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Rhythm as Platonic Form of Psychological Process (Part 2)

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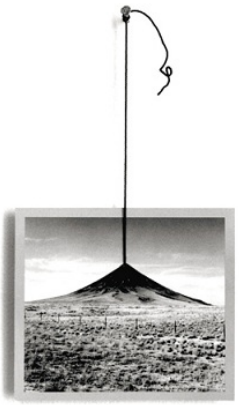

Publication date: Sunday 26 August 2018

Previous chapter

Rhythm in Experimental Perspective (Bolton - 1894)

In the experimental part of his dissertation, Bolton realized a spectacular reversal of perspective. By contrast with his introduction, in which he had tried to encompass all "rhythmic phenomena" in a grand cosmological and evolutionary view, this part was entirely dedicated to a very limited phenomenon: the famous "metronome sound illusion" or, to put it in more scientific terms, the "subjective accentuation of an objectively uniform series of sounds," which had already been noticed by Mach (1865) and Wundt thirty years before. Naturally, this limited phenomenon opened on a larger problem that had far-reaching consequences: how the human mind transforms an entirely regular series of auditory impressions into regular groups?

> This work was undertaken with several objects in view. The first and most important object was to determine what the mind did with a series of simple auditory impressions in which there was absolutely no change of intensity, pitch, quality or time-interval. (*Rhythm*, 1894, p. 34)

Making a point not to confuse physics and psychology, Bolton called a "rhythmic series" the physical "regular variations with respect to the intensity or time-interval of the sounds" and "rhythmical series" the transposition of the latter by the consciousness into "series of groups of impressions."

> Regular variations with respect to the intensity or time-interval of the sounds in this series, which will be called a rhythmic series, were then to be tried separately and together, with the purpose of determining what values these properties of sound have in forming a rhythmical series that is, a series of groups of impressions out of a rhythmic series. (*Rhythm*, 1894, p. 34)

Bolton wanted to improve Wundt's protocol which was based on the use of a metronome and therefore could not produce entirely similar sounds (p. 61-62). Bringing into play the most modern technology, he used instead a telephone connected to an induction circuit generating totally similar clicks by way of a uniformly rotating drum equipped with contact-arms, which during rotation came into contact with a series of contact-plates linked with the telephone.

This apparatus was able to produce an infinity of particular metric arrangements by making, first, the *intensity* of the clicks vary regularly.

> By using both single and double ended arms on the shaft, and operating the five pairs of keys, it was possible to get an arrangement by which variations in intensity might occur every sixth or eighth click. Taking all the possible arrangements together, the operator might introduce a more intense click every two, three, four, five, six or eight clicks. Again, he might make a series of clicks which were composed of two, three, four or five different intensities of sound. (*Rhythm*, 1894, p. 39)

Second, the *frequency* of the clicks was measured with a stop-watch and could also be changed at will.

> The rate at which the drum-shaft revolved determined the rate of the clicks in the telephone. This was controlled by the fan regulator upon the chronograph. Faster or slower rates were obtained by using smaller or larger fans. The rate was determined by counting the clicks in the telephone by a stop-watch. Rates between one click in two seconds and ten in one second were possible. As the rate was a very important factor, it will be given in all cases in the presentation of results. (*Rhythm*, 1894, p. 40)

The protocol of the experimentation was carefully designed in order to avoid any suggestion by the operator.

> When the experiment began, the apparatus was first set so that about three or four clicks to the second were heard in the telephone. The subjects were not informed in any particular in regard to the experiment. They were invited to be seated and listen to the telephone. This they did, taking very generally a rather critical attitude. They were then invited to say anything that suggested itself to them, whatever the character. These statements were all carefully recorded, and will be given in substance. (*Rhythm*, 1894, p. 40)

Bolton did not underestimate the methodological difficulties he met. Concerning the apparatus, he admitted that it allowed to produce variations in intensity and frequency but not in pitch and quality or color of sounds.

