Riccardo Martinelli

Stumpf and Brentano on tonal fusion

1. Brentano, Stumpf and tonal fusion

Carl Stumpf repeatedly declared his intellectual debt towards Franz Brentano, who influenced him both from a personal and from a philosophical point of view[1]. Stumpf's devotion and gratitude towards his Würzburg teacher is testified by many writings[2], letters and by the dedication of the second volume of the *Tonpsychologie* and of the posthumously appeared *Erkenntnislehre*[3]. However, the relationship of Brentano and Stumpf went through different phases. As Stumpf reports, some disappointment took place since 1896, and around 1903 they broke up almost completely and overcame their crisis only in the following year[4]. Together with some personal reasons, scientific questions played an important role in this process. Stumpf moved from a Brentanian standing point, but investigated sense perception – and especially tonal perception – in an original manner. As a consequence, some of his most renowned and important results, such as the doctrine of tonal fusion, became unacceptable for Brentano. However, their divergence dramatically increased after Brentano's development and publication of a new theory of sensible perception[5]. Thereafter, Brentano's and Stumpf's works offered alternative approaches to the same matter. As we shall see, this also explains why[6] the two philosophers contended about tonal fusion in 1907, seventeen years after the publication of Stumpf's doctrine – but only two years after Brentano's first public pronouncement on tonal perception[7].

In this essay I shall focus on the polemic concerning tonal fusion and try to show its importance in the development of the relationship between Brentano and Stumpf[8]. Far from representing a marginal episode, this quarrel is quite relevant to our understanding of this relationship. Stumpf never followed Brentano's new theory of «sensible qualities»[9]. On the contrary, Stumpf's theory, as published in the two volumes of the *Tonpsychologie*, was one of its natural opponents – and perhaps even one of its polemic targets. The polemic as to the mechanism of tonal fusion reveals then a more general divergence concerning the idea of human sensibility as a whole. This allows us to backdate the fundamental divergence in Brentano's and Stumpf's approach to sensibility, which became later explicit in the *Erkenntnislehre*[10].

The recognition begins with an analysis of Stumpf's idea of tonal fusion (§ 2). I shall then introduce Brentano's new theory of sensible qualities and of music perception (§ 3), and conclude with his criticism of Stumpf's tonal fusion (§ 4).

2. Stumpf's doctrine of tonal fusion

Stumpf's interest in the world of sound and music is deeply rooted in his personal and intellectual biography. He depicts himself as a young student «with more love of music than of erudition» in Würzburg in 1866, when he attended Brentano's habilitation discussion and, strongly impressed by his figure, decided to devote himself to philosophy[11]. This fundamental decision prevented him neither from practising music throughout his life, nor from making it one of his favourite fields of scientific investigation[12]. Some essential features concerning this topic emerge from many of his early writings. In the first, theoretical section of the first volume of the *Tonpsychologie* (1883), Stumpf lists the main relationships characterising appearances: multiplicity, increase, similarity and *fusion*[13]. This distinction represents the general philosophical frame of the successive, more specific analysis concerning *tonal* fusion. Also in his Psychology lessons in Halle (1886/87), Stumpf already says that consonant tones given «in simultaneous hearing or presenting approximate the impression of one single tone»[14].

However, it is only in the second volume of the *Tonpsychologie* (1890), that Stumpf systematically deals with the perception of simultaneous tones and formulates the doctrine of *Tonverschmelzung* in a convenient manner. To begin with, Stumpf wonders about the very nature of the perception of a simultaneous multiplicity of tones[15]. Following the Aristotelian method of the *aporiai*[16], he carefully discusses all the possible solutions for this question, i.e. that one perceives «many sensations at the same time, or just one sensation, or many sensations one after another»[17]. Accordingly, a perceived chord[18] would be conceived (1) as the result of many tone-sensations fused together (*Mehrheitslehre*, «multiplicity theory»); (2) as a single, unitary sensation – i.e. a chord-sensation – whose components depend of each other and are undetachable (*Einheitslehre*, «unity theory»); (3) as the result of a tremendously fast alternation of the two tonal sensations in the mind (*Wettstreitslehre*, «contrast theory»)[19].

