Rhythm as Form of Physiopsychological Process (part 1)

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

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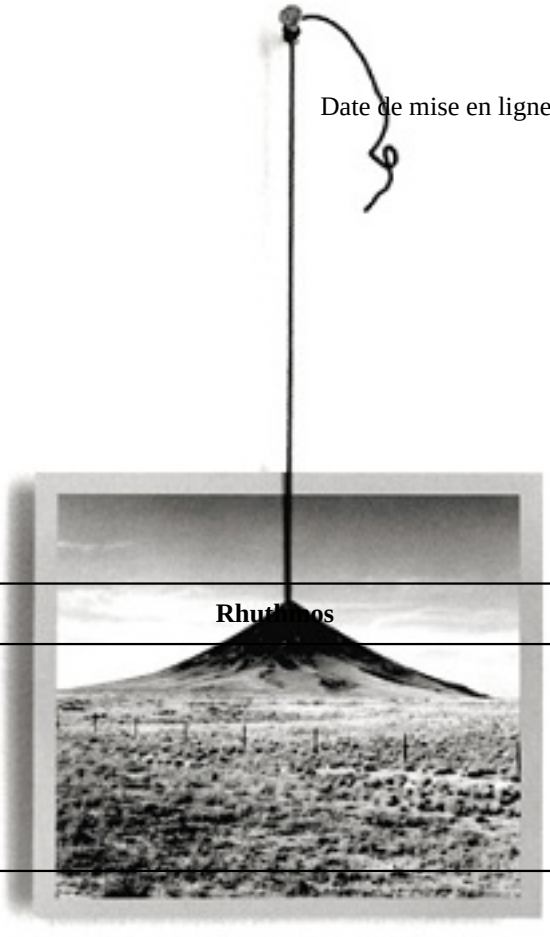

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Previous chapter

In the 1870s, a new branch grew from the trunk of physiology and transformed into what Wilhelm Wundt, who was instrumental in this change, termed "physiological psychology," a kind of investigation of the human mind based on both experimental method and physiological perspective. Contrarily to the previous period, rhythm started to be elaborated *per se* which resulted in parting from the medical model. However, the interest in poetry illustrated by Brücke faded out and the theoretical trend triggered by Helmholtz's contribution on sound and music became prevalent. As a result, psychology unconditionally adopted the musical definition of rhythm.

From Physiological to Psychological Rhythm (Wundt - 1873)

In the mid-1860s, the young Wilhelm Wundt enthusiastically endorsed the ongoing transformation of the research field from physiology to psychology. From 1864, he began to lecture on what he called "physiological psychology." This new investigation took him another ten years and he finally published in 1873-1874 his first well-known book *Grundzüge der physiologischen Psychologie - Principles of Physiological Psychology*, which was expanded and republished six times (last. ed. 1908-1911). This was the first textbook ever written pertaining to the field of experimental psychology, although it was still considered constituent part of physiology. In 1875, Wundt was made professor of philosophy at the University of Leipzig, where he opened in 1879 the first laboratory ever to be exclusively devoted to psychological studies. He stayed in this position until his retirement in 1917.

In the *Principles*, Wundt's interest in rhythm was actually only incidental to the more focal problems of "span of consciousness" and "synthetic activity of consciousness." As a matter of fact, he dealt with the question only in three instances in the third part of the book. But this contribution was, as we shall see, already quite elaborate and it fully participated in the establishment of a new concept of rhythm at least in psychology.

Rhythm was not any more to be taken in the medical sense but as "auditory rhythm," that is, at least as a starting point, as the musicians defined it. After having described the "Physiological Characteristics of the Nervous System" (Part 1), then the "Sensations" (Part 2), Wundt analyzed the "Ideas" evoked in the consciousness by the various sensations generated by the nervous system (Part 3) [1]. "Taste and Movement Ideas" were first dealt with (Chap. 12), then "Auditory Ideas" (Chap. 13), "Ocular Ideas" (Chap. 14), "Imagination Ideas" (Chap 14), "Complex Ideas, General Ideas and Intuition Forms" (Chap. 16) and, finally, the "Aesthetic Feelings" (Chap. 17).

