

THE RISE AND FALL OF THE GRAZ SCHOOL

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The gestalt movement is generally considered to have begun with EHRENFELS' (1890) seminal article *On 'Gestalt Qualities'* (see ASH, 1982, 1995; BOUDEWIJNSE, 1996; HARRINGTON, 1996; MACNAMARA & BOUDEWIJNSE, 1995). Thirty years later, in 1920, Wolfgang KÖHLER published *Die physischen Gestalten in Ruhe und in stationären Zustand [The Physical Gestalten in Rest and in Immobile Condition]*. The gestalt notion, with its implications, was by then well thought out. Generally, the Berlin gestalt school of Max WERTHEIMER, Kurt KOFFKA and Wolfgang KÖHLER was painted as *the* successor of EHRENFELS' thought. The works of the Graz school - Alexius MEINONG, Stephan WITASEK and Vittorio BENUSSI - however, pre-date those of the Berlin school by about 10 years. Furthermore, the first article in which a member of the Berlin school *clearly* articulated his own position was written by KOFFKA in 1915, and it gave a detailed exposition and a well-thought-out criticism of the Graz school. The Berlin school developed, or at least presented itself, partly in contrast to the Graz school. This warrants a discussion of the Graz school, which also has an interesting lineage. BENUSSI was not an Austrian citizen; he carried an Italian passport. After World War I, therefore, he was forced to leave Austria for Italy, where Cesare MUSATTI became his principal student. MUSATTI, in turn, taught Fabio METELLI and Gaetano KANIZSA. KANIZSA, like BENUSSI, would propose a theory of perception in which two levels of processing are identified and which recognizes that the organism adds to the perceptual data.

The importance of the Graz gestalt school also becomes clear after reading Karl BÜHLER's (1913) *Die Gestaltwahrnehmungen [The Gestalt Perceptions]*, in which he reported his experiments carried out around 1910 under the guidance of Oswald KÜLPE at the Psychological Institute of the University of Bonn. Of importance for us is a chapter titled *Theoretical discussion of „gestalt qualities“ in psychology* (pp. 5-31), wherein BÜHLER commented on contemporary research on gestalt perception. His comments read as a who's who of gestalt psychology at the beginning of this century. For the modern reader, two facts pop out from his treatment: (1) the prominent position of the Graz gestalt school and (2) the absence of KÖHLER and KOFFKA. The only member of the Berlin school mentioned is WERTHEIMER, and that can be explained by the fact that WERTHEIMER's research was carried out un-

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der KÜLPE, BÜHLER's superior. BÜHLER's account makes it clear that at the beginning of this century, MEINONG and his collaborators, and not the Berlin gestalt school, played an important role in formulating gestalt psychology. Bertrand RUSSELL (1904) published three articles on MEINONG in the prestigious journal *Mind*, what is another indication of the predominance of the Graz school around 1900.

MEINONG

EHRENFELS' *On 'Gestalt Qualities'* appeared in 1890. One year later, Alexius MEINONG discussed it in *Zeitschrift für Psychologie und Physiologie des Sinnesorgane*. He wrote: „I know of a reader of the essay under review who is suspicious that outer mental realities lie behind the gestalt qualities“ (p. 252). It is difficult to know what MEINONG's reader meant by „outer mental realities.“ Since the unnamed reader, however, could not accept this notion, he (or she) disagreed with EHRENFELS' theory. MEINONG could understand the reader's suspicion, but thought it wrong and a misinterpretation of EHRENFELS' term „gestalt quality.“ MEINONG, however, did not give any reason why the reader's understanding was wrong. So, he did not say that EHRENFELS agreed with him, nor did he provide other arguments - based, for instance, on EHRENFELS' text - to substantiate his position. Thus, MEINONG gave no proper refutation of a reading of the text contrary to his own interpretation. Note that EHRENFELS' article is well written, and the term „gestalt quality“ could very well have been aptly chosen.

In order to appreciate MEINONG better, it is worth looking at a distinction already made by Thomas Aquinas. Aquinas (ca. 1252), in his *On Being and Essence*, differentiated being from essence. Being, he said „has two meanings“ (p. 30). It denotes „something positive in reality“ (p. 30), or „signifies the truth of a proposition“ (p. 30). Note that in the latter case, the proposition does not need to reflect an external reality. That „affirmation is opposed to negation“ (p. 30) is true, but we cannot point to this truth as we can point to tables and chairs. Some things do exist in external reality, while other things exist, but not out there, not in the real world.

The other term in AQUINAS' essay, essence, denotes the quiddity, the (Aristotelian) form, the nature. „The essence is what is signified through the definition of a thing“ (p. 31). If something does not need to exist in outer reality, then its essence surely needs not have real existence. Aquinas went even further, writing:

„Matter, then, cannot exist without form, but there can be form without matter: Form as such does not depend on matter. There is no necessity, then, that the essence or quiddities of these substances be anything else than form“ (p. 53).

And a few pages further:

„Every essence or quiddity can be understood without knowing anything about its being. I can know, for instance, what a man or a phoenix is and still be ignorant whether it has being in reality. From this it is clear that being is other than essence or quiddity“ (p. 55).

In other words, essence has to be separated from (material) existence. MEINONG agreed with this view. In a later work, *On the Theory of Objects*, MEINONG (1904) noted that one can talk about Santa Claus, the Golden Mountain, a round square, or a riot which did not take place. We know that Santa Claus lives in the North Pole and brings presents to children; the mountain is made of gold; that square is round (and therefore cannot exist); and that the rebellion against the authorities did not take place. Like AQUINAS, MEINONG held that objects of knowledge do not need to exist. He named them „ideal objects,“ and he supported his notion further by pointing to the figures dealt with in geometry. These figures - lines without width, perfect circles, infinitely small points, and so on - do not exist. Nonetheless, their properties can be known, which is a position AUGUSTINE had already taken (see, for instance, AUGUSTINE'S *Confessions*, ca. 395). MEINONG also noticed that „difference“ between objects, or their „similarity,“ is non-existent as well. Difference or similarity as such is not something concrete, out there. SMITH (1988) said it as follows:

„We cannot, MEINONG argued, *see* the „difference“ or the „similarity“ between two colours in the same sense in which we can see the colours themselves. Similarly we cannot *see* higher order objects such as geometrical shapes, velocities, distances. For such objects are *ideal*, like numbers and concepts, that is they are outside space and time, and what is outside space and time is not capable of being grasped in acts of sensation“ (p. 22).