This preliminary philosophical distinction has crucial importance for any discussion of tonal fusion. Stumpf's definition of tonal fusion (see below) can be properly understood only against the background of this conceptual framework. It is

remarkable that some divergence with Brentano emerge at this fundamental level. As we shall see, Brentano first inclines for the third option and finally switches to the second. On the contrary, Stumpf definitely and permanently defends the first doctrine, the «multiplicity theory»[20]. For him, hearing (or remembering, or thinking of) a chord implies the apprehension of a true multiplicity of tones, more or less «fused» together.

As Stumpf observes, sometimes we clearly distinguish this multiplicity and correctly recognise that there are two tones. Some other times, however, we completely fail to grasp the actual state of affairs, and falsely believe that a single tone is given. Such confusion does not necessarily derive from subjective inaccuracy or inexperience. Stumpf's experiments show that the reliability of the judgments concerning tonal multiplicity follow general rules, depending on *which* tones are chosen to build up the chord. An interval of major second is usually recognised as made up of two tones; but the octave is often taken for a single note. In other words, each different tonal multiplicity (the octave, the fifth, the fourth, and so on) is essentially characterised by a certain degree of «tonal fusion», that is, by the strength of its natural tendency to build up in our perception a sensorial whole rather than a mere sum of sensations. Stumpf defines *tonal fusion* (*Tonverschmelzung*) in the following words:

> The relation between two contents, more specifically between contents of sensation, whereby these do not constitute a mere sum but rather, a whole (*ein Ganzes*). The consequence of this relation is that, for its higher degrees, the overall impression – on the same terms – increasingly approaches that of a single sensation, and is increasingly more difficult to analyse[21].

In a general sense, the remote origins of this idea could be individuated within ancient music theories, carefully investigated by Stumpf with remarkable philological competence, and especially in Aristotle's version[22]. More specifically, however, Stumpf borrows many aspects of this doctrine from the well-known physiological experiments concerning the sense of touch performed by Ernst Heinrich Weber[23]. In weighing two bodies, Weber noted, successive evaluation considerably improves precision. On the contrary, if both hands simultaneously compare the two weights, the resulting sensations tend to mix, and then to confound the subject[24]. Something similar happens when we hear two simultaneous sounds. Stumpf, who had been personally introduced to Ernst Weber[25] by his brother Wilhelm, his admired teacher in experimental physics[26], shared this general principle and transferred it to the field of tonal perception[27].

Tonal fusion, Stumpf claims, can be observed and verified according to an experimental methodology. This enables him to determine the different «degrees» of tonal fusion[28]. Stumpf explains consonance and dissonance as degrees of tonal fusion: the more two tones are fused, the more consonant they result. Finally, Stumpf establishes tonal fusion's independence of other factors. He admits that the degree of

tonal fusion depends on the physical frequencies of sounds, but only in a very indirect way. Different physical frequencies may correspond to the same degree of fusion because of minimal differences that remain below the threshold between sensation and judgement (*Urteilsschwelle*). Rather than physical, then, the cause of tonal fusion is physiological. Specific energies underlying the different degrees of fusion are excited by two stimuli: accordingly, Stumpf speaks of second-order specific energies, that he also calls *specific synergies*[29]*.* With this, Stumpf directly criticises Helmholtz's auditive theory[30]. In his view, Helmholtz's theory was unable to explain the occurrence of tonal fusion with merely imagined tones, i.e. those given in a «*bloße Phantasievorstellung*»[31]. Stumpf's theory of tonal fusion accounts for this fact, thus explaining important processes such as musical imagery (and then, composition) or silent score reading, as usually performed by skilled musicians.

Most notably, Stumpf's approach undermines any naturalistic approach to the philosophy of music as supported, for instance, by Helmholtz's insistence on the allegedly «natural» role of the series of harmonic overtones, analysed in the inner ear[32]. On the contrary, notwithstanding its undeniable artistic value, western tonal music cannot be considered more «natural» than any other kind of music in the light of tonal fusion. Thus, Stumpf's great interest in non-European musical systems and his pioneering work in the field of ethnomusicology consciously follow on his approach to the problem of consonance as a result of tonal fusion[33].