Rhythm was first discussed and defined in a short section of the chapter dedicated to "auditory ideas," along with "constant sound," "harmony," "minor and major chords" (Chap. 13). However, music was not in itself Wundt's concern; auditory rhythm was only an entry point to address fundamental psychological issues. This explains why Wundt addressed again the question of rhythm in the chapters dedicated to the Kantian problem of the "intuition of time and space" (Chap. 16) and to the "aesthetic feelings" (Chap. 17). In my comments, I will follow the same order.

Whereas, in his previous physiological research, Wundt used almost exclusively the traditional medical concept of rhythm (*alternation* associated with *ratio*), he immediately introduced, in his physiopsychological studies, a different definition of the concept borrowed from music at least as it was commonly defined in his time.

Wundt started by contrasting rhythm with harmony and melody. All of them were related to the translation of our successive sensations of hearing into a succession of sound ideas; but whereas the latter implied "qualitative changes," the former resulted from "intensive changes." From the outset, the rhythm was thus equated with *a regular succession of rises and falls in sound intensity*.

> For the development and completion of the notion of time *[Zeitauffassung]*, however, the *intensive* change of sound is of greater importance. One and the same sound can be set stronger or weaker. If such rises and falls *[Hebungen und Senkungen]* follow one another with certain regularity, the sounds are thereby *rhythmically* articulated *[rhythmisch gegliedert]*. (*Principles of Physiological Psychology*, 1873-1874, p. 513, my trans.)

But rhythm was not dependent only on the auditory system. It was also related with innate bodily capabilities and, therefore, also defined as "regular rhythmic alternation of movements." Due to "the arrangement of the locomotor organs," Wundt noticed, both kinds of rhythm entrained each other.

> However, the change in sound intensity has its nearest model in the nervous feelings that accompany our own movements. For the arrangement of the moving limbs, especially the locomotor organs, explains the disposition toward a regular rhythmic alternation of movements *[einem regelmäßigen rhythmischen Wechsel]*. Thus, during dancing, marching, and beating, a corresponding rhythmic sequence of our movements joins, with an almost irresistible force, with the alternation of sound perceptions. (*Principles of Physiological Psychology*, 1873-1874, p. 513, my trans.)

From an evolutionary viewpoint, bodily rhythm had most probably anticipated auditory rhythm but the latter had eventually developed upon and refined the former. While being related to each other, bodily and auditory rhythms resulted from different degrees of evolution and were, therefore, endowed with various levels of sophistication.

> Inspired by our movement, in which we find the earliest rhythmic *[das Rhythmische am frühesten finden]*, we call rhythm in general a movement that progresses according to a precisely determined measure *[eine nach genau bestimmten Maass fortschreitende Bewegung]*. But the subtlety with which our ear understands the steps of the rhythmic movement *[die Schritte der rhytmischen Bewegung]* makes it surpass our original sensations of movement. On the one hand, it differentiates temporal parts as fractions of bar, which are no longer discernible in one's own movement. On the other hand, it is able to immerse itself in rhythms whose slow progress can no longer be reproduced in the movement of our body. (*Principles of Physiological Psychology*, 1873-1874, p. 517-518, my trans., same idea p. 520)

In the fifth edition of the *Principles* (1902), which was partly translated into English (1904 - 2nd ed. 1910), Wundt

more precisely, if cautiously, explained this interaction between auditory and movement rhythms by the close localizations of the concerned nervous centers in the brain.

