Rhythm as Form of Physiopsychological Process (Part 2)

- Recherches
- Le rythme dans les sciences et les arts contemporains

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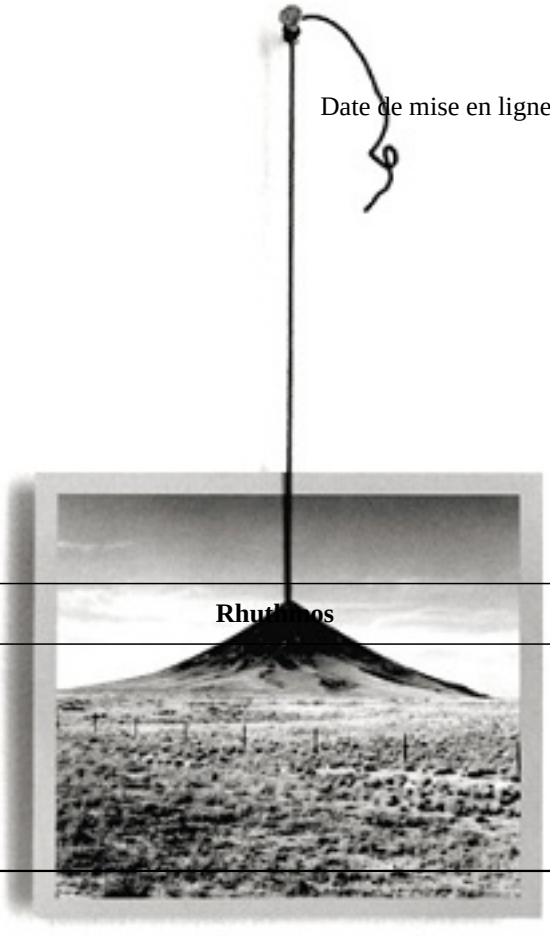

Rhuthmos

Table of contents

Previous chapter

Rhythm of the Limbs (Wundt - 1896)

In 1896 he was already 64 Wundt published his *Grundriss der Psychologie - Outlines of Psychology* "for the purpose of furnishing [his] students with a brief manual" (Author's Preface) and had it translated into English the following year. It had nine German and three English editions (last in 1911 and 1907 respectively). Although Wundt re-elaborated most of the same subjects that were exposed in his previous works, some significant and interesting changes happened in his use of the rhythm concept.

Possibly because of the stress put on the body by some of his younger colleagues as Mach or Bolton (see below), Wundt started, this time, his presentation from the sense of touch. As all temporal ideas, rhythm was first generated by the touch, not "the *outer* tactual sensations" however but "the inner sensations which accompany movements" and are determined by "the mechanical properties of the limbs" (p. 144-145).

> The *mechanical* properties of the limbs are important physiological bases for the rise of these ideas. The arms and legs can be moved in the shoulder-joints and hip-joints by their muscles, and are at the same time subject to the action of gravitation drawing them downward. As a result there are two kinds of movements possible for them. First, we have those which are continually regulated by voluntary activity of the muscles and may, therefore, be indefinitely varied and accommodated at every moment to the existing needs we will call these the arhythmical movements. Secondly, we have those in which the voluntary energy of the muscles is operative only so far as it is required to set the limbs oscillating in their joints and to maintain this movement *rhythmical* movements. (*Outlines of Psychology*, 1896-1897, p. 145, trans. Charles H. Judd)

Wundt suggested to neglect "the arhythmical movements exhibited in the various uses of the limbs," which were "in all probability derived from the rhythmical movements," and concentrate on the latter (p. 145). This new way to address the problem of rhythm by starting from the limbs instead of the ears resulted in its transformation into the "principle of *the isochronism of oscillations of like amplitude*" or "regular oscillations."