Tonal fusion has been widely discussed by philosophers, psychologists and musicologists. Stumpf took many of his critics seriously; as a result, he revised many aspects of his doctrine. However, a reconstruction of the whole debate on tonal fusion would take us too far. Let us here simply individuate two general trends: on the one side, a tendency to discuss tonal fusion in a rather technical vain (e.g. examinations of Stumpf's claims concerning feature, consequences or utility of tonal fusion, remakes of his experiences); on the other side, a more radical approach, often consisting of a complete refusal of tonal fusion as ill-defined, or wrong psychological concept. As I shall show, Brentano's name must be listed in both groups.

3. Brentano on sensible qualities and tonal perception

Brentano developed a new theory of sensible qualities during his Vienna period, around 1890[34]. The vicissitudes of his doctrine of intensity show that this innovation goes hand in hand with his philosophical development as a whole[35]. In the first edition of 1874 of *Psychologie vom empirischen Standpunkt*, Brentano asserted that all psychical phenomena (sensible and intellective presentations, judgments and feelings

– both in primary and in secondary conscience) admit of an intensity[36]. Instead of this, in the 1911 edition he claims that only sensible phenomena, i.e. sensations, have an intensity[37]. The mental presentation e.g. of number three does not possess any intensity; similarly, the so-called different «degrees» of our belief in the existence e.g. of a horse and a centaur have nothing to do with intensity. On the contrary, different sensations imply true degrees of intensity. The person who hears a louder sound (or who hears and sees, touches, etc. at the same time) surpasses who hears a fainter sound. According to this new approach, sensibility radically differs from the rest of human conscience: accordingly, Brentano keeps the two realms carefully aside and speaks of sensory and noetic conscience[38].

Some of Brentano's reasons for this move, related with the doctrine of specific sense energy, will be discussed above. But how is the problem of intensity related to the theory of sensation – and finally, with tonal fusion? Some early traces of Brentano's new theory of sensation can be found in a conference held in Vienna at the Philosophical society (*Philosophische Gesellschaft*) in January 1893[39]. Three years later, in 1896, Brentano presented his new doctrine in full detail at the third international Congress of psychology, held in München under Stumpf's (and Theodor Lipps') presidency[40]. According to Brentano, all sensible qualities, i.e. elementary sense elements such as «red», or «tough», and so on, are given within the «space of sensation» (*Empfindungsraum*), also designed as «sensory space» (*Sinnesraum*)[41]. Within this space-like entity, sensible qualities are reciprocally impenetrable, just as real bodies within the real space or «world-space» (*Weltraum*)[42]. Given that human sensibility has a threshold, the actual disposition of sense qualities in the sensory space may remain unnoticed. Thus, if a certain number of «spots» in the space is empty, we then experience a low degree of intensity, which results the «measure» of the «density» of sensation. It is for this reason that a lower degree of intensity actually implies a lower level of reality.

Thus, besides intensity, Brentano's new theory explains the nature of multiple qualities. When different qualities lay one by the other in the phenomenal space, and the texture remains beneath the threshold, we experience multiple qualities. Mixed colours, like orange, result from the juxtaposition of red and yellow qualities filling the spots of the phenomenal space. This is analogous to some well-known occurrences in the real space: e.g. the optical effect of a tweed tissue, or a «divisionist» painting, and so on. This mechanism holds, for Brentano, for mixed qualities of any kind, including those pertaining to the sense of hearing. With this, Brentano's new theory of phenomenal space offers an alternative to Stumpf's concept of fusion, both in a general sense and in the specific application to tonal phenomena.