MEINONG (1904) wrote in his *On the Theory of Objects* that it is self-evident that one cannot have a mental presentation, a judgement or idea on its own, but that there has to be something presented, judged or thought. MEINONG got that notion from his teacher, Franz BRENTANO. BRENTANO argued that all phenomena of the mind are characterized by an intentional relation with something as an object. So, hearing does not occur without something to be heard, remembering without something to be remembered, and so on. That object can be mental or physical; it can even be an illusion or fiction. One can remember yesterday's anger, imagine Pegasus and even believe that one will be extremely rich one day. BRENTANO (1874) noticed that one cannot have reference without presentation: „It is impossible for conscious activity to refer in any way to something which is not present“ (p. 148). BRENTANO was one of the great interpreters of Aristotle and therefore, not surprisingly, we can trace this notion all the way back to Aristotle: „When the mind is actively aware of anything it is necessarily aware of it along an image“ (*De Anima*, 432 a7). There must be an image before awareness of objects - also of objects that exist outside the mind - occurs. This notion precedes John LOCKE's 'simple and complex' ideas.

In Germany, Johann Friedrich HERBART (1776-1841) developed a model in which presentations [*Vorstellungen*] push each other out of consciousness or pull other presentations in consciousness, depending on the circumstances, but always according to specific mathematical rules. Presentations are, according to HERBART, the basic units of mental life, and we find a similar notion in EHREN-FELS' and BRENTANO's work. That idea would be challenged at the beginning of the 20th century by the gestaltists. WITASEK and BENUSSI would suggest that the mental unit is sometimes changed when included in a greater complex. A presentation, then, is no longer an unchangeable mental „atom,“ the solid building block from which ob-

jects in consciousness are being built. The Berlin gestalt school would go much further and would altogether deny that mental experience can be explained by mental elements. It would also point to the importance of brain processes - in contrast to the workings of mental units in the soul - in the formation of conscious experience.

MEINONG tried to understand BRENTANO's characterization of the mental as having reference to an object. If there can be no seeing without something to be seen, then what is that something? MEINONG's research led him to the object theory, which he formulated in a book explicitly aimed at celebrating the 10th birthday of the psychological laboratory he founded in Graz, where he was a professor. Theory, however, is not the right word. MEINONG proposed a new science, the science of objects, of objects as such, and its subject matter is any object towards which one may potentially have an intentional relation. It is the science of all possible mental representations, of all potential or possible objects of knowledge. It is an „a-priory science which concerns everything which is given“ (MEINONG, 1904/1960, p. 109). Quite remarkable! MEINONG launched a new science at an occasion intended to celebrate the progress of the science of psychology.

We already saw that we know and can talk about essences that cannot exist in the real world and therefore can never be perceived through the senses. What, then, is the foundation of these thoughts? How do we know them? MEINONG's answer is that we produce them ourselves. That explanation seems reasonable; objects like a round square exist, but are not 'out there,' ready to be perceived by the senses. This leaves as the most obvious explanation that we create them ourselves.

That, however, was not EHRENFELS' view, and his opinion needs some elaborating. EHRENFELS wrote that: „Gestalt qualities are given in consciousness simultaneously with their foundations, without any activity of the mind specifically directed towards them“ (p. 112). EHRENFELS explained his notion with the example of a melody. A melody is made up of distinguishable perceptual elements, the notes. These notes are the foundation of the gestalt quality. EHRENFELS, however, believed that with those notes there is something else given to consciousness, namely the gestalt quality. Thus each note has its image, or presentation, in consciousness, but together with these presentations, another presentation appears, that of the gestalt quality. The latter presentation stands for the melody as a whole. When we play the same melody again, but with different instruments and even in a different musical key, completely different notes reach the ear and, as a consequence, different images or presentations reach our consciousness. These different tones, however, evoke the same gestalt quality, according to EHRENFELS, and therefore we recognize the same melody.

EHRENFELS believed the concept of gestalt quality could also explain our ability to recognize similarity, for instance when we recognize the composer of a new song because we heard his or her songs before, or when we notice two men, who are complete strangers to us, as brothers.

„Thus we recognize the composer of a melody through its similarity with other, familiar melodies, though without our being in a position to specify more precisely in what this similarity consists. We recognize the relatives in a family in a resemblance

manifested in their whole physical nature and bearing, a resemblance which often stubbornly resists analysis into relations of identity between individual constituent parts" (p. 106).

EHRENFELS defined similarity as an immediate perceptual phenomenon; not a conceptual one, because analysis fails to come up with the reasons of the resemblance. He explained recognition of the same tune in different performances through the notion of gestalt qualities. Then he applied this concept to explain how we hear similarities between different melodies and notice family resemblances.

Let us now return to MEINONG's (1891) treatment of EHRENFELS' article. MEINONG argued that a tone, or its counterpart in the visual domain (a part in space), will result in a content in a person's consciousness. Several contents (presentations) may be joined together. Just like several atoms may form a molecule, so can several presentations form a new mental entity. MEINONG's notion contains a strong atomic element, which he shares with HERBART, BRENTANO and EHRENFELS. MEINONG believed that the binding of mental elements into a complex requires an activity by the person, and he used the word 'complex' to refer to the mental presentation so produced. Certain contents together will more or less automatically create a complex in consciousness. That is, for instance, the case when tones form a melody and (spatial) parts a figure. MEINONG noted that those complexes are often one of observation [*Beachtung*] or naming [*Benennung*]. Complexes that are not created so easily and where more effort on the part of the person is needed can often be expressed through a relation term. An example of such a complex is a comparison between two entities. MEINONG, in other words, recognized a gliding scale of complexes, from the ones that are very easily evoked to those that need more effort. Note that there is no room for EHRENFELS' gestalt quality in MEINONG's theory, because EHRENFELS' gestalt quality does not depend on an activity on the part of the observer, but is rooted in the individual presentations. To come back to the analogy of atoms forming a molecule, in EHRENFELS' opinion the mental atoms or presentations themselves evoke the band - the gestalt quality - that binds them together into a whole. That notion of gestalt quality is replaced by MEINONG through an effort within the person working on the contents provided by outside stimuli and creating from these contents complexes such as melodies, figures or comparisons. MEINONG did not explain how complexes are created. It is, however, clear that it is through an unconscious operation upon the basic mental data.