> It was seen at the outset that it would be practically impossible with the apparatus at our disposal to employ pitch variations, and for that reason no attempts were made with variations in pitch. Variations in quality or tone-color were contemplated, but the experiment was not carried out, first on account of a lack of time, and secondly of proper apparatus. (*Rhythm*, 1894, p. 34)

Concerning the subjects, he also recognized that he had sometimes to induce them in paying attention to the "to the grouping of the sounds."

> The statement most generally given, and voluntarily, was that the sounds were all alike, and seemed to be separated by the same interval of time. After this statement the subject paused, as if most that could be said had been said. In some cases they asked for particulars in regard to what they should look for. Sometimes, however, they went on to say that there was an apparent change of intensity in the sounds ; the clicks seem to group themselves by twos or fours, as the case might be; generally, however, it required some kind of a suggestion to direct the attention of the subject to the grouping of the sounds. (*Rhythm*, 1894, p. 41)

Despite these two limitations, he thought that the results were trustworthy enough. The experiment had been performed with thirty subjects and the observations documented in substance (p. 42-60) before being thoroughly commented and explained (p. 60-84).

Bolton's first conclusion was to agree with the empirical findings of his predecessors. The mind groups similar sounds by "accenting regularly certain sounds more than others."

> The first point in the preceding records to which attention is called is the rhythmical grouping of the sounds. The grouping was the same in every case. It was accomplished by accenting regularly certain sounds more than others. The weaker or less accented sounds seem to run together with the stronger, and to form organic groups which are separated from one another by intervals which are apparently longer than the interval which separates the individual clicks. Such rhythmical grouping has been observed frequently at other times by many persons. (*Rhythm*, 1894, p. 60)

To give more weight to this assertion, he reminded the reader with a series of already common auditory experiences in the second half of the 19th century: the particular sound made by locomotive, mill-wheel, winnowing machine, feed cutter and, last but not least, metronome.

> Several of the subjects testify to have known of their tendency to group the puffs of the locomotive, even in early childhood, and they have taken great delight in it. [...] The puffs are grouped by four. The first and third are accented, the first generally stronger than the third. [...] A kind of rhythm is also observed in the noise of mill-wheels. The winnowing machine and feed cutter, such as are found upon many farms, produce a rhythmical sound which few persons fail to observe. [...] Several experimenters have also observed this same grouping of rhythmic sounds. In the work undertaken by Dietze in Wundt's laboratory upon the *Umfang* of consciousness, this rhythmical grouping of the sounds of the metronome was observed and employed to determine the length of the mental span. (*Rhythm*, 1894, p. 61)

Then, going from the data to the scientific elucidation, Bolton explained, using the model provided by Wundt, the sound-grouping phenomenon, i.e. what he called rhythm, by "a series of efforts of the mind," "a sequence of acts" or better yet, "waves of attention."

> This rhythmical grouping was a series of efforts to attend to the sound. The grouping results from a sequence of acts of attention. When the attention is directed to the sensation, it lays hold upon the first impression with great force and makes it the sole object of consciousness. If this were the only sound, the attention would turn to something else, but as succeeding impressions follow before the first wave of attention has subsided, they are seized upon with less force than the first impression, and are subordinated to it in different degrees according to the strength of the apperceptive act. Subsequent waves of attention follow the same process as long as the will directs the attention to the phenomenon. (*Rhythm*, 1894, p. 67-68)

Bolton claimed that a series of auditory impressions must be organized by the attention "with a kind of subordination among them" to enter the consciousness.

The view taken, then, was that only one undivided state of consciousness might arise during each pulse or wave of attention, and that the number of objects which can be grasped in that state must form an organic unity or be presented as a single object have the appearance of a unit. *A given number of auditory impressions within certain time limits, when presented in such a way that there is a kind of subordination among them with respect either to time, intensity, pitch or quality, or with respect to any two or more of these properties, always stand as a unit in consciousness*. They form an organic unity which is the essential condition of a number of impressions entering into a state of consciousness. (*Rhythm*, 1894, p. 69)

If no "organic unity" objectively exists in the impressions, the mind provides them with an arrangement that allows them to enter the consciousness.