However, in the version printed in the proceedings of the München congress, there is little material for a controversy on tonal fusion with Stumpf[43]. After all, in this version, tonal perception plays a secondary role. The problem of tonal perception was expressly tackled by Brentano in a paper written for the fifth International Congress of Psychology, held in Rome in 1905. Brentano's conference was scheduled for the opening session, yet he finally did not attend the congress but sent his paper for the proceedings[44]. Some criticism of Stumpf is introduced in this text, yet Brentano still avoids a wide polemic on tonal fusion. Together with other writings, the München and the Rome paper were published in 1907 in a volume entitled *Untersuchungen zur Sinnespsychologie*. In this volume, Brentano adds some footnote to both essays. It is noteworthy that the widest and most significant of these footnotes consist of an attack upon Stumpf's theory of tonal qualities, sensory feelings and tonal fusion[45]. To sum up, in the 1897 paper (München) Brentano does not even mention Stumpf; in the 1905 paper (Rome) some criticism is introduced; the notes added in 1907 (to both essays) aim for the most part at a sharp criticism of Stumpf's positions. A footnote added to the 1907 version of the 1897 paper is here particularly relevant, since Brentano widely discusses tonal fusion[46].

Given its role in Brentano's 1905 text, a short digression concerning the law of specific energy is necessary. According to Helmholtz's doctrine, as expounded in his *Lehre von den Tonempfindungen* (1863[1]), each acoustic frequency acts upon a single nervous fibre located in the inner ear, so that the activation of this fibre triggers a «specific energy», which is transmitted to the brain. In his view, the inner ear is then similar to a piano, whose strings are set free to resonate sympathetically[47]. When a tone of a certain pitch is heard, the corresponding «string» (i.e. nervous fibre) of this piano resonates, so that the corresponding «specific energy» finally reaches the central system. Helmholtz's «one fibre/one sensation» approach[48] was an extension of Johannes Müller law of specific energies: not only the different senses, but even the different qualities within each sense are determined by a specific energy.

Brentano's attitude towards this doctrine deserves special attention. He firmly and explicitly endorses the law of the «specific energies» not only in its general, but in its largest application[49]. He thus clearly supports Helmholtz's theses[50]. According to Brentano, the law of specific energy does not merely provide a distinction between the different senses (e.g. sight and hearing), but also between different qualities within a certain sense (e.g. pitches in hearing)[51]. This might help us explaining why did Brentano adopt this new theory of sensibility, a doctrine which is perhaps logically consistent and metaphysically convenient, but manifestly lacks any kind of empirical (even in Brentano's sense) support[52]. Actually, Brentano's new approach was less successful – even within his school – than he might have expected. Ehrenfels explicitly

criticised it[53], and no prominent member of the Brentano school defended or developed his doctrine[54]. In Brentano's own eyes, however, his hypothesis of the «sensory space» could offer the advantage of a possible convergence with the doctrine of the specific energies and the potential local individuation for each sensation suggested by Helmholtz's approach, as Brentano himself explicitly suggests[55].

However, Helmholtz's wide application of the law of specific energies had often raised perplexities, particularly as to the theory of tonal sensations. In fact, Helmholtz assumed that the specific energies involved in tonal perception are as numerous as the different audible pitches. This enormous amount appeared somewhat disturbing, the more so if compared with the three (or, at least, four, according to the different versions) specific energies, one for each fundamental colour, required by the so-called Young-Helmholtz's theory of visual perception[56]. For this reason, notwithstanding his enthusiastic commitment to Helmholtz's *Lehre von den Tonempfindungen*, Ernst Mach had tried to lower the number of the specific energies of the auditory nervous system[57]. Mach assumed only two specific energies, that he called «dull» (*dumpf*) and «bright» (*hell*): the former prevailed in low-pitched sounds, the latter in high-pitched ones, and a balanced mixture of the two elements at the middle of the range.