MEINONG indicated that he was well aware that his view went against that of EHRENFELS. He acknowledged that, according to EHRENFELS, the gestalt quality is given with the foundation. That can only mean that the gestalt quality appears in consciousness without any effort. MEINONG, in other words, said that EHRENFELS did not propose a production theory of gestalt, since the gestalt quality is not produced. This, of course, places his opposition to the view that EHRENFELS' gestalt qualities are extra-mental, or arise somehow independent of the mind, on weak grounds.

EHRENFELS said that we perceive a gestalt quality. That means we also perceive directly what belongs or does not belong to the whole. The gestalt quality belongs to the tones of the melody, not those coming from the background. Hence, we perceive which tones belong to the melody and which sound is background noise. MEINONG must have disagreed. Since he believed that the complex is produced by the observer, he must also have held that the observer is actively involved in forming the boundaries of that complex.

Let us look at what the implications of „perceive“ versus „produce“ are for an explanation of the phenomena of similarity and difference. EHRENFELS explained them through the agency of a gestalt quality. Similarity or difference is something we perceive. Remember, one recognizes two men as brothers because their gestalt qualities are similar. MEINONG disagreed. He held that by comparing A with B, one produces a new entity that includes A and B. In that new presentation, A and B have a certain relation to each other, namely of sameness or difference. Judgement, according to MEINONG, is based on inner production and not on the perception of gestalt qualities. That new, produced presentation has as its foundation the presentations of the entities being compared. Thus, by comparing two entities, a complex mental entity [*Tatbestand*] is created through which more basic entities stand in a certain relation to each other and, of course, also to the complex.

Relations are one-sided dependent, namely on that which is related. A relation cannot exist without the entities that are related. One cannot have equality or difference without things being equal or different. One cannot have a family without family members. The other way around, naturally enough, is not true. An entity can exist without it having a particular relation to others. LINDENBERG (1980) wrote: „Relations are dependent elements; fundamentals are independent“ (p. 96).

Production Theory

MEINONG singled out a special type of ideal object, which he defined as objective. „An objective is thereby treated as a complex of some kind, with the object belonging to it as a kind of component“ (p. 85). For instance, if blue is an object, then not blue is an objective. Not not blue is a further objective, and so on. When we have a mental object A, the negation of A, not A, is as good a mental object as A. We can judge A to be true or false, the same for not A. We can become angry or happy about A and also about not A. (The negation theory of LA PALME REYES *et al.* (1994) is based on a similar insight.) Another example is a unicorn. If we start with unicorn, the next step could be to assert the being of a unicorn, a statement we judge to be false, while the not being of a unicorn is true. Notice that how the elements are related falls not under the realm of causality, as HERBART, for instance, believed, but under the realm of logic.

There is, theoretically, no end to the range of objectives, but there is a start: the object. The objective has no real existence. Still, it is an object of knowledge. We can, for instance, judge it to have being or to fail to have being. Indeed, as MEI-

NONG remarked, „A must be ‘given’ to me in some way or other if I am to grasp its non-being...“ (p. 85). So, we can judge the sentence, „After the election, there was no riot,“ to be true. Some objects cannot even exist, such as a round square. We have seen that sameness and difference are also ideal objects. We can judge things to be the same or different; we can even measure their difference or perform other mathematical operations on them. That, still, does not make sameness or difference real objects.

RUSSELL (1904) concluded from MEINONG’s definition of a complex: „A complex implies a relation, and *vice versa*; it is more than the collection of constituents, in virtue of the combining relation“ (p. 210). And a little further he concluded: „What distinguishes our complex is not any constituent at all, but simply and solely the fact of relatedness in a certain way“ (p. 210). A complex, according to RUSSELL, forms a whole and is not a mere collection of its constituents; a complex, then, is a gestalt. Just as a gestalt can be differentiated from a mere collection of items by being a whole, complexes differ from other mental objects by the criterion of forming a unity. Further on in his series on MEINONG, RUSSELL tried to come to grips with the nature of the band that binds the constituents together. „Complexes, as soon as we examine them, are seen to be always products of propositions: One might be tempted to describe them, rather loosely, as propositions in which the truth or falsity has been left out“ (p. 346). His theory hesitantly formulated and not sure of himself, RUSSELL seems to offer as the solution that the constituents are placed in the over-arching framework of a proposition. In his third article, however, RUSSELL wrote: „Among objects there are two kinds, the simple and the complex. The latter are characterised by a certain kind of unity, apparently not capable of definition, and not a constituent of the complexes in which it occurs“ (p. 512). But that does not exclude his earlier suggestion to consider complexes as propositions.

„We now know that those objects which exist, and even those which have being, run far short of the sum-total of objects of knowledge“ (p. 87). MEINONG logically remarked that the potential objects of knowledge far exceed the real existent ones. At this moment, one may wonder what this has to do with the human mind, or with psychology. That, I hope, will become clear later on, when we discuss the works of MEINONG’s students and collaborators BENUSSI and WITASEK.

Since MEINONG published his proposal to celebrate the 10th year of his own psychological laboratory, he had to indicate what the task of psychology should be. One thing was clear, psychology could not deal with all the potential objects of knowledge, since those belonged to his new science. MEINONG restricted psychology to occupy itself „only with real psychological events“ (p. 91), in other words, the objects which are actually present. MEINONG distinguished the science of objects - presumably a highly abstract science - from psychology - a more empirical science. This division recalls a division KANT (1800) made in his *Logic*, between logic on the one hand and psychology on the other. (John MACNAMARA always explained that division to his students, and I am indebted to MACNAMARA for what follows.)