> If such organic unity does not exist and it is possible to make it, the mind imposes such an arrangement upon a given number of the elements that they may enter into a state of consciousness. (*Rhythm*, 1894, p. 69)

Thus, each wave of attention allows the synthesis of one rhythmic unit organically composed of subordinate sounds. This "rhythmical grouping is due to the unifying activity of the mind."

> The conscious state accompanying each wave of attention grasps together or unifies all the impressions that fall within the temporal period of a wave. As the result of a series of attentive efforts, a series of auditory impressions takes the form of a sequence of groups. This rhythmical grouping is due to the unifying activity of the mind; it is an attempt to conceive a series of sounds in a simpler form. When the mind acts upon a continuous series of auditory impressions, it groups all the impressions that fall within the period of a wave of attention, and conceives them as a single impression, or a unity. Each succeeding wave groups a like number, so that the series is conceived in the form of groups. (*Rhythm*, 1894, p. 76)

Naturally, this rhythmic power of the mind was based on an analogous rhythm in "the activity of the nerve cell."

> This rhythm in the attention, and hence in conscious activity, finds its counterpart in the activity of the nerve cell, which we have seen reason for believing was a series of explosions an alternation of periods of activity and periods of repose. (*Rhythm*, 1894, p. 77)

But it was above all related with "the muscular movements" (p. 90). Bolton had already noticed that most subjects of his experiment were "unconsciously keeping time, with the foot tapping to every fourth or every second click" (p. 41). He now developed the argument based on Wundt's *Physiologische Psychologie* (vol. II, p. 73).

> Most subjects felt themselves impelled by an irresistible force to make muscular movements of some sort accompanying the rhythms. If they attempted to restrain these movements in one muscle, they were very likely to appear somewhere else. Wundt says that the intensive clang change has its nearest pattern in the sensation of motion. A corresponding rhythmical series of motions associates itself in dancing, marching and beating time, with almost irresistible force to the changes of strength in the clang. The most common forms of muscular movement were beating time with the foot, nodding the head, or swaying the body. Subjects 3, 10 and 17 accompanied the rhythmical grouping by muscular contraction of the diaphragm and chest, and it was exceedingly difficult to restrain them. [...] Most subjects were unconscious of their muscular movement. (*Rhythm*, 1894, p. 90-91)

However, concerning the question of the primacy of the muscular movement or the mental power, Bolton decided

against Wundt, who believed in the second option, and for Mach and Ribot, who insisted on the first. As we have seen, that was, probably, one of the reason for Wundt's new intervention in the debate in his 1896 *Psychology*.

> The question we have to decide upon is, are these muscular movements and associations the result or the conditions of the rhythmical grouping? With Ribot we accept without hesitation the latter. (*Rhythm*, 1894, p. 91)

In the last pages of his dissertation, Bolton rapidly exposed "a further investigation into the nature of rhythmical groups, especially with reference to poetical rhythms" (p. 84). Since "the click of the telephone is almost instantaneous," he used another apparatus based on the interruption of the sound of an electric tuning fork, which was placed before one of Helmholtz's resonators. "Regular interruptions resulted in a series of uniform sounds and silences" (p. 85). The results of this second experiment, presented in a table, complemented the previous one. Groups spontaneously formed in the consciousness of the subjects out of the perception of regular "series of sounds of uniform length and intensity." But the accents played again an important role in the grouping.

> Several facts are to be observed in this table. First, a series of sounds of uniform length and intensity may be grouped by two, three or four. [...] Second, a more intense sound occurring regularly imposes a grouping according to the number of sounds between the accents. The accented sound comes first in the 2 and 3-groups, and in the 4-group the first and third receive accents. [...] Third, a longer sound occurring regularly in the series, imposes a grouping according to the number of sounds between the longer ones. The long sound, as a rule, is the last in the group, and is frequently accented. (*Rhythm*, 1894, p. 87-88)

Among many other results, as Meumann, Bolton noticed the effect of an accent on the apparent duration of a sound which, as we have already noticed, was a slightly different problem than "*Der Accent macht lang*" discussed by Brücke (see above, chap. 1).