With rhythmical movements the case is different. Their significance for the psychological development of time-ideas is due to the same principle which gives them their importance as physiological organs, namely, the principle of *the isochronism of oscillations of like amplitude.* In walking, the regular oscillations of our legs in the hip-joints not only make the muscular energy expended less, but reduce to a minimum the continual voluntary control of the movements. (*Outlines of Psychology*, 1896-1897, p. 145, trans. Charles H. Judd)

Rhythm was now meant as *regular beat* and *wave* the newest acceptation which had been elaborated during the last couple of decades in physiology and medicine (see vol. 2, chap. 2) and not anymore as *succession of bars and accents organized according to varying time signatures* as in 1873, nor naturally as *alternation* and *ratio* as in his early works. While Wundt took into account the "continuous succession of sensations that are repeated in the following period in exactly the same order," he was careful to precisely describe this succession as a series of oscillations or waves composed of "a continuous series of weak inner tactual sensations from the joints and muscles" and, on both sides, "a complex of *outer* tactual sensations" of superior intensity.

> Every single period of oscillation in such a movement is made up of a continuous succession of sensations that are repeated in the following period in exactly the same order. The two limits of the period are marked by a complex of *outer* tactual sensations: the beginning by the impression accompanying the removal of the foot from the ground, the end by that accompanying its return to the ground. Between these there is a continuous series of weak inner tactual sensations from the joints and muscles. The beginning and end of this series of inner sensations coincide with the outer sensations and are more intense than those between them. They arise from the impulse of movement coming to the muscles and joints and from the sudden inhibition of the same, and serve also to mark off the periods. (*Outlines of Psychology*, 1896-1897, p. 146, trans. Charles H. Judd)

This continuous and "regular succession of sensations" had, naturally, its undulating counterpart in "a regular and exactly parallel series of *feelings*," first of "*strained*" then of "*fulfilled* expectation."

> Connected with this regular succession of sensations is a regular and exactly parallel series of *feelings.* If we consider a single period in a series of rhythmical movements, there is always at its beginning and end a feeling of *fulfilled* expectation. Between the two limits of the period, beginning with the first movement, is a gradually growing, feeling of *strained expectation,* which suddenly sinks at the last moment from its maximum to zero, to make place for the rapidly rising and sinking feeling of fulfillment. From this point on the same series is again repeated. (*Outlines of Psychology*, 1896-1897, p. 146, trans. Charles H. Judd)

Wundt then introduced the "tactual ideas of beats" (title given to this section in the Table of Contents). He noticed that entirely regular beats tended to be perceived as differently stressed but, instead of using the well-known example of the hearing of regular water drops or of the puffs of a locomotive, he used the example of marching or dancing. Before penetrating and becoming active in the sense of hearing, this phenomenon grows, he claimed, from the body itself. This remark allowed him to link his new *physiological* to his former *metric* definition of rhythm.

The simplest temporal ideas of touch are made up of the rhythmically arranged sensations that follow one another with perfect uniformity in the manner described, when like oscillatory movements are repeatedly carried out. But even in ordinary walking a slight tendency toward a somewhat greater complication arises; the beginning of the first of *two* successive periods is emphasized, both in the sensation and in the accompanying feeling, more than the beginning of the second. In this case the rhythm of movement begins to be *metrical.* In fact, such a regular succession of accented and unaccented ideas corresponds to the simplest measure, 2/8 time. It arises easily in ordinary walking because of the physiological superiority of the right side, and appears very regularly when several persons are walking together in *marching*. In the latter case even more than two periods may be united into one rhythmical unit. The same is true of the complicated rhythmical movements of the dance. But in such composite tactual rhythms the auditory temporal ideas have a decided influence. (*Outlines of Psychology*, 1896-1897, p. 147, trans. Charles H. Judd)

Rhythm of the Mind (Wundt - 1896)

Wundt was now in position to redeploy his former musical conception of rhythm. In audition, the *continuous and undulating form* of the rhythmic succession, which characterizes bodily movements, is indeed substituted by a *strictly discrete series of separate beats*. There is, at least apparently, an "absence of all objective sensational content in the intervals" and the "external impressions here do nothing but divide the separate intervals from one another."

> [The temporal auditory ideas] differ from temporal ideas of touch in that often only the extremities of the single intervals that go to make up the total idea, are marked by sensations. In such a case the relations of such intervals to one another are estimated essentially by the apparently empty or heterogeneously filled intervals that lie between the limiting sensations. This is especially noticeable in the case of *rhythmical* auditory ideas. [...] A series of regular strokes made in this way as the simplest form of temporal auditory ideas, is distinguished from the simplest form of temporal touch-ideas, described above (p. 147), mainly by the absence of all objective sensational content in the intervals. The external impressions here do nothing but divide the separate intervals from one another. (*Outlines of Psychology*, 1896-1897, p. 148-149, trans. Charles H. Judd)

However, Wundt reintroduced in this binary auditory metrics a concern for the *undulations* of the "affective contents" of the intervals, which he found parallel to those "in the course of a rhythmical tactual movement."