KANT (1800) started with the claim: „Everything in nature, in the inanimate as well as the animate, happens *according to rules*, although we do not always know these rules“ (p. 13). Understanding, according to KANT, also employs rules and, furthermore, we can come to know them: „the *understanding* in particular is bound in its acts to rules we investigate“ (p. 13). Understanding, KANT wrote, „brings the presentations of the senses under rules. It therefore is avid to seek rules, and satisfied when it has found them“ (p. 13). Understanding is an entity in the human organism that brings the images of the outer and inner world into a meaningful whole, or into a statement that relates images with one another. Understanding stops searching for rules when it is satisfied that it has found them. Here, KANT believed, resides the cause of error in human understanding; it namely stops too soon (see p. 59). Now KANT asked himself: „*According to what rules does it [understanding] proceed itself?*“ (p. 14) How do we know the rules that regulate human understanding? KANT’s answer reads: „These rules we can think by themselves, e.g. we can think them *without their application or in abstracto*“ (p. 14). Or again: „Insight into these rules can therefore be gained a priori and *independently of any experience*“ (p. 14), by „reflect[ing] solely upon the use of the understanding itself“ (p. 14). KANT, it seems, believed that humans can reflect upon rules without taking into account objects (presentations) to which the rules apply and that would exemplify the rules. To give an example, we can, according to KANT, reflect on grammar without the aid of concrete language. Moreover, KANT believed that one cannot gain knowledge of the necessary rules from life, observing: „*How thinking occurs and how it is* under manifold hindrances and conditions“ (p. 15) will only lead to knowledge of the rules that apply in specific situations. The rules of logic, on the other hand, always apply, regardless of the situation, and are therefore taken from „the *necessary* use of the understanding, which one finds, without any psychology, in oneself“ (p. 16). Then, in the same vein, we cannot reach knowledge of grammar by studying particular utterances, because that would only lead to an insight to rules that govern these utterances.

Just as KANT’s logic is about necessary rules while leaving aside their empirical implementation, MEINONG’s science of objects is about mental objects without experiential data. Notice that KANT’s logic, MEINONG’s science of objects and psychology are all about knowledge and, therefore, must be rooted in human experiential data. Since they share a common foundation, it seems likely that scholars who are interested in one of these subjects must co-operate to further each and every one’s scientific field, just like linguists and psychologists work together.

BENUSSI

MEINONG’s theory is highly abstract and formulated in very general terms. Fritz HEIDER, a student of MEINONG, wrote of his teacher (1970):

„MEINONG, in his passion for clearly articulated theories, developed the idea of his friend and former student [namely EHRENFELS] and said that there is a two-step process. The first step leads from stimuli to the sensations, and the second from

sensations to the gestalt. The first step is mainly determined by external sources - that is, by the stimuli - while the second goes on by virtue of an internal factor, an act of the subject, which he called the act of production" (p. 133).

It is not immediately obvious from *On the Theory of Objects* that MEINONG's ideas may be summed up as HEIDER did. Notice also that the ones who called themselves gestalt psychologists (the Berlin school) did not accept this view. HEIDER's quote is, however, clearly valid for MEINONG's collaborators, WITASEK and BENUSSI. They translated MEINONG's thoughts into a psychological theory. WITASEK was for years the *de facto* head of the psychological laboratory in Graz. He may be considered MEINONG's first assistant. BENUSSI experimented very often in the laboratory at Graz and can be counted as MEINONG's second assistant. We get a good idea of BENUSSI's psychology from his contribution to the collection celebrating 10 years of psychological experimenting in Graz. Another good explanation of BENUSSI's position is an article written by KOFFKA (1915), who abstracted from BENUSSI's (experimental) work the main theoretical notions of the Graz school. KOFFKA's description is accurate. Thereafter he gave a detailed criticism of BENUSSI's notions and introduced the views of the Berlin school or, in his words, the *WERTHEIMERSchen Gestalttheorie* [the gestalt theory of WERTHEIMER]. Note that the Berlin school started to publicize its viewpoints about 10 years after the Graz school, and the Berlin school identified itself partly in opposition to the Graz school.

BENUSSI's contribution to his laboratory's collection is titled *On the Psychology of Gestalt Perception*. The word 'gestalt' is used here in its modern meaning: a whole made up of parts, irrespective of whether those parts are colours, tones, space elements or others. EHRENFELS always used the word 'gestalt' together with 'quality,' as in 'gestalt quality' (disregarding one or two exceptions). MEINONG used 'gestalt' on its own, without adding the word 'quality,' but restricting the use of the word 'gestalt' to the visual modality. A gestalt is then a visual figure, something occupying space, a unity made up of spatial elements. It is the visual counterpart of a melody, a unity of tonal elements. In spite of the difference between MEINONG and BENUSSI on the use of the word 'gestalt,' one must still conclude that BENUSSI followed the train of thought of his teacher and boss obediently.

BENUSSI started his article with the claim that a melody (a tonal gestalt) and a figure (a spatial gestalt) by their nature have no external reality, that they are ideal. Implicit in BENUSSI's statement is MEINONG's idea that there are basic, fundamental presentations and ones that are the result of further inner processing of those presentations. The resulting presentations, or the outcomes of the processing stage, do not exist in the world. BENUSSI held that tones and colours really exist. Melodies and figures, on the other hand, are constructed from the sensations, which, in turn, are caused by stimuli that reach the senses. Melodies and figures are not really out there; they are ideal objects, unable to affect our senses.

MEINONG pointed out in *On the Theory of Objects* that objects that cannot be perceived by our senses must be constructed in ourselves. BENUSSI applied the same logic to our perception of gestalten. It cannot be denied, of course, that one experiences melodies and figures. But they cannot stimulate our senses, and there-

fore one has to obtain them through different means. Since one does not receive them from the outside, there remains only one option: One has to make them inside. In BENUSSI's psychology, a gestalt takes the same position as an objective in MEINONG's theory. A gestalt is the result of further processing of (more) basic presentations. Certain energies have an impact on the senses, resulting in presentations of colours, spaces, tones and so on. These presentations are comparable to the objects in MEINONG's system. The next step in MEINONG's system is the production of objectives. In BENUSSI's psychology, the next step is the production of a new presentation, such as difference (for instance between two colours). But the next one can also be the production of a gestalt, like a melody or figure. MEINONG's system of basic objects, objectives and more elaborate objectives becomes in BENUSSI's hands essentially a system with two phases. The first one is that of the senses, and the second one of production.

KOFFKA (1915) concluded that according to BENUSSI, a melody and a note are descriptively the same, but functionally different (see p. 15). It means that in inner perception, one cannot differentiate between the origin of a note and of a melody. We hear them, they are both mental objects. Functionally, however, they differ. A note is directly evoked by the auditory system in consciousness, while a melody cannot become conscious directly, since it is the result of a production process. KOFFKA (see p. 16) also made it clear that, according to BENUSSI, the production process is a mental process and should not be confused with a physical one. The production process works on notes, colours and so forth. Thus its building blocks are mental objects. It is not a further processing of physical effects of stimuli reaching the senses that leads to gestalt perception in BENUSSI's theory. Here lies an important difference with the Berlin gestalt school, which related the gestalt experience not to further processing of mental presentations but to brain states, or physiological processes taking place higher up.

