

Rhythm as Form of Physiological Process (Part 3)

Wednesday 29 August 2018, by [Pascal Michon](#)

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Physiology of Poetic Rhythm (Brücke - 1871)

As Hermann von Helmholtz, Carl Ludwig, and Emil Du Bois-Reymond, the German-Austrian physiologist Ernst Wilhelm von Brücke (1819-1892) was a resolute advocate of the School of Organic Physics which wanted to practice physiology exclusively on the basis of the exact natural sciences and in decided contrast to the so-called “Romantic Physiology” or to older vitalist currents. Contrarily to his colleagues, though, Brücke paid some heed to poetry. In 1871, he published a short booklet comprising 81 pages entitled *Die physiologischen Grundlagen der neuhochdeutschen Verskunst - The Physiological Bases of the New High German Prosody*. After Helmholtz’s essay on music, this was the second time that rhythm was taken as a subject of investigation, but this time from poetry.

Remarkably, Brücke was very critical about the metric theory of the first half of the 19th century which, due to a forced translation of metric patterns from tongues as Greek and Latin based on syllable quantity to German based on word stresses, tended to impose an unnatural pronunciation either by displacing word accents or distorting syllable durations.

I do not think the reader will contradict me if I proceed from the principle that a verse is all the more correct, the less one must depart from the prosaic pronunciation while scanning it [*scandiren*]. If one wants to prove a prosodic error, one only needs to scan [*scandiren*] it sharply and show the distortion which the pronunciation of one or the other word or group of words suffers as a result. This distortion can essentially be of two kinds: first, it can affect the accent, and second, the quantity. It is therefore possible to distinguish two fundamental laws: the law of accent congruence, which states that the accentuation required by the verse should not diverge from the common one; and the law of duration congruence, which states that we should not be compelled by the verse structure to time the pronunciation of the individual syllables in such a way that disturbing deviations from the natural use, recognized as correct, arise. We must devote a special investigation to each of these two laws. (*The Physiological Bases of the New High German Prosody*, 1871, p. 1, my trans.)

Brücke wanted to expose a more “natural” way to deliver German poetry by retrieving the physiological bases of the German language. It was clearly a naturalist enterprise which was attuned with those of his colleagues in the school of Organic Physics, especially Helmholtz’s.

But he encountered the same paradox as them. On the one hand, Brücke made remarkable findings.

He underlined the fact that the metric patterns based on ictuses could sometimes conflict with the natural stresses of the German language and artificially transform an unstressed syllable in a stressed one. This could even result in “inadmissible and ridiculous” way of scanning a line of verse (p. 21).

It is clear from the above that one will first choose stressed syllables to place ictuses, but also that arses which are not hit by an ictus may support a second-order stress. The fact that it too is formed of a stressed syllable does not cause any distortion of the accent, but rather that the ictus falls on a weaker syllable. If we scan [*Scandiren wir*]:

Fur meines Vaterlandes Ruhm bin ich bereit

we read according to the usual scheme for the iambic trimeter, but we read badly. In order to make the verse lecture bearable, we are compelled to change its rhythm [*den Rhythmus desselben*] and read.

Fur meines Vaterlandes Ruhm bin ich bereit

Here is a new rhythm [*ein neuer Rhythmus*] given by three equidistant ictuses, with the difference that the ictus does not fall on the first but on the second arsis of each dipody. (*The Physiological Bases of the New High German Prosody*, 1871, p. 5-6, my trans.)

He, therefore, found necessary to adapt the metric accents to the most common pronunciation of word stresses.

The change of rhythm [*Der Wechsel des Rhythmus*] in one and the same system of versification is not only permissible, but often even required. (*The Physiological Bases of the New High German Prosody*, 1871, p. 6, my trans.)

He laudatorily quoted Minckwitz's *Lehrbuch der deutschen Verskunst - Textbook of German Versification* (1863, p. 22 and p. 87) for making it clear that German poetry could not, for sheer linguistic reasons, indiscriminately use Ancient Greek patterns—yet, eventually criticizing him for being in other passages inconsistent with his previous statements (p. 11).