Now, Brentano begins his paper on tonal qualities with an attempt to undermine Mach's reform of Helmholtz's theory. If the different pitch of musical notes results from blending only two elements just as, for example, grey is composed of black and white, the world of sounds would be deprived of its chromatic variety. Who would seriously claim, yet, that Beethoven (so to speak) painted his symphonies in different shades of grey?[58] Moreover, Brentano observes, Mach's theory cannot resist Stumpf's criticism that two tones played together should originate a third tone of intermediate pitch rather than a chord. However, Brentano specifies in a footnote [1905] that this criticism holds for Stumpf's own theory: he is associated with Mach in defending the view, rejected by Brentano, that «the tones of a scale proceed as a right line»[59]. Mach's two specific energies, renamed by Brentano «tonal black and white» (*Tonweiss* and *Tonschwarz*), can account for the series of noises, extending over the entire auditive range. In the field of vision, black and white coexist with pure colours and their blends; similarly, Brentano claims, in the field of musical perception two different kind of elements must be given. In his hypothesis, the phenomenal space is filled up by «qualities» belonging to two kinds, «saturated» (*gesättigt*) and «non-saturated» (*ungesättigt*)[60]. As to the tonal field, saturated qualities are responsible for the cyclically recursive feature expressed by the names of the notes (C, D, and so on); whereas the amount of the two non-saturated qualities, i.e. tonal «black» and «white», define the position of this note within the linear dimension of the audible range[61]. According to Brentano, however, the relative amount of the element of the two kinds is not constant. The «saturated»

elements prevail at the middle of the audible range, and dramatically decrease at its periphery.

5. Brentano's critique of tonal fusion

Let us now take a step back and introduce Brentano's main pronouncements on tonal fusion in a chronological order. In Mai 1890, Brentano expresses gratitude to Stumpf for the announced dedication of the second volume of the *Tonpsychologie*[62]. In July, after having received the book, he promptly congratulates Stumpf for his commitment to metaphysics, as declared in the Preface[63]. However, in a subsequent letter of November 1890, Brentano takes note of Stumpf's divergence («*freilich an Differenzen fehlt es nicht*»). Stumpf's arguments, Brentano thinks, cannot shake his own theory of musical harmony[64]. Brentano expresses then the wish to convince him, in a next meeting, that «a chord (*Mehrklang*) is a tone (*Ton*) in the same sense that purple is a colour»[65]. In other words, Brentano supports the «unity-theory» dismissed by Stumpf in favour of the «multiplicity-theory». Previously, Brentano had adopted – with some reservation – the «contrast hypothesis» (*Wettstreitslehre*). At that time (1882), he already claimed that two simultaneous qualities cannot be locally identical, but had not yet wholly developed his later doctrine of sensible qualities. To escape the difficulty, Brentano supposed that two allegedly simultaneous tones alternate with tremendous speed, as if they would build up an indefinitely accelerated musical trillo[66]. After the development of his new approach, this problem can be better solved by means of the above illustrated mechanism, so that the unity theory prevails. As to the theoretical background of tonal fusion, then, Stumpf's and Brentano's conceptual frames diverge essentially since the beginning of this debate. As to tonal fusion itself, however, in the letter of November 1890 Brentano confesses his need for more reflexion. He contents himself, at this stage, with some general criticism of Stumpf's hypothesis of «specific synergies» as physiological causes of tonal fusion[67].

An in-depth criticism of tonal fusion was yet only temporally delayed. As we already know, Brentano faces the question in one of the footnotes added in 1907 to the München paper in his *Untersuchungen zur Sinnespsychologie*. Brentano begins with some rather technical observation against Stumpf's idea of tonal fusion as confined within the octave[68]. The degrees of fusion e.g. of a fourth and an eleventh (i.e. the fourth of the higher octave) are different, since tonal fusion tends to diminish in the second case[69]. However, these level of discussion do not imply a special philosophical divergency between the two philosophers. Brentano's criticism concerns a special aspect of Stumpf's theory, and partly a matter of definition[70]. He also enumerates a

series of cases in which he would speak of tonal fusion, thus adopting a broader definition of «Verschmelzung» than Stumpf[71]. Yet, Brentano also confronts himself with tonal fusion in Stun's sense. As we have seen, Stumpf considers tonal fusion as a primitive phenomenon and rejects any attempt to reduce it to any other constitutive factor. On the contrary, Brentano claims now that tonal fusion results from three different and more primitive factors: past experience, feelings and physical «beats»[72]. In distinguishing the two fused tones, he argues, past experience plays a significant role, since we usually hear several tones fused together in a timbre (*Klangfarbe*) and then unconsciously develop the habit of fusing sounds together. Furthermore, feelings influence our judgment. An act of emotional nature (*Affekt*), regularly combines with any tone sensation[73]. However, chords either strongly increase this pleasant feeling, or provoke the opposite effect: for instance, the major third is a grateful harmony (*Wohlklang*), while «the melancholic (*wehmütig*) minor third marks the entrance of the opposite feeling»[74].