BENUSSI noted that errors can occur in the sense phase as well as in the production phase. A wrong presentation of the outer reality may take place in both cases. The errors that can arise in the first phase, that of the senses, are stimulus bound. They are the result of the interaction between the stimulus and its sense. Subjective factors inside the observer play no role in the appearance of these errors. They are related to the particular sense organ. Errors happening in the production phase are more independent of the energy reaching the senses. BENUSSI offered the MÜLLER-LYER illusion as an example of an error of the second type. He explained that illusion by assuming that in the production of a gestalt, the parts coming from the senses affect each other, causing some of them to be slightly altered, creating the illusion. These errors, in other words, are caused by a change in the elementary, sensory presentations. And, since they arise at a later stage, these errors are more independent of the sense organs, and subjective factors play a role in their formation. As a consequence, they can be influenced by the condition of the observer (such as how tired he or she is), by the attitude of the observer, former experiences, and so forth. It was thus in explaining the MÜLLER-LYER illusion that BENUSSI departed from HERBART's notion that the basic units of mental life are stable and un-

changeable. BENUSSI could only explain the false impression by assuming that sometimes the units may be deformed.

KOFFKA (1915) summarised it accurately (see p. 18). The sense impressions are (1) a prerequisite of the gestalt, and (2) they are the components of the gestalt. The form of a part as component, however, can differ slightly from the form it had as sense impression, because the production process may change the form of the parts when putting them together in a gestalt.

WITASEK

WITASEK discussed gestalt perception in his (1908) textbook *Foundations of Psychology* [Grundlinien der Psychologie] and in his (1910) *Psychology of Visual Space Perception* [Psychologie der Raumwahrnehmung des Auges]. Both works implement MEINONG's ideas in the area of psychology. The striking similarity to BENUSSI's work is therefore not accidental. From BENUSSI's and WITASEK's work, one can only conclude that MEINONG exercised a profound influence on the thoughts of his collaborators.

BRENTANO's influence is felt immediately at the beginning of WITASEK's textbook, where WITASEK differentiated the mental from the physical, based on the criterion that the mental has reference. Psychology, according to WITASEK, should be the study of mental facts. We also find MEINONG's influence in that passage. MEINONG was, like KANT, of the opinion that psychology should only be concerned with facts, and WITASEK seemed to agree.

In *Psychology of Visual Space Perception*, WITASEK (1910) stated that the impressions of the senses are grouped together into complex unitary objects, and it is the latter objects that we experience (see p. 292). The grouping together of sense impressions, however, is not a mere ordering of them. Rather, that grouping is a distinguishable mental process resulting in a new and unique mental formation. WITASEK's notion of perception becomes clear from the names he gives to parts of the perception process. The grouping gets the name of 'production of presentation,' and its results 'produced presentation.' Inner activity, or production, thus leads to a new presentation, the produced presentation. The last presentation can become conscious in its own right.

The question then arises, how does the mind know which gestalt to produce? WITASEK did not deal explicitly with this problem, but I think his answer would be: It depends on the task at hand. If one is interested in the difference between two stimuli, then, naturally enough, one will produce a complex that can answer the question regarding the difference.

WERTHEIMER (1925) did not mention the Graz school by name, but surely the following explanation of the gestalt phenomenon applies to them: „Still 'some' 'higher processes' amount to what is actually given - partial sum - which attaches to the sum of what is given, and makes it happen“ (p. 11). WERTHEIMER rejected this

explanation, which can be clarified using the example of a melody. A melody is not directly perceived, according to the Graz school; only the individual notes are. Those notes are, in WERTHEIMER's words, what is actually given, the partial sum. That implies that something else must be responsible for our capability to hear a melody. That something else has to be attached to the tones and make it happen. Make what happen? The melody. And that something is, of course, the production process. KOFFKA (1915) noted too that in the Graz view, strictly speaking, the presentation of a gestalt has no outside stimulus; a gestalt is indirectly evoked by outside stimuli. In his textbook *Foundations of Psychology*, WITASEK (1908), explaining the hearing of a melody, wrote that the ear produces the experience of single notes. These must be grouped together to form the experience of a melody. That grouping is not a mere ordering, or a putting together side by side of those notes. Instead, the grouping is a process that uses as input the individual notes and produces as output a gestalt. This process can be smooth, easy and unconscious, or more difficult. But its result is always a new presentation. That presentation is thus something new, extra to the sense elements, something which the subject has added to the sense elements and which stands side by side with those elements. WITASEK believed that the sense impressions are further worked on, resulting in more complex presentations of gestalt, movement and so forth. Both the latter and the former, the sense impressions and the gestalt, can become conscious. Perception, in this view, is the result of an inner process. Then, the whole is more than the sum of its parts (received from the senses). There is something extra added to the parts, namely the production process. He denied that gestalten affect the sense organs. There are, according to him, no outer stimuli that cause the sense organs to perceive a gestalt. Neither does the impact of a stimulus on the sense organ evoke the presentation of similarity or difference. Inner action is necessary for these presentations to arise.

WITASEK argued that the sense impressions as well as the presentations resulting from the production process can become conscious. The element and the gestalt are both conscious. WITASEK explained why we can perceive individual sense impressions as well as gestalt impressions. His framework makes it possible for sense impressions to arise without the experience of a gestalt, a difference and so forth. The other way around, however, is not possible. We cannot detect a difference between elements without at least two elements there, nor a gestalt without some parts. He thought there were different production processes working at the same time. One can, for instance, notice the difference between two colours - the result of one production process. Or, one sees movement - the result of another production process. One can also perceive a gestalt - the result of another production process. He even acknowledged the existence of several production processes leading to different gestalten. Since there are these different production processes, each with its own outcome, one plurality of sense impressions can have various outcomes.

WITASEK held that the production processes take place unconsciously and that one is only aware of their results. Nonetheless, one has the ability to choose among the production processes and select the one or ones needed for the task at hand.