> Still, the intervals of such a series are not entirely empty, but are filled by subjective affective and sensational contents which correspond fully to those observed in tactual ideas. Most emphatic of all are the *affective contents* of the intervals. These feelings in their successive periods of gradually rising and suddenly satisfied expectation, are the same as in the course of a rhythmical tactual movement. Even the sensational substratum for these feeling is not entirely absent; it is merely more variable. (*Outlines of Psychology*, 1896-1897, p. 149, trans. Charles H. Judd)

As in 1873, Wundt underlined that there are, for the perception of auditory rhythm, physiological upper and lower "limits" determined by the frequency of the beat and, consequently, a "most favorable medium rate." From a series of experimental evidence, Wundt concluded against some of his colleagues, like Mach or Bolton, that if the motor aspect of rhythm had first appeared during human evolution, by modern man, it was not primary any more but only auxiliary to its "subjective" dimension. Rhythm was mainly a mental phenomenon.

It follows from the conditions described that the influence of the subjective elements on the character of time-ideas is the easiest to demonstrate. First of all, this shows itself in the effect which different rates of the sensations have on the formation of temporal ideas. It is found that there is a certain medium rate of about 0.2 sec. which is most favorable for the union of a number of successive auditory impressions. Now, it is easy to observe that this is the rate at which the above mentioned subjective sensations and feelings are most emphatic in their alternation. If the rate is made much slower, the strain of expectation is too great and passes into an unpleasurable feeling which becomes more and more unendurable. If, on the contrary, the rate is accelerated, the rapid alternation of feelings becomes fatiguing. Thus, in both directions limits are approached where the synthesis of the impressions into a rhythmical time-idea is no longer possible. The upper limit is about one second, the lower about 0.1 sec. (*Outlines of Psychology*, 1896-1897, p. 149-150, trans. Charles H. Judd)

Therefore, the "rhythmical combination" i.e. rhythm as *musical arrangement* could not explain the full "extent of the scope of consciousness." It had to be supplemented with "the rate of the successive impressions" i.e. rhythm as *beat* and *frequency*.

> The extent of the scope of consciousness as found in measurements made when the conditions of attention remain the same, depends partly on the rate of the successive impressions and partly on their more or less complete rhythmical combination. When the rate of succession is slower than about 4", it becomes impossible to combine successive impressions to a temporal idea; by the time a new impression arrives, the preceding one has already disappeared from consciousness. When the rate passes the upper limit of about 0.18", the formation of distinctly defined temporal ideas is impossible because the attention can not follow the impressions any longer. The most favorable rate is a succession of strokes every 0.2 0.3". (*Outlines of Psychology*, 1896-1897, p. 215, trans. Charles H. Judd)

By providing this series of numerical evidence, rhythm was made once more closer to the new scientific paradigm than to its older musical definition, which was yet still simultaneously maintained.

> Thus, it has been observed that in general a period divided into intervals is estimated as longer than one not so divided. We have here a phenomenon analogous to that observed in the illusion with interrupted lines (p. 125). The overestimation is generally much greater for temporal intervals. This is obviously due to the fact that the oft repeated alternation in sensations and feelings in an interval of time have a much greater influence than the interruption of the movement through points of division in the case of the similar spacial illusion. Furthermore, if in a long series of regular beats single impressions are emphasized by their greater intensity, or by some qualitative peculiarity, the uniform result is overestimation of the intervals preceding and following the emphasized impression, in comparison with the other intervals of the same series. If, however, a certain rhythm is produced successively with weak and then with strong beats, the rate appears slower in the first case than in the second. (*Outlines of Psychology*, 1896-1897, p. 150, trans. Charles H. Judd)

Wundt then recalled the well-documented illusion that makes us believe that there are auditory ideas that are overstressed and others that are not in "a series of beats which are objectively exactly alike."