> The accented long sound frequently appeared more prolonged than the unaccented sound of the same length ; the accent had the effect both to increase the length of sound and of the interval which followed. (*Rhythm*, 1894, p. 88)

In the conclusion, Bolton risked discussing aesthetic matters. According to him, the empirical evidence showed that poetic rhythm had to be made into "*a perfectly regular sequence of impressions.*" If, in any case, a series of impressions stood in an arbitrary "order of arrangement" of even in a "state of confusion," "*each member of the sequence [had to be at least] exactly the same in the arrangement of its elements.*"

> This general principle may be stated: *The conception of a rhythm demands a perfectly regular sequence of impressions within the limits of about 1.0 sec. and 0.1 sec. A member of the sequence may contain one or more simple impressions. If there are a number of impressions, they may stand in any order of arrangement, or even in a state of confusion, but each member of the sequence must be exactly the same in the arrangement of its elements.* (*Rhythm*, 1894, p. 93)

This "general principle" explained why the "best" poetry, i.e. the most "pleasurable," was that in which "the accents recur at regular intervals" and "the successive feet" are "of precisely the same character." Since it disturbed "the temporal sequence of the accents," the introduction of a 3-syllable foot was, for example, to be avoided, at least in iambic verse.

> The application of this principle to poetry demands that the accents in a line shall recur at regular intervals; it requires also that the successive feet in a line shall be of precisely the same character. The introduction of a 3- syllable foot into an iambic verse is allowable on this condition only, that the 3- syllable foot can be read in the same time of the two, so that there shall be no disturbance in the temporal sequence of the accents. [...] The frequent use of such a foot would be fatal. (*Rhythm*, 1894, p. 93)

To tell the truth, aesthetics was not Bolton's main concern but, as his quite objectionable cosmological and evolutionary views, which paradoxically articulated most of the monistic as well as dualistic clichés of the period, his support for the most rigid metric, which was so far from the experience of the contemporary poets (see vol. 2, chap. 8 and 9), tells us a lot about the radicalized version of the *Platonic metric paradigm* he helped to put into circulation.

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Bolton's essay is fascinating in a different way, though, from Meumann's. It shows how the new scientific interest in rhythm which spread in the late 19th and the early 20th century was partly colonized by ideological and phantasmagoric elements, and how, simultaneously, the empiricist and Aristotelian perspective involved in experimental investigation was included in a larger Platonic frame.

The second part of his essay was based on experimentation and resulted in some findings which mainly confirmed Wundt's theory of limited time-span attention and sound-impressions grouping, while giving more room to Mach's emphasis on the motor factor. However the first part, which is nowadays often euphemistically considered as "outdated," unveiled the metaphysical, social, and historical background of this "scientific" investigation.

1. On the theoretical level, although Bolton endorsed the newest mechanist meaning of rhythm as *period* and *wave*, he re-established a metaphysical continuity between man's life and the cosmic dynamics, reinstating, by the same token, beliefs which dated far back to the Middle Ages and the Renaissance (see vol. 2, p. 297 *sq*. and p. 390 *sq*.; vol. 2, p. 15 *sq*.).

2. On the social and historical level, he simultaneously introduced into psychology and by the same token legitimized most of the worst clichés on "savages," "primitives," children, and women, which were widespread in the 19th century. Completely at odds with his self-proclaimed empiricism, he developed a fact-proofed ideological vision of the world.

In short, quite inconsistently, Bolton associated a monistic view of nature, based on the most modern physic and life science, with a dualistic view of man, based on an evolutionary conception of history and a strongly differentialist anthropology.

If we now compare Bolton to Meumann, we find deep differences but also some similarities. As we have seen, Meumann and Bolton's studies clearly exemplified two divergent trends in experimental psychology. The first was more skeptical, empiricist, interested in poetry and critical of metric somehow more Aristotelian than Platonic. The

second, instead, was more speculative, historicist, embracing the most ancient Idealist doctrine associating cosmos and man, and the more modern Evolutionist assumption concerning man's history, paying little attention to art and endorsing the most traditional metric in some way, more Platonic than Aristotelian.