WITASEK explained movement as follows: The individual sense impressions result in individual space presentations. Those presentations are compared with one another, resulting in the presentation of a movement. That process of comparison takes place unconsciously; the experience of movement is considered the result of a comparison of the various space presentations following each other. WITASEK believed that the mechanism of comparison can explain the presentation of a melody too, or that of a note increasing in loudness. Individual auditory impressions are compared, leading to the gestalt experience. WITASEK also accounted for the phenomenon of stroboscopic vision. Perception of movement is possible, even when the production process receives incomplete information from the senses, because the production process will still compare the sense material. WITASEK went on to remark that the production process can even distort basic material, and he gave as examples stroboscopic vision and the MÜLLER-LYER illusion.

WITASEK also mentioned differences between the process taking place in the sense organs and in the production process. The first process accepts only sense-specific energy, whereas the latter accepts input from several or all senses. Errors taking place in one process are different from those happening in the other. We already saw that the MÜLLER-LYER illusion was explained as an error of the production process.

We saw that EHRENFELS already related the gestalt quality to memory and recognition. WITASEK, at the end of his short life, carried out experiments to test G.E. MÜLLER's ideas on the memory of series of elements. G.E. MÜLLER believed that associations are formed between the elements, and WITASEK disagreed with him. WITASEK's experiments were set up to disprove a theory, and here we encounter for the first time a psychological experiment in our sense of the word. These experiments were written down by WITASEK's student Fisher (see WITASEK and Fisher, 1918). G.E. MÜLLER believed that one learns a series of elements through the establishment of associations between the elements, while WITASEK suspected that one learns it through gestalt formation (*Gestaltbildung*), or the combination of the elements into a whole. The term 'gestalt formation' could be chosen by Fisher and not by WITASEK, but it denotes clearly WITASEK's idea. The shaping of a gestalt from its elements, however, is anathema to the Berlin school, as we will see in KOFFKA's criticism.

KOFFKA's criticism

BENUSSI's and WITASEK's theory held that one is aware of individual sense impressions and the gestalt presentation. They argued that the content of the whole is functionally different from the content of the parts. BENUSSI and WITASEK held that the elements and the whole are different from each other, but not independent, since there is a causal process from the parts to the whole. We saw that KOFFKA (1915) understood this Graz notion as follows: The parts are components of the

whole and the form of the parts in the whole does not need to be completely equal to their forms when evoked as sensory impressions (see p. 17).

EHRENFELS, on the other hand, believed that perceived regularities of the stimuli are not put together into a meaningful whole in the observer. He held that those wholes exist outside the observer and that the parts of the whole belong together for reasons not related to the observer. The Berlin school continued in this tradition, believing that gestalten are out there and are reconstructed in the brain and then presented to consciousness. There exists an isomorphic relation between a gestalt and its perception. The Berlin school would agree that this demands a most impressive physiological apparatus, but not a processing unit that works on elemental units, transforming them and in some cases even distorting them in order to create the more complex unit of a gestalt.

Associationist' theorists believe that presentations are put together from more elementary ideas. That process is lawful, because the association of ideas is related to the regularities of the process of bringing them together. Lawful, however, does not mean that there is a direct relation between the outer world and the way the ideas are associated with each other. MEINONG and especially his collaborators BENUSSI and WITASEK proposed a theory which is in many respects opposite to EHRENFELS'. They (the Graz school) believed that perception involves processing units that have sensory input and provides a different output. By accepting an inner processing mechanism that works on atomistic units and brings them together, it seems the Graz thinkers, although they were no associationists, could have been criticized by the Berlin gestaltists for making the same errors as the associationists. After all, we already find a two-stage theory of perception back in LOCKE's work.

LOCKE distinguished simple ideas from complex ideas. Simple ideas, for example the colour green, are experienced when an outward sense is appropriately stimulated. These simple ideas can also be assembled into complex ideas and LOCKE gave as an example man. The experience of simple ideas is the result of a passive process, while the experience of a complex idea requires a unification of simple ideas through an activity taking place in the observer. Both types of ideas, simple and complex, can be experienced in consciousness, but we cannot tell the difference between the two from our experience. It is not from the factual experience that we get an indication how it came about, directly from the senses or through an intermediate step of assemblage. We find a similar argument in HERBART's theory, and since LOCKE's and HERBART's writings preceded MEINONG *et al.*'s, it seems appropriate to ask oneself: What is new in the Graz school? LOCKE and the other British associationists, as well as HERBART, painted presentations as being connected to one another in series, where one presentation leads to the likely occurrence of the next one. The Graz school proposed the existence of several internal mechanisms - in the observer, not in the presentations - that link the presentations together. Therefore, the Graz school had no need anymore for internal connections between presentations that would link them in series and that, when the right presentation was evoked, would unwind automatically. With its stress on mechanisms underlying perception that are under voluntary control, the Graz school preceded modern per-

ceptual theories, in which perception is explained through a creative and intelligent process.

Later KÖHLER of the Berlin school would point out that certain atoms may all oppose each other; nonetheless the sameness of these individual relations of opposing forces could lead to quite different results. The end result depends namely on the overall placement of the atoms. Here again, or at least according to KÖHLER and his friends, the relation between single entities is not the determining variable of that what happens; that variable is the overall structure wherein the elements are placed. Let us, however, now return to how KOFFKA (1915) took on the challenge of the Graz school. He had studied the Graz school very well, as proven by his fair and detailed account of his opponent. The controversy was: Are gestalten real or are only elements real and the gestalten pulled together by the observer.

KOFFKA noticed that the pillars of the Graz school were: (1) There are two kinds of illusions (one caused by the senses, the other by the production process); (2) there are multiple outcomes from a set of stimuli to gestalt presentations; (3) there are no gestalt stimuli. He would dispute all three.

BENUSSI held that a stimulus can lead to only one sense impression, whereas different production processes can lead to different outcomes. KOFFKA argued that this strict classification between two separate and distinct phenomena could not be retained. He noticed that the same sense impression can lead to more outcomes. When one concentrates on a grey field, the experiences of this field vary; some appear more yellow and others more blue. On the gestalt side, there are presentations that never vary, where there is always the same outcome. Therefore, BENUSSI's differentiation cannot pass scrutiny. The feature of one outcome is not only reserved for sense impressions, and neither is the feature for multiple outcomes for gestalten. In short, BENUSSI's classification of illusions in two totally separate entities must be rejected.