> The acusticus is precisely the sensory nerve that gives certain objective sense impressions a specific relation to movement; our movements adapt themselves involuntarily, in a corresponding rhythm, to rhythmical impressions of sound. (*Principles of Physiological Psychology*, 1902, ed. 1910, p. 276, trans. Edward B. Titchener)
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> The connexions with certain sensorimotor and regulatory centres, in particular, centres like the pregemina, cerebellum, etc., can, in the present state of our knowledge, be referred only quite generally to the interactions between auditory impressions and rhythmical movements. (*Principles of Physiological Psychology*, 1902, ed. 1910, p. 299, trans. Edward B. Titchener)

Having defined rhythm as *regular alternation of acoustic rises and falls or bodily movements*, Wundt explored the range within which the rhythm could develop. Since rises could be performed in three progressive ways (low, medium, high), he classified the *"rhythmic structures"* from the simplest one one bar containing two alternate sounds to the most complex ones one bar containing three or four alternate sounds, each possibly endowed with three different degrees of intensity.

> The simplest rhythmic structure *[Das einfachste rhythmische Gebilde]*, which consists of a certain number of well-defined rises and falls of the sound, is called the *bar [den Takt]*. The simplest possible form of time signature *[Taktform]* is the 2/8 time signature, in which rise and fall *[Hebung und Senkung]* regularly alternate without further gradation. On the other hand, the 3/4 and 4/4 time signatures *[Taktformen]*, in which all three degrees [in the intensity] of rising are represented, constitute the upper limit of the more common ones [...] The 2/4-time signature, in which two degrees of rising can be distinguished, is in a middle position. (*Principles of Physiological Psychology*, 1873-1874, p. 514, my trans.)

According to Wundt, all other "rhythmic structures" could be reduced to the four previous ones.

> Several other kinds of time signatures *[Taktformen]*, which are still admitted, can all be reduced to the four enumerated here, so the 2/1 and 2/16 to the 2/8, the 3/2 to the 3/4, the 2/2 and 4/8 to the 2/4; others are extensions of the same, in which the number of falls, which follow a rise, is increased by one or a few. In this way the 3/8 time signature arises from the 2/8, the 9/8 from the 3/4, the 6/4 and 12/8 from the 4/4, the 5/8 from the 2/4 time signature. Finally, two simpler time signatures, with regular alternation, can form a more complex one: thus, the 5/4 time signature is only a combination of the 3/4 and 2/4 time signatures. (*Principles of Physiological Psychology*, 1873-1874, p. 514-515, my trans.)

Directly borrowing from the music theorists, Wundt distinguished two- and three-part time signatures (nowadays duple and triple meters), as well as mixed ones "which are composed of two- and three-part elements at the same

time" (p. 515).

He then addressed the question of *accentuation*. As it was already customary in music, he used "rise" or "arsis" as synonymous with "strong beat," i.e. contrarily to the original Greek meaning of unaccented note. But he noticed that a bar could "begin with the arsis as well as with the thesis," at least in duple meters.

> It is only a matter of convention that every bar should begin with the strong beat *[mit dem schweren Takttheil]* , and in the more complex time signatures *[Taktformen]* with the strongest rise *[mit der stärksten Hebung]* [...]. Actually, every bar *[Takt]* can begin with the arsis as well as with the thesis, and for the formation of the two-part bars the two forms [...] must indeed be regarded as equally possible. This is different with the tripartite measures. Here the practice of both modern and ancient rhythmics *[Rhythmik]* shows that the strong beat *[der schwere Taktteil]* is always sandwiched between two weaker ones *[zwischen zwei leichteren]*. (*Principles of Physiological Psychology*, 1873-1874, p. 515, my trans.)

Following the classification of time signatures, Wundt described the building of a whole piece of music by way of connecting the smallest units into increasingly larger units. The first of these aggregated units he called "rhythmic series" or "phrase," which corresponded to a "line of verse" in poetry. Second order units were called "rhythmic periods."

> A certain number of bars *[Takten]* join in a *rhythmic series* [rhythmischen Reihe] [Footnote : It is usually referred to as a phrase *[Absatz]* in musical metric, and as a line of verse *[Verszeile]* in poetry.]; the *rhythmic period* [rhythmische Periode] builds up from a number of series. These more complex constituents of the rhythm are also enclosed between a lower and an upper limit. (*Principles of Physiological Psychology*, 1873-1874, p. 516, my trans.)