The main accents of the verse, namely its ictuses [*Hebungen*], must not be placed on any other syllables than on those which have the main accent in High German pronunciation. The observation of this law produces rhythms [*Rhythmen*] which must appear most pertinent and

appropriate even to the one who does not know anything about verse and versification, or for the first time hears a series of feet. [...] An artificial rhythm [*ein künstlicher Rhythmus*], built solely on musical sound as in Greek, is not possible in our language because the logical accentuation of words [*die logische Betonung der Wörter*] cannot be changed but has to remain the same as in prose. (Minckwitz quoted in *The Physiological Bases of the New High German Prosody*, 1871, p. 11-12, my trans.)

But, on the other hand, he defined, according to a metric, Platonic and a rather narrow definition—respectively to already existing alternatives (see, vol. 2, part. 2 and 4)—verse rhythm as a succession of “accents” and “ictuses.”

It is well-known that the individual syllabic complexes, on which the verse is built, the so-called verse feet, are composed of a raising of the voice (*arsis*), that is, an intensified exhalation pressure, and a lowering of the voice (*thesis*), i.e. a diminished expiratory pressure. But just as there are accent of the first order and accent of the second order, not every arsis is equal to the others; in many cases one has to distinguish first order arses and second order ones. The former are the ones who are said to be hit by the ictus. Thus, in regular and complete iambic trimeter, the ictus falls on the first arsis of each dipody [group of two feet], and we therefore scan [*wir scandiren deshalb*]:

Als rasche Pfeile sandte mich Archilochus.

(*The Physiological Bases of the New High German Prosody*, 1871, p. 5, my trans.)

The paradoxical association of a correct perception of German poetry with a Platonic perspective explains why Brücke concentrated on the measurement of the metric durations between arses and ictuses in verse.

Since we are dealing with the metric as theory of time measurement [*als der Lehre von der Zeitmessung*], let us simply ask ourselves: what is the basis of our measurement [*unseres Messens*] in each individual case, the [time-]length [*die Länge*], which, on the one hand, we may not surpass, but, on the other hand, must be fully realized? If we recite [*Man recitare*] a verse and simultaneously beat time [*schlage den Tact dazu*], it will be easy to perceive that the latter always corresponds with the uplift. Time beating is here, as in music, nothing but a tool for time measurement. The regular, or at least to a certain extent, regulated distances from arsis to arsis are therefore the basis of our whole time measurement, and this is confirmed by the experience of reciting verse [*das Sprechen von Versen*] while playing music or dancing. (*The Physiological Bases of the New High German Prosody*, 1871, p. 22, my trans.)

For the sake of scientific objectivity and precision, Brücke used a kymograph dubbed with a metronome to measure the time distances between arses and ictuses.

For these measurements, I made use of a kymograph-drum, rotating at a steady speed, on which I marked each arsis, including those struck by an ictus, while reciting [*recitirte*] iambic verses, hexameters, Alcaic and Sapphic stanzas. At the same time, the signals of a metronome were electrically transmitted to the same drum in order to inform the observer of any changes in the course of the instrument. (*The Physiological Bases of the New High German Prosody*, 1871, p. 23, see also p. 31, my trans.)

Predictably, he found that the distances between the various stresses were approximately equal to each other.

The subsequent comparison of the time distances between the individual marks showed that in iambic and trochaic meter the arses hit by an ictus and those not hit were equally distributed, and further that in the hexameter, in the Alcaic and Sapphic verses all arses were at the same distance. (*The Physiological Bases of the New High German Prosody*, 1871, p. 23, my trans.)

Another investigation concerned the measurement of syllable durations and the study of their varying associations by linking the kymograph to the lips.

Finally, in order to completely eliminate the influence of the various vowels and consonants, [and] so to write the rhythm of the verse itself, one can utter syllables composed of the same letter, e.g. *ba*, *bam*, *pap*, and then have the lip write on the kymograph. You then get pictures like the followings:

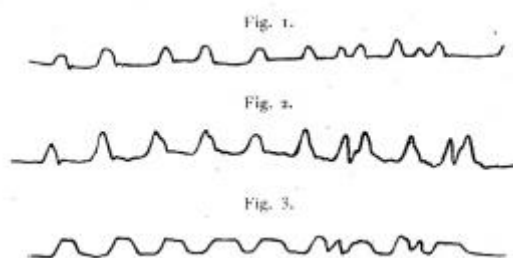


Fig. 1 shows an Alcaic line of verse formed from the syllable *pap*. The movement was made by the lower lip, so that the curve at *a* was a valley, at *p* always a peak. [...] In Figure 2, the syllable sequence *bimbám bambámbam bámbabam bámbabam* has been written in the Alcaic rhythm; the arsis peaks are also at the lowest ends of the descending parts of the second, fourth, sixth, and ninth dents. [...] In Fig. 3, I have shown an Alcaic line of verse formed entirely of the syllable *ba* to show how the curve forms, when the syllables develop throughout not from consonants but

vowels. (*The Physiological Bases of the New High German Prosody*, 1871, p. 32-33, my trans.)

Brücke also proved by using the kymograph that the traditional saying: “the stress makes [the syllable] long [*Der Accent macht lang*],” was utterly wrong and that an unaccented syllable could last twice as long as the previous one which was accentuated, as for example in *abfahrtsboot* (p. 58). Since the modern German metric rhythm was based on accents and not on durations, it was thus possible to alter the utterance speed of some syllables to accommodate it. Brücke retrieved, in this instance, a conclusion that had already been reached by Aristotle and Augustine, although in a different metric systems and for very different reasons: rhythm is more important than meter (see vol. 1, p. 97 *sq.* and p. 334).

On the arsis, i.e. when the expiratory pressure reaches its maximum, its climax, from which it sinks again, there may be any syllable which can be stressed by the expiratory pressure without distorting the pronunciation of those which are next to it. It is quite indifferent whether the syllable is long or short in itself, i.e. whether it requires much or little time for pronunciation in the ordinary language. In verse you can always spend [on each one] as much time as the rhythm demands. (*The Physiological Bases of the New High German Prosody*, 1871, p. 83, my trans.)

Brücke recognized that many forms of German poetry escaped his description (p. 49-50). But he nevertheless concluded that new High German poetry was based on the regular recurrence of stronger and weaker accents, metric ictuses and natural linguistic stresses, at least for its main prosodic forms. Physiology’s contribution finally only amounted to propose to substitute the old metric with a new one more adequate to the German language.

The German verse consists of a succession of syllables, in the utterance of which the increase and decrease in the exhalation pressure is regulated in a certain periodic way according to time. The beat of the verse [*Den Takt des Verses*] is carried out by muscles capable of altering the volume of the thoracic cavity; the separation of the syllables is produced by the organs of speech in the narrower sense, including the larynx. (*The Physiological Bases of the New High German Prosody*, 1871, p. 83, my trans.)

Except indirectly when dealing with the pronunciation, the psychological side was not developed by Brücke but, like Helmholtz, he unsurprisingly found that the pleasure induced by what he called “poetic rhythm” was similar to that induced by “watching the play of the waves or the dance.” It was triggered by “the periodic return of certain movements,” which in poetry meant “the symmetrical movements in raising and lowering the voice.”

As the eye, watching the play of the waves or the dance, is pleased by the periodic return of certain movements, the ear is pleased by the symmetrical movements in raising and lowering the voice. (*The Physiological Bases of the New High German Prosody*, 1871, p. 6, my trans.)

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In the 1850s and 1860s, the interest of physiologists in rhythm as operating concept as well as subject of investigation increased noticeably. But most of them had been trained as medical doctors and, consequently, they remained within the frame of the traditional medical model, although they tended to extend its use. Vierordt and Wundt, for instance, attributed a rhythmic nature to a larger battery of physiological phenomena (heartbeat, contractions of arteries or brain skins, movements of respiration and perspiration, contractions of childbirth) but they did not change its basic meaning as *series of alternate movements*.

When some of them took rhythm as subject of investigation in its own right, they heavily borrowed from the theories of music and poetic metric. Even if they wanted to *physiologically* investigate musical and poetic rhythms, i.e. according to a materialist and empiricist perspective, instead of borrowing from the contemporary artists themselves, they rather naively took the definition provided by the academic theoreticians of those disciplines for granted. The result was the spreading of the *Platonic metric paradigm* by the most devoted empiricists and materialists of the time.

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