KOFFKA pointed out that the classification between two distinct illusions can also not be maintained. The perception of contrast between two colours, for instance, can vary even though contrast perception is a sensory or peripheral phenomenon. KOFFKA believed, in contrast to BENUSSI, that objective and subjective factors are involved in every perception. He did not believe that one illusion is only caused by objective factors and the other one just by subjective factors.

KOFFKA opposed the view that there are no gestalt stimuli. He believed there are real gestalten. So, he (1915) asked rhetorically: „And what about the series of events in the central nervous system that we assume are related to the gestalt perception“ (p. 36). These events are, according to KOFFKA, not a mere sum of the individual excitations. Instead, they form an overall gestalt process [*gestaltete Gesamtprozess*] (see p. 36). KOFFKA argued here that a set of individual stimuli has an overall effect in the brain. The overall effect is different from the sum total of the individual effects caused by each stimulus and it evokes the presentation of a gestalt in consciousness. In this view, a gestalt stimulus is the outer condition leading to brain activity that precedes a gestalt experience. The Berlin gestalt school rejected HERBART's

notion that the ever-changing flow of conscious experience must be explained from the workings of mental elements. Instead, the Berlin gestalt school related consciousness to the overall activity of the brain. The specific ideas of the Berlin gestaltists on the functioning of the brain, or how cortical currents would underlie perception, are now outdated and no longer accepted (see MURRAY, 1995).

The Berlin thesis that the whole is grasped before the parts now becomes more comprehensible. The overall brain state leads to a gestalt presentation. That brain state is caused by individual stimuli, but their identity is somehow hidden in the overall effect. It is thus the overall effect in the brain that evokes the gestalt experience. That gestalt experience is primary, and the elements become conscious after the gestalt, according to the Berlin theory. In the Berlin view, the gestalt presentation is not secondary to the sense impressions. Also, the gestalt is functionally more original than the presentations of its elements. A gestalt cannot be comprehended as an assemblage of the individual parts.

In his review of the Graz school, KOFFKA referred to an article that KÖHLER wrote two years earlier for the same magazine. KÖHLER's article was translated into English as *On Unnoticed Sensations and Errors of Judgement*. Therein KÖHLER rejected the constancy-hypothesis, that is the notion that a one-to-one relationship exists between an external stimulus and the sensation it evokes. He considered false the view „that the sensation depends only, or almost only, on the stimulus and its peripheral reception“ (p. 20).

KÖHLER (1913) believed that: „Apart from the stimuli and the well-known peripheral conditions, a number of other factors, primarily central ones, also play an essential role in the determination of sense data“ (p. 38). KÖHLER was not very explicit about the other factors. But he said: „The momentary direction of attention, set, and other central factors exert a powerful influence on the sensory processes themselves“ (p. 20). At the end of his article, KÖHLER wrote:

„... as soon as the remaining factors, apart from peripheral conditions, also exert their influence. This applies particularly to the psychological correlates of stimulus complexity, and specifically to the everyday perception of *things*“ (p. 39).

It seems KÖHLER had in mind that central factors, such as attention, play an important role in the perception of daily objects. KÖHLER's view undermined not only BENUSSI's theory, but any atomistic position, since he denied there are primary elements. Instead, what psychologists considered elements are the result of an interplay between peripheral and central forces, and as a consequence these so-called elements are not basic at all. KÖHLER left one of the central tenets of 19th-century German psychology behind and, I think, took a decisive step into the direction of the Berlin gestalt notion.

Coming back to KÖHLER's (1913) position, even a question such as, 'How do two sensations compare?' becomes meaningless, since, as KOFFKA (1922) noted, „The two sensations themselves do not exist“ (p. 542). That leaves the question open: What does exist? The answer of the Berlin gestalt school is: an „undivided, articulated whole“ (KOFFKA, 1922, p. 542). It is difficult to understand what the Ber-

liners meant with an articulated whole. In 1913, KÖHLER's answer was that the experience of the sensations, the elements, is caused by an interplay of - for lack of a better word - forces. That interplay determines the quality of the sensations evoked.

KÖHLER's article is thus a step in the direction of the holistic theory of gestalt, although KÖHLER did not propose gestalt as a causal factor. In 1913 he was still looking at factors such as attention and fatigue to understand the different experiences of sensations. The experimental proof of that insight, of the importance of attention on the quality of perception, was provided by Edgar Rubin (1915). In Rubin's figure-ground experiments, the figure, or the field to which the subjects pay attention, was experienced as being qualitatively different from the - unattended - background.

KÖHLER's (1913) rejection of atomistic theories also becomes evident from how he then formulated his concept of science.

„For me too the task, the goal of scientific investigation, seems to be the finding of constants, the discovery of constant properties and their consistent ordering in a theoretical structure, or the discovery of unchanging laws governing the variation of characteristics and of their relations. Nobody doubts this...“ (p.17).

From the „for me too,“ and from „nobody doubts this,“ I can only conclude that KÖHLER had no idea how far his view had diverged from that of his doctoral supervisor Carl Stumpf, as well as EHRENFELS, and Stumpf's and EHRENFELS' teacher, BRENTANO. All those scholars believed that science aims to find basic units and their laws. Note that KÖHLER did not use the word 'elements.' Instead, he mentioned „constants,“ „constant properties“ and „unchanging laws governing the variation of characteristics“ (p. 17). Science, then, is not about basic units anymore. It is not clear what KÖHLER meant by properties and characteristics. But whatever they may be, they cannot be compared with, for instance, an atom in chemistry. The property 'red' and the characteristic 'loudness' - and now I assume this is a correct interpretation - do not stand on the same footing as a chemical element.

KOFFKA's article, to be distinguished from KÖHLER's, clearly stated whom KOFFKA opposed (namely BENUSSI) and what he thought was wrong with his opponent's position. KOFFKA's article, however, also demarcated his own position. In 1915, thus, the nascent notion of the Berlin gestalt school had matured to a well-expressed opinion. That means that somewhere between 1913 and 1915, the Berlin gestalt idea dawned on its principal players.

Abstract

At the beginning of the 20th century, there existed two gestalt schools, the older and now forgotten Graz school, and the younger and now famous Berlin school. After explaining Alexius MEINONG's review of Christian von EHRENFELS' seminal work on gestalt perception, this article defines MEINONG's notions regarding objects of knowledge and how his students, Stephan WITASEK and Vittorio BENUSSI, would render MEINONG's ideas in a psychological theory of gestalt perception (the production theory). It was in a review of the latter work that Kurt KOFFKA presented the Berlin gestalt notion for the first time in mature form.