For physiological reasons, the "rhythmic series" could range from two to six bars, not more, but the "rhythmic periods" could be composed only of two series, not more, except in poetry.

> The smallest rhythmic series consists of *two* bars, the largest of which, as the musical and poetic metrics equally show, is formed by *six* bars. In music, the medium between these extremes, the even-numbered series of *four* bars, is the ordinary form. Rhythmic series, which go beyond six bars (the hexapody), are extremely rare. For the *period* [Periode] (or stanza *[Strophe]*), too, *two* is the smallest number of series of which it is composed, and it is at the same time the most usual one: the first series forms the anterior phrase *[Vordersatz]*, the second the posterior phrase *[Nachsatz]*. Relatively rare, and almost only in poetic rhythm, which in this respect provides a greater range against monotony, three, four and even five series can be connected with each other. (*Principles of Physiological Psychology*, 1873-1874, p. 516-517, my trans.)

Beyond these limits, Wundt claimed, the perception/ideation of rhythm begins to blur and the connectedness of a

piece has to be sustained by the melody.

> In music, the whole divided into bars, series and periods [*Takte, Reihen und Perioden]* is often composed into larger sections or phrases *[Abschnitte oder Sätze]*. But these sections lack rhythmic clarity *[die rhythmische Übersichtlichkeit]*. They find their connection not in rhythmic motives, but in melody. (*Principles of Physiological Psychology*, 1873-1874, p. 517, my trans.)

Auditory Rhythm as Cause of Time Idea (Wundt - 1873)

In Chapter 16, which was dedicated to "Complex Ideas, General Ideas and Intuition Forms," Wundt turned to the role played by the rhythm as it had been previously defined on a musical basis in the constitution of our "idea of time." He started by borrowing from Kant the concept of "intuition of time" but he immediately added that the latter had to be explained psychologically, i.e. genetically, instead of being merely considered as innate.

> Kant first proved that the forms of intuition *[die Anschauungsformen]* are actually *subjective* in nature. The problem arose then of explaining them psychologically, as soon as one went beyond the view still held by Kant himself [that] space and time are forms already set in us to which the sensory perceptions readily fit. (*Principles of Physiological Psychology*, 1873-1874, p. 580, my trans.)

In Chapter 13, elaborating on Augustine's well-known argument our idea of time derives from our interior capacities of expectation and memory (*Confessiones*, 11) but also, probably without knowing it, on a less well-known one time must be linked with the power to utter words rhythmically (see vol. 1, p. 383 *sq*.) Wundt had already claimed that the "intuition of time" derived from the existence of "rhythmic" successions of alternate auditory sensations and ideas. Even in a mere binary succession of beats, the ideas of *past* and *future* were given both through the regular division of the continuous flow of time and by the "memory" and the "expectation" entailed by this division.

> An unchanging, continuous sound provides our consciousness with no hints as how to divide it into periods of time. The simplest way, in which such a division can be made, is that the sound, while remaining qualitatively unchanged, decreases and increases in intensity. As moments of *rising* (arsis) and *falling* (thesis) follow each other, they separate from each other in our consciousness. Each rise is considered as a repetition of the previous one. At the same time, as soon the alternation becomes regular, on every fall a new rise is expected, and vice versa. Thus, this simplest form of rhythmic structure *[rhythmischer Gliederung]* already contains the full intuition of time *[Zeitanschauung]* with its reference from the present sensation to those of the past and future. (*Principles of Physiological Psychology*, 1873-1874, p. 513, my trans.)

He had also suggested a little further down that only a rhythmic succession of "a constant number of rises and falls" allowed to grasp the idea of *continuous duration* and that of its *division into segments*.

The rhythmic element which sustains all composite arrangements is the bar *[der Takt]*. Since it contains a constant number of rises and falls *[eine constant Anzahl von Hebungen und Senkungen]*, it takes *a determined amount of time* [eine bestimmte Zeitdauer]. The idea of duration *[Die Vorstellung der Zeitdauer]* and its division *[und ihrer Eintheilung]*, therefore, not only finds its expression in rhythm *[im Rhythmus]*, but also realizes itself essentially through it. We have a reasonably accurate idea of the timing of an event *[von den Zeitverhältnissen eines Ereignisses]* only if it proceeds in rhythmic form *[in rhythmischer Form]*. (*Principles of Physiological Psychology*, 1873-1874, p. 517, my trans.)