> The tendency found in the case of rhythmical touch-ideas for at least *two* like periods to unite and form a regular metrical unit shows itself in auditory ideas also, only in a much more marked degree. In tactual movements, where the sensations that limit the single periods are under the influence of the will, this tendency to form a rhythmical series shows itself in the actual alternation of weaker and stronger impressions. With auditory sensations, on the other hand, where the single impressions can be dependent only on external conditions, and are, therefore, objectively exactly alike, this tendency may lead to the following characteristic illusion. In a series of beats which are exactly alike in intensity and are separated by equal periods of time, certain single beats, occurring at regular intervals, are always heard as stronger than the others. The time that most frequently arises when there is nothing to determine it, is the 2/8-time, that is, the regular alternation of arses and theses. A slight modification of this, the 3/8-time, where *two* unaccented follow one accented beat, is also very common. (*Outlines of Psychology*, 1896-1897, p. 151-152, trans. Charles H. Judd)

This phenomenon was one more proof to him for the primacy of the subjective power in recognizing rhythm.

> The phenomenon of subjective accentuation and its influence on the sensation of rhythms, shows clearly that temporal ideas, like spacial ideas, are not derived from objective impressions alone, but that there are connected with these, subjective elements, whose character determines the apprehension of the objective impressions. (*Outlines of Psychology*, 1896-1897, p. 152, trans. Charles H. Judd)

After this long discussion, Wundt finally introduced what he had considered first in 1873: the ordinary musical metric, which was therefore now presented as a complicated construction based upon more original and simple phenomena. The musical rhythm was only an extension and sophistication of the *beat*, limited by the physiological possibilities to synthesize it.

> If the effort is made to unite as many impressions as possible in a unitary time-idea, the phenomena become more complicated. We have accents of different degrees which alternate in regular succession with unaccented members of the series and thus, through the resulting divisions of the whole into groups, the number of impressions that may be comprehended in a single idea is considerably increased. The presence of two different grades of accent gives 3/4-time and 5/8-time, the presence of three grades gives 4 /4-time and 6/4-time, and as forms with three feet we have 9/8-time and 12/8-time. More than three grades of accentuation or, when the unaccented note is counted, more than four grades of intensity, are not to be found in either musical or poetical rhythms, nor can we produce more by voluntarily formation of' rhythmical ideas. Obviously, these *three grades of accentuation* mark the limits of the *possible complexity* of temporal ideas, in a way analogous to that in which the maximal number of included beats (§15, 6) marks the limits of their *length.* (*Outlines of Psychology*, 1896-1897, p. 151-152, trans. Charles H. Judd)

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As we can see, the first rhythmological change that resulted from the passing in the 1870s from plain physiology to physiological psychology was the demise of the basic medical model of rhythm. But this significant change which broke with a two-thousand-year-old tradition was not supported by any correlative interest in the poetic innovations that had been developing since the end of the 18th century (see vol. 2, chap. 3, 4 and 8) and that had still somehow influenced Brücke's novel study. Instead, it entirely relied on the musical model of rhythm. This substitution had, actually, already be tempted in the 18th century by Marquet (see vol. 2, chap. 2) and was implicit in Helmholtz's study on sound impressions, but Wundt gave it new impetus and the musical model of rhythm became one of the most widely spread in psychology as well as other human sciences until late in the 20th century.

However, during the very last years of the 19th century, Wundt introduced some innovations which noticeably transformed the way psychology dealt with rhythm. In order to address the criticisms raised by younger psychologists, he wanted to pay more heed to its motor aspect while still reasserting the primacy of its mental side. Wundt was thus driven to reduce rhythm to sheer binary alternation, oscillation or regular succession of beats, or at least to give the primacy to the physiological over the musical model. Instead of starting from the musical theory of rhythm and applying it to inner sensations of movement and hearing, he now began from the alternate movements of the lower limbs, the oscillations of the hips, and the alternate perceptions of down-beat and off-beat, before reconstructing the whole musical rhythmic system of beats, bars, and time signatures. Consequently, whereas rhythm was primarily defined as a *regular and articulate arrangement of beats and bars,* it was now presented, in its

deeper essence, as a *succession of regular beats endowed with a certain frequency*. Around 1900, psychology endorsed the most modern scientific acceptation of rhythm (see vol. 2, chap. 2) at the expense of both its ancient medical and musical meanings, without yet, naturally, making them completely disappear.

Next chapter