However, both of them took rhythm as main subject of investigation and based their research on experimental observation. As a result, their contributions marked a turning point in psychological rhythmology. Through their works, a new generation appropriated the concept of rhythm and considered it crucial for at least two decades.

Both of them inherited and somehow summarized the successive shifts in the definition of the concept. In the 1860s and 1870s the medical and physiological definition had been slowly replaced by a new one drawn from poetic or musical metrics. The former had seemed too crude to adapt to the needs of the new investigations into poetry utterance and perception (Brücke), sound and music perception (Helmholtz), or sound perception, generation of the time idea, and pleasure of music hearing (Wundt). If Vierordt still understood rhythm mainly in a medical way as alternation of durations endowed with a certain ratio, Brücke, Helmholtz, Wundt and Meumann borrowed their notion of rhythm mainly from linguistic, metric, or music, equating it with notions such as "accents," "ictuses," "beat," "bar," "time signature," "phrases," and "periods."

However, in the 1890s, eager to establish itself solidly in the University and the scientific world, psychology revived its original link with physiology, which had in the meantime transformed its own concept of rhythm. Thus, a new shift transformed the psychological concept into a *regular succession of beats or waves*. This is less obvious in Meumann's study, due to his rejection of metric, but clearly discernible in Bolton's contribution as well as Wundt's late studies. By 1900, this new definition of the term became widespread in psychology.

Finally, both of them, although in divergent perspectives, illustrated the *Platonic metric paradigm*. Indeed, around 1900, psychologists could argue about the origin of rhythm: some thought it was triggered by the pleasurable feeling due to the fulfilled expectation of the return of an event, others by an innate corporal power, others by a synthetic power of the mind. But most, if not all of them, agreed about the basic Platonic understanding of rhythm as *order of movement*.

Despite the recent explosion of research compiled in 1913 by Christian Ruckmich in his more-than-two-hundred-entries bibliography, this presupposition was common to all psychologists, who discussed rhythm in a plethora of ways but never questioned its definition. This is well evidenced by the article Ruckmich published the same year in the previous number of *The American Journal of Psychology*, in the introduction of which he emphasized the extraordinary success of the notion of rhythm "both inside and outside of the science of psychology," its kaleidoscopic use at the hands of psychologists, but in which he also ingenuously noticed that "no one, as far as the literature tells, has since that time [Bolton's essay published in 1894] attempted to make a complete study of rhythm."

The experimental investigation of the perception of rhythm has grown so extensive and, at the same time, so indefinite in scope that the writing of an introduction which shall be adequate to the general problem is now altogether out of the question. The subject of rhythm has been carried over into many fields both inside and outside of the science of psychology: within, it has been related to attention, work, fatigue, temporal estimation, affection, and melody; without, it is frequently mentioned in connection with music, literature, biology, geology, gymnastics, physiology, and pedagogy. If we follow out its progress within the range of psychological investigation, we find, again, an intricate plexus of results, theories, and issues. Emphasis has been laid on various component factors of consciousness involved in the perception of rhythm: changes of affective processes; effect of pitch, of duration, of intensity of stimulus on rhythmic perception; types of possible rhythmic perception; part played by different modalities of imagery; bases for rhythmic grouping and accentuation. An adequate summary of the work done even in this limited field would fill a fairly large monograph. It is now, furthermore, no longer possible to undertake a set of experimental investigations, as was done twenty years ago, [reference in footnote to Bolton's essay published in 1894] to cover the entire range of the perception of rhythm. Attacks directed at the problem from various points of view, and with various methods of procedure, are the run of the day. No one, as far as the literature tells, has since that time attempted to make a complete study of rhythm. (Christian A. Ruckmich, "The Role of Kinaesthesis in the Perception of Rhythm," *The American Journal of Psychology*, vol. XXIV, n° 3, July, 1913, p. 305-306)

Next chapter