In Chapter 16, Wundt elaborated further these suggestions by psychologically deriving the "intuition of time" from the rhythmic succession of ideas triggered by rhythmic perceptions, their persistence in the consciousness in the form of "aftereffects," and the resulting general idea that "they can easily be reproduced."

> The *intuition of time* [Zeitanschauung] arises from the succession of different ideas *[Vorstellungen]*, each of which remains available to the consciousness when a new one enters into it. But the nature of the idea of time *[Das Wesen der Zeitvorstellung]* does not consist in the actual reproduction of ideas *[Vorstellungen]* but in the *idea that they can be reproduced* [in der Vorstellung, dass sie reproduziert werden können]. Psychologically, this is only possible if every idea, when it disappears from consciousness *[aus dem Bewusstsein]*, leaves behind an aftereffect, which lasts alongside the new ideas. Such an immediate aftereffect does not need to extend to all reproducible ideas. Rather, we have come to know facts in the temporal conception of the auditory impressions, which point to a rather narrow scope of the immediate conception of time. It is clearly indicated by those limits which the simplest rhythmic structure *[das einfachste rhythmische Gebilde]*, the *bar* [*der* Takt], must conform to in order to be integrated into one whole. In the conception of the more complex rhythmic forms there is already a reproduction of such ideas, whose immediate after-effects have already disappeared from consciousness, and which have retained only the general characteristic that they can easily be reproduced. (*Principles of Physiological Psychology*, 1873-1874, p. 680-681, my trans.)

The "idea of time" was thus not innate, as Kant had believed, but resulted from an "indispensable external condition": "the succession of sensory impressions" and their reciprocal resonance by means of "intermediate imaginary image," which he also called "memory images - *Erinnerungsbilde*."

> The idea of time finds originally an indispensable external condition of its formation, in any case, in the succession of sensory impressions. Let us suppose, to start with the simplest case, that the same sound impressions, for example, pendulum strokes would follow each other at regular intervals [...]. If the first pendulum stroke has passed, an imaginary picture *[Phantasiebild]* of it will remain until a second one occurs. [...] this simple repetition of a previous impression provides all the elements of the idea of time *[Zeitvorstellung]*: the first sound is the beginning of time *[Zeitanfang]*, the second the end of time *[Zeitende]*, and the intermediate imaginary image *[dazwischenliegende Phantasiebild]* represents the stretch of time *[Zeitstrecke]*. At the moment of the second impression, all of a sudden, the whole idea of time *[Zeitvorstellung]* exists, for here all three elements are given simultaneously: the second impression and immediately the imaginary image, the first impression through the reproduction. (*Principles of Physiological Psychology*, 1873-1874, p. 681-682, my trans.)

This psychological approach drove Wundt to challenge the usual infinite concept of time as too theoretical and practically inadequate, and underline instead the limits of our natural "intuition" and "idea of time" which seemed here to almost blend together.

According to this [the fact that our immediate conception of time is based on limited time stretches], our idea of time *[unsere Zeitvorstellung]* is far removed from the infinite extension which we ascribe to time according to its concept *[dem Begriffe nach]*. The latter, like every concept, is a postulate that is never reached by the ideation *[Vorstellung]*. Of course, we are naturally quite close when we think of the after-effects of the ideas which are necessary for the time intuition *[für die Zeitanschauung]* as faded pictures or remnants. But a series of simultaneous stronger and weaker ideas *[starker und schwacher Vorstellungen]* is not yet a time series. (*Principles of Physiological Psychology*, 1873-1874, p. 681, my trans.)

Time could actually not be conceived of as an abstract concept emptied "from any particular ideal content," as it was too often the case.