Consonant chords evoke pleasant feelings (and *vice versa*), so that we rely upon these *Affekte* to distinguish chords from each other. Finally, one must consider physical «beat». When the two acoustic waves are out of phase, a periodical disturbing stimulus arises, which also influences our judgment. In all of these cases, perceptual results depends less on tonal fusion than on the above mentioned factors. Without explicit reference, Brentano opposes here to Stumpf some aspects of Helmholtz's theory – which he had defended from Mach's criticism since the beginning of his essay. In a previous phase, Brentano had held a different position. In a letter of 1882, for instance, he explicitly agrees with Stumpf's criticism of Helmholtz's explanation of dissonance. Pleasure arises from both harmonic and melodic combination of tones, but in the latter case no «beats» can be given[75].

Brentano's wide criticism of Stumpf does not merely imply a slight revision of tonal fusion: rather, it has destructive effects upon Stumpf's entire construct. No surprise, than, that Stumpf protested and claimed that Brentano misunderstood his doctrine of tonal fusion[76]. Brentano answers in a letter of May 1907, in which he develops a different and – at least apparently – more conciliating strategy. Brentano apologises and – as a result of Stumpf's protest and of a renewed reading of the *Tonpsychologie* – acknowledges that he had not «completely» understood the theory of tonal fusion[77]. Nonetheless, he observes, it still remains unclear what Stumpf actually meant. Does fusion occur – Brentano asks – between the two «phenomenal tones» (in Brentano's term, the primary objects), or does it concern the relationship of the act of hearing with the two phenomenal tones (secondary/primary object); or finally, do the

two acts of hearing – i.e. the act of hearing the one and the other tone – fuse together (secondary objects)?

Dropping external factors such as past experience, feelings and «beats», Brentano eventually discusses Stumpf's theory on the basis of his own theoretical framework. Even in this new phase of the discussion, however, Brentano's criticism is severe. He considers reasonable to admit the first hypothesis, i.e. that tonal fusion is a relationship between the two phenomenal tones. Accordingly, these «primary objects» must become «parts» of a new unitary «whole»[78]. However, asks Brentano, what kind of «whole» is this? Stumpf's analogy with the unity of extension and colour seems inappropriate to him: the «extended-coloured object» (*das ausgedehnt Farbige*) is a single individual, which can be labelled either as «extended» or as «coloured». However, this is not the case of the two fused tones: the one tone *is not* the other tone, at least not in the same manner that «the extended» *is* «the coloured». The only kind of fusion between phenomenal contents, Brentano argues, is a local specificity, given within the «phenomenal space». Since Stumpf denies any local specification to tonal perception, Brentano concludes, tonal fusion turns out to be a «qualitas occulta»[79]. Brentano concludes with another remark. Stumpf seems to accept at least Brentano's observations concerning the extension of tonal fusion beyond the octave. But then, he thinks, Stumpf will be probably brought to adopt the whole of Brentano's theory of sensible qualities, from which that piece of doctrine logically descends[80].

With this, Brentano's discussion of tonal fusion provides important hints concerning Stumpf's divergence from him as to the theory of sense perception. Both Brentano's early «misunderstanding» and his renewed criticism in the letter of May 1907 testify of a deep difference between the two philosophers as to the theory of musical phenomena. According to Brentano, a successful interpretation of tonal phenomena can be developed from the starting point of his new theory of intensity and sensible qualities. On the contrary, Stumpf relies upon of a conceptual set whose essential features are closer to Brentano's first phase, where a mechanistic model based upon a calculus of intensity coexisted with the descriptive one[81]. The gap with Stumpf turns out to be deeply grounded in a different conception of human perception and of its psychological significance as a whole[82].

[1] Stumpf 1919; 1922; 1924; Brentano 1989.

[2] Stumpf 1919, 86.