Zusammenfassung

Zu Beginn des 20. Jahrhunderts gab es zwei Schulen der Gestaltpsychologie: die ältere und inzwischen vergessene Grazer Schule und die jüngere in heute berühmte Berliner Schule. Im vorliegenden Beitrag wird zunächst Alexius MEINONGs Review der die Entwicklung der Gestaltkonzeption befruchtenden Arbeit von Christian von EHRENFELS über Gestaltwahrnehmung geklärt; sodann wird MEINONGs „Gegenstandstheorie“ mit ihrem sog. Vorstellungsgegenstand dargestellt und erläutert, wie seine Schüler, Stephan WITASEK und Vittorio BENUSSI, MEINONGs Ideen auf eine psychologische Theorie der Gestaltwahrnehmung (Produktionstheorie) übertrugen. Anlässlich eines Reviews jener Arbeit stellte Kurt KOFFKA die Berliner „Gestalt“-Konzeption erstmals in einer elaborierten Form dar.

References

- ANTONELLI, M. (1994). *Die experimentelle Analyse des Bewußtseins bei Vittorio BENUSSI*. Amsterdam: Rodopini.
- AQUINAS, T. (Ca 1252/1949). *On Being and Essence* (A. Maurer, Trans.). Toronto: Pontifical Institute of Medieval Studies.
- ARISTOTLE (1941). *The Basic Works of Aristotle* (R. McKeon, Ed.). New York: Random House.
- ASH, M.G. (1982). *The Emergence of Gestalt Theories: Experimental Psychology in Germany, 1890-1920*. Ann Harbor, MI: University Microfilms International.
- ASH, M.G. (1995). *Gestalt Psychology in German Culture, 1890-1967. Holism and the Quest for Objectivity*. Cambridge: Cambridge University Press.
- AUGUSTINE (ca 397/1961). *Confessions* (R.S. Pine-Coffin, Trans.). London: Cox & Wyman.
- BOUDEWIJNSE, G.-J.A. (1996). *The Gestalt Line*. Unpublished Doctoral Thesis, McGill University, Montreal.
- BENUSSI, V. (1904). Zur Psychologie des Gestalterfassens (Die MÜLLER-LYERsche Figur). In A. MEINONG (Ed.) *Untersuchungen zur Gegenstandstheorie und Psychologie*, (S. 302-448). Leipzig: Johann Ambrosius Barth.
- BRENTANO, F. (1874, 1928/1973). *Psychology from an Empirical Standpoint* (A.C. Rancurello, D.B.Terrell & L.L. McAllister, Trans.). London: Routledge & Kegan Paul.
- BROCK, A. (1994). Whatever happened to Karl BÜHLER? *Canadian Psychology*, 35, 319-329.
- BÜHLER, K. (1913). *Die Gestaltwahrnehmungen*. Stuttgart: W. Spemann
- EHRENFELS, C. Von (1890/1988). On „gestalt qualities“. In B. Smith (Ed. and Trans.) *Foundations of Gestalt Theory*, 82-117. Wien: Philosophia Verlag.
- HARRINGTON, A. (1996). *Reenchanted Science*. Princeton NJ: Princeton University Press.
- HEIDER, F. (1970). Gestalt theory: Early history and reminiscences. *Journal of the History of the Behavioral Sciences*, 6, 131-139.
- KANIZSA, G. (1979). *Organisation in Vision*. New York: Praeger.
- KANT, I. (1786/1970). *Metaphysical Foundations of Natural Sciences* (J. Ellington, Trans.). Indianapolis: Bobbs-Merrill.
- KOFFKA, K. (1915). Beiträge zur Psychologie der Gestalt- und Bewegungserlebnisse. III. Zur Grundlegung der Wahrnehmungspsychologie. Eine Auseinandersetzung mit V. BENUSSI. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, 73, 11-90.
- KÖHLER, W. (1913/1971). On unnoticed sensations and errors of judgement (H.E. Adler, Trans.). In M. Henle (Ed.) *The Selected Papers of Wolfgang KÖHLER*. New York: Liv-eright.

- KÖHLER, W. (1920). *Die physischen Gestalten in Ruhe und im stationären Zustand*. Eine naturphilosophische Untersuchung. Erlangen: Verlag der Philosophischen Akademie.
- LA PALME REYES, M., MACNAMARA, J., REYES, G.E. & ZOLFAGHARI, H. (1994). The non-Boolean logic of natural language negation. *Philosophia Mathematica*, 3, 45-68.
- LINDENFELD, D.F. (1980). *The Transformation of Positivism. Alexius MEINONG and the European Thought, 1880-1920*. Berkely: University of California Press.
- LOCKE, J. (1689/1975). *An Essay concerning Human Understanding* (P.H. Nidditch, Ed.). Oxford: Clarendon.
- MacNAMARA, J. (1993). Cognitive psychology and the rejection of BRENTANO. *Journal of the Theory of Social Behavior*, 23, 117-137.
- MACNAMARA, J. & BOUDEWIJNSE, G.-J.A. (1995). BRENTANO's influence on EHRENFELDS's theory of perceptual gestalts. *Journal of the Theory of Social Behavior*, 25, 401-418.
- MEINONG, A. (1904/1960). „The theory of objects“ (I. Levi, D. B. Terrell & R. M. Chisholm, Trans.). In R.M. Chisholm (Ed.) *Realism and the Background of Phenomenology*. Glencoe, Ill: Free Press.
- RUBIN, E. (1915/1921). *Visuell wahrgenommene Figuren* (P. Collett, Trans.). Kopenhagen: Gyldenalske Boghandel.
- SMITH, B. (1988). Gestalt theory: an essay in philosophy. In B. Smith (Ed.) *Foundations of Gestalt Theory* (pp. 11-81). Wien: Philosophia Verlag.
- WITASEK, S. (1908). *Grundlinien der Psychologie*. Leipzig: Dürr'schen Buchhandlung.
- WITASEK, S. (1910). *Psychologie der Raumwahrnehmung des Auges*. Heidelberg: Carl Winter's Universitätsbuchhandlung.
- WITASEK, S. & FISCHER, A. (1918). Assoziation und Gestalteinprägung. Experimentelle Untersuchungen. *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, 79, 161-210.

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