> In forming the concept of time *[Begriff der Zeit]*, we empty it from any particular ideal content *[Vorstellungsinhalte]*, and thereby arrive at the assumption that time is a general form *[gleichbeschaffene allgemeine Form]*, which is evenly available in every given moment *[in jedem Augenblick]*, and which accompanies the ideas. The result is that image of infinite continuous straight line, forward and backward. [However], as far as the intuition of time is concerned, this picture has no reality at all. (*Principles of Physiological Psychology*, 1873-1874, p. 684, my trans.)

Our natural intuition of time had to be investigated practically. Since the flow of consciousness does not stop between strokes, the analysis of the rhythmic series could not be reduced to the mere recurrence of beats. On the one hand, due to the continuous activity of the mind, the impressions of the first and the second stroke are necessarily different; on the other hand, the echo of the first stroke meets new impressions whose origin he did not explain before the second stroke enters the field of consciousness.

> The elementary conditions, as they have been assumed here, must be made more complex since, first of all, the end-point is related with a different impression than the starting-point, and second, there is no pause between the two points but a series of different impressions. As a matter of fact, the memory image *[Erinnerungsbild]* of the first impression will accompany the ideas *[Vorstellungen]* that fill in the time stretch *[Zeitstrecke]*. (*Principles of Physiological Psychology*, 1873-1874, p. 682, my trans.)

Both facts explained that we can think of the time under two different guises as *limited time stretch* or as *unlimited time series* and to build upon the former the idea of the latter.

At the moment when the final impression happens, however, a couple of things are possible: it can either be related to the initial impression, so that it is reproduced as above; then again the idea of the precisely determinate time stretch *[die Vorstellung der bestimmt abgegrenzten Zeitstrecke]* arises. Or, there can be no reason for such reproduction; then the idea of the *indeterminate* course of time *[die Vorstellung des* unbestimmten *Zeitverlaufs]* arises. (*Principles of Physiological Psychology*, 1873-1874, p. 682, my trans.)

A further argument concerns the impressions located between beginning and end points. Each one of them still lingers in the memory after [actually] disappearing. So every intermediate impression becomes the starting point of a subordinate time stretch. If, according to the association laws, the last impression reproduce the first one, then all these tuned and superimposed time stretches recede behind the main stretch. If, [instead,] such reproduction does not happen, then all the time stretches are equal to one another, but all are, at the same time, indefinite. In both cases, the condition in which the consciousness finds herself corresponds only to a very obscure sense of time. Nevertheless, it provides the basis for the formation of the *concept of time* [zur Bildung des Zeitbegriffs] in which the idea of the indeterminately limited *[unbestimmt begrenzten]* time series is elevated to the requirement of an *unlimited* one *[einer* unbegrenzten *Zeitreihe]*. (*Principles of Physiological Psychology*, 1873-1874, p. 682-683, my trans.)

Yet, the idea of *unlimited time series* is not yet complete because it still lacks the idea of *course of time*.

> [The clear intuition of the *course* of time - *die klare Anschauung des* Verlaufs *der Zeit*] is not yet included in the indefinite idea of time. The addition of the new impression to the memory images only arouses in general the idea of a previous one. Since the new impression does not reproduce a particular preceding one, the idea of stretch of time *[die Vorstellung der Zeitstrecke]*, which constitutes an element of the course of time *[in den Verlauf der Zeit]*, is completely absent. For every particular course of time *[Zeitverlauf]* consists of stretches of time *[Zeitstrecken]*, which must be marked by beginning and end points. (*Principles of Physiological Psychology*, 1873-1874, p. 683, my trans.)

Finally, only rhythm, "because the uniform reproduction of the previous [bar] gives clear marks to the beginning and end of each simple time stretch," provides the ultimate idea of *time-course* which has to supplement our sense of *infinite time*. Through rhythm time is interpreted as "measurable quantities."