[3] Stumpf 1939, iii.

[4] Stumpf (1929), quoted in Oberkofler 1989, xxi-xxiii.

[5] Brentano 1893, 1897; 1905; 1907a; 1907b (see Brentano 1907 and 2009). For a discussion see above.

[6] This circumstance has been pointed out by Allesch 2003, 229.

[7] Stumpf 1890; Brentano 1905. For more details, see the discussion above.

[8] I shall not consider here two other polemic issues concerning sensory feelings and tonal qualities. As to the former, see Fisette 2009; on tonal qualities Martinelli 1999, 155-160; 199-204.

[9] As pointed out by Baumgartner (2009, xi), this was suggested by Emil Utitz, who names Stumpf, Köhler and Eisenmeier among the «few» who followed Brentano as to this special aspect of his doctrine (Utitz 1917, 231).

[10] See Fisette 2006, 32. From a Brentanian point of view Kastil (1948) vehemently reacted against Stumpf's theses.

[11] Stumpf 1924, 391 s.

[12] Stumpf (1918, 7-8) lists a series of reasons for preferring the study of auditory phenomena.

[13] Stumpf 1883, 96. Since his first book (Stumpf 1873) on the psychological origin of the presentation of space, Stumpf introduces the idea of «psychological parts», which is relevant to tonal fusion: see Kamleiter 1993, 30-38.

[14] Stumpf 1886/87, 292.

[15] Stumpf 1890, 1. Aristotle already posed this question in *De sensu*, VII, 447a 12 ff.

[16] Stumpf 1890, 9, quoting Aristotle, *Metaph*. B 995a.

[17] Stumpf 1890, 12.

[18] For the sake of simplicity, I shall hereafter designate the occurrence of *two* simultaneous notes as a «chord». Properly speaking, however, in the harmonic theory a chord (*Dreiklang*, *Akkord*) is made up of no less than *three* simultaneous tones, conjoined after certain harmonic rules. For Stumpf, fusion and *consonance* have to do with two-tones unities (harmonic intervals, *Zweiklänge*), whereas in the case of three-tones chords he speaks of *concordance* (*Konkordanz*). See Stumpf 1898, 1911.

[19] Stumpf 1890, 1. On this problem see Aristotle, *De sensu*, VII, 448a 20-22.

[20] Stumpf 1890, 40 ff.

[21] Stumpf 1890, 128.

[22] The Pythagorean Architas of Tarentum, a contemporary and friend of Plato, already claimed that one hears a single sound in consonances; Plato himself often speaks of consonance (*symphōnia*); however, according to Stumpf, only Aristotle understands the *mixis* of sounds in a psychological, rather than metaphorical sense: see the historical reconstruction in Stumpf 1897, 27. However, Stumpf (1890: 17) also says that Aristotle is wrong in adopting (*De sensu*, VII, 447b) the «unity theory».

[23] See Stumpf 1890, 61.

[24] Weber 1851, 85 f.

[25] Stumpf 1924, 395.

[26] Stumpf 1924, 392, where Stumpf declares that «besides Brentano and Lotze», Wilhelm Weber «developed and formed my manner of scientific thinking».

[27] A difference is that tonal fusion depends on qualitative rather than on quantitative factors.

[28] Stumpf 1890, 135. The five degrees of fusion correspond to the groups formed by the intervals of octave, fifth, fourth, third and sixth, and finally all the remaining.

[29] Stumpf 1883, 214. On the law of specific energies see below.

[30] Stumpf 1883, 152.

[31] Stumpf 1890, 138.

[32] Actually, Helmholtz allowed for a specifically aesthetic moment, independent of the nature of the sensations of tone. See Hatfield 2004. Nevertheless, his demonstration that tonal music follows on the very nature of tone sensations implied a substantial advantage of western tonal music upon any other kind of music.

[33] Hypotheses concerning consonance should be tested on both cultivated and non-cultivated of european and non-european music: see Stumpf 1911, 355; Stumpf and Hornbostel, 1911. Obviously, Stumpf's wide-mindedness on this question offers no evidence of the correctness of his claims, yet it represent a good reasons to consider his ideas seriously. On the Phonogramm-Archiv founded by Stumpf see Simon 2000.

