, 2000.
8 Rubin, E. (1921). *Die Flechenfigur, die Kontur und der Strich*. Copenhagen: Gyldendalske-Boghandel.