> This accounts for the great importance of the *rhythm* for the formation of the idea of time *[Zeitvorstellung]*. Each bar *[Takttheil]* forms a simple time stretch *[Zeitstrecke]*, which is integrated with others into a larger time series *[Zeitreihe]*. The course of the latter *[der Verlauf derselben]* is immediately grasped, because the uniform reproduction of the previous [bar] *[Vorangegangenen]* gives clear marks to the beginning and end of each simple time stretch *[Zeitstrecke]* and to the entire series *[ganze Reihe]*. In this case, therefore, the intuition of the *measurement* of time *[Anschauung zur* Messung *der Zeit]* becomes also immediate. The successive bars *[Takte]* are interpreted as quantities of time *[Zeitgrössen]*, which are further subdivided into the rises and falls of the rhythm *[Hebungen und Senkungen des Rhythmus]*. (*Principles of Physiological Psychology*, 1873-1874, p. 683, my trans.)

This had two important consequences. First, Wundt opposed in advance Bergson's conception of time as *durée continue* and anticipated, by the same token, Bachelard's view on time as consisting of discrete time points (Bachelard, 1932 and 1936; see Lamy, 2014).

> An often-used picture compares time with a line without thickness. Through this image one has been enticed to attribute to time an essential quality of space, *continuity*. But time itself is a *discrete* entity. It consists of individual ideas that fit together; a single unvarying continuous idea could never lead to time intuition. For that very reason the *number*, which according to its original meaning can only be referred to discrete objects, is a concept which first emerges from the idea of time. (*Principles of Physiological Psychology*, 1873-1874, p. 684, my trans.)

Second, since it entailed both concepts of time-infinity and time-measurement, rhythm was therefore granted the power to elicit "the *concepts of number* and *quantity*."

> Thus, the rhythmic idea of time *[die rhythmische Zeitvorstellung]* first and foremost contains the condition for the emergence of two important concepts, the *concept of number* and the *concept of quantity [des* Zahlbegriffs *und des* Grössenbegriffs*]*. (*Principles of Physiological Psychology*, 1873-1874, p. 683, my trans.)

As for arithmetic operators, *addition* and *subtraction* were conceivable as extensions of any "arbitrary alternation of ideas," i.e. irregular series. But *multiplication* and *division* were "psychologically hardly imaginable without the rhythmic structure of the time series," so as the concepts of *power* and *root* which result from their repetition.

> Any change of ideas *[Wechsel von Vorstellungen]* can lead to the number concept *[Zahlbegriff]*. [...] Since each time interval points to a preceding and succeeding one, the concept of number combines with [that of] the *unlimited*. The progress from one idea to another is the model of *addition*, the regression in the time series the model of *subtraction*. Yet, while these simplest forms of the concept of number can arise from any arbitrary alternation of ideas, the more complex forms of the progressive and regressive processes are psychologically hardly imaginable without the rhythmic structure of the time series *[die rhythmische Gliederung der Zeitreihe]*. Every compound rhythmic structure breaks down into simpler constituents. The generation of the bar *[des Taktes]* from its elements, the rhythmic series from the bars, corresponds to the *multiplication*, the splitting *[Zerlegung]* to the *division*. The relation of the simplest bar elements to the rhythmic series and periods finally provides the model for the repetitions of these processes, which lead to the concepts of *power* and *root*. (*Principles of Physiological Psychology*, 1873-1874, p. 684, my trans.)

Auditory Rhythm as Cause of Aesthetic Feelings (Wundt - 1873)

The second psychological dimension of rhythm that attracted Wundt's attention, and the least developed as a matter of fact, was the part it plays in our "aesthetic feelings." In Chapter 17, he again compared and contrasted rhythm and harmony. Both were ways to bring order to sounds, in pitch for harmony, in time for rhythm. Endorsing a long Platonic tradition (see vol. 1, chap. 2), he attributed the aesthetic pleasure to this power of ordering a chaotic matter that would procure otherwise disagreeable impressions.

> Because the sense of hearing brings order to *[ordnet]* the simultaneous as well as the successive impressions, it is endowed with two basic forms of aesthetic feelings: harmony and disharmony, rhythm and arrhythmia. The basis of *harmony*, as has been shown in detail, is the coincidence of certain partials of different sounds. [...] The *rhythm* provides pleasure through intensively or qualitatively related impressions, which are repeated in the alternation of different auditory ideas usually according to regular periods of time. (*Principles of Physiological Psychology*, 1873-1874, p. 692-693, my trans.)

Deaf to the experiments of the most important musicians of his time, not to mention the poets, who all tried to get rid of metric patterns (see vol. 2, chap. 8), and merely translating into "science" a rather classical taste, Wundt claimed that the most pleasurable series of sounds were those based on "regular alternation" and "repetition of the similar," within yet the range of human perception. Beyond a certain limit, the rhythm could merely not be recognized.

> In order to create an aesthetic pleasure, at least two different impressions, rise and fall of the sound, as in 2/8 time signature must follow each other in regular alternation. The rhythmic feeling likewise ceases when the series of different impressions becomes so long that the repetition of the similar can no longer be felt, as in 9/4 time signature or in other forms that exceed the limit of clarity. (*Principles of Physiological Psychology*, 1873-1874, p. 693, my trans.)

There was a way, though, to "extend" the "rhythmic feeling" "over larger successions" with the help of the melodic and harmonic feelings, which could beneficially enhance the more primitive means of expression provided by the rhythm.

> By combining the bars into rhythmic series, the series into periods, finally the musical periods into the divisions of the melody, the rhythmic feeling can be extended over larger successions. As the harmony, the rhythm is based on the easily manageable connection of ideas. Within the general regularity of succession, various forms of pleasure become possible, then, through the variable bar structure *[Taktgliederung]*, [and] the faster or slower succession of impressions [forms of pleasure] which [can] expand infinitely, since they join, in the melody, with the laws of harmonic sound connection. (*Principles of Physiological Psychology*, 1873-1874, p. 693-694, my trans.)

Yet, Wundt concluded by giving the same psychological and aesthetic significance to harmony, which gave "direction to the mood," and to rhythm, which was supposed to "portray the alternation and waves of the emotions."

> In the whole of the musical effect, it is the harmony which gives direction to the mood *[der Gemütsstimmung ihre Richtung gibt]*, the rhythm which portrays the alternation and waves of the emotions *[das Wechseln und Wogen der Gefühle schildert]*. But both forms of expression are held together by the principle of unity governing the manifold. (*Principles of Physiological Psychology*, 1873-1874, p. 694, my trans.)

Let us recapitulate. In his *Principles of Physiological Psychology*, published for the first time in 1873-1874 and republished many times until the 1910s, Wundt devoted a much larger space to rhythm than any of the previous studies we dealt with. Thanks to his contribution, rhythm became from the 1870s a major subject in psychology. Under both its auditory and bodily guises, it was now considered as the physiological basis of our inner sense of time in all its complexity: continuous duration as well as division into segments, limited objective time stretch as well as unlimited time series, limited span of consciousness as well as infinite course. It was also viewed as one of the physiological causes of the pleasure we take in listening to music.

Concerning time, this physiopsychological inversion of the Kantian dogma our sense of time is not innate but depends on physical and physiological factors (acoustic/hearing and inner perception of bodily movements) launched a vast program of research which developed at least for the next three decades. Concerning aesthetic, the result was less convincing, though. Wundt was unconcerned with any real artistic practice and only prolonged a traditional way of looking at art (essentially music, poetry was left by the wayside) through Platonic categories.

On the conceptual level, Wundt's contribution was even more striking. If rhythm was not any more used in the old medical sense, it was now merely taken in the sense of music, most of the time as *regular succession of rises and lowerings* or, at best, as *regular succession of measures divided into beats*. Here too, as his predecessors, Wundt became one of the most efficient propagators of the *Platonic metric paradigm*.

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[1] Wundt defined "an idea - *eine Vorstellung*" as, "according the common meaning of the word, the image of an object produced in our consciousness *[in unsern Bewusstsein erzeugte Bild eines Gegenstandes]*." (p. 464, my trans.)