[34] On Brentano's theory of sensation see Eisenmeier 1918; Baumgartner 2009. On the origin of this doctrine, see Baumgartner 2009, XVI f.

[35] This question cannot be introduced here. For an interesting account, partly relying upon Brentano's Würzburg lectures, see Chrudzimsky-Smith 2004.

[36] Brentano 1874 (in 1924, 169; 192 ff.).

[37] Brentano 1911, 151 f.

[38] Brentano 1928.

[39] See Brentano 1893. Stumpf was informed by Brentano (1989, 106 [19.3.1893]) about this conference. Actually, Brentano did not announce him a new theory of sensibility but simply mentioned a possible contrast with Hering as a consequence of his new approach. Many years later, in preparing a paper concerning Brentano, Stumpf (1982, 155 [31.12.1918]) confessed to Franz Hillebrand that he knew very little about Brentano in Vienna.

[40] Brentano 1897. The essay was published in the proceedings of the München conference as «Zur Lehre von der Empfindung», and in 1907 as «Über Individuation, multiple Qualität und Intensität sinnlicher Erscheinungen» (Brentano 1907a). The München title originated from a request of change made by the organisers of the congress (Stumpf, Lipps and Schrenck-Notzing): Brentano 1989, 107-108.

[41] Brentano 2009, 52 (1905, 114; 1907, 70). In a letter to Stumpf of 1874 [25.7.1874], in a critical discussion of Fechner's law, Brentano contrasted a «real» and a «phenomenal» space (*phänomenaler Raum*): Brentano 1989, 57.

[42] Brentano 2009, 52 (1905, 114; 1907, 70).

[43] However, the München congress marks the beginning of a critical phase in their friendship. Stumpf was busy with the organisation of the congress and found no time for Brentano; moreover, he had to ask him a drastic cut in his speech because of the lack of time and the generalised delay at the crowded conference. Brentano left the official final meeting without even greeting Stumpf. See Stumpf (1929), quoted in Oberkofler 1989, xxii.

[44] See Brentano 1905.

[45] The text of the two papers relevant to our purposes have been published as Brentano 1897 (München proceedings), Brentano 1905 (Rome proceedings) and 1907 (three footnotes added to each paper). All texts are now available in Brentano 2009. To prevent confusion, when needed, I shall indicate in square brackets the year of publication of Brentano's claims.

[46] See Brentano 2009, 150-158 (2007, 218-228).

[47] Helmholtz 1870, 129; see Vogel 2004.

[48] Hatfield 2004, 531.

[49] In his lessons on psychology in Halle, Stumpf subscribes the law only in its general sense: Stumpf 1886/87, 293.

[50] With its «descriptive» approach, Brentano is obviously quite far from Helmholtz's physiology (as remarked by Chisholm 1979, XIV); yet he leaves the door open for a potential convergence with Helmholtz's influential «genetic» doctrine.

[51] Brentano 1909, 158 (1907, 21): «Es gilt hier das Gesetz von der spezifischen Energie der Sinne. Dieses Gesetz wird nicht bloß heutzutage von den Sinnesphysiologen ersten Ranges noch festgehalten, sondern seit Thomas Young, oder wenigstens seit Helmholtz sich das Verdienst erworben hat, auf die Bedeutung von Youngs Hypothese hinzuweisen, neigen sie auch zu der Annahme, daß es wie für die Gattung, so auch für die Art der Qualität zutreffend sei, ohne daß freilich damit gesagt sein soll, daß dem Nerven und nicht vielmehr dem zentralen Organ der spezifizierende Einfluß zukomme. Wenn nun dies, warum nicht auch annehmen, daß derselbe Reiz wie in verschiedenen Sinnen Heterogenes, in demselben Sinne spezifisch Verschiedenes bewirken könne, und daß dies beim Gesichtssinn wirklich der Fall sei. Es handelt sich hier also um nichts anderes als um eine Steigerung von auch anderwärts Bekanntem, und auch unsere Gegner geben die betreffenden Tatsachen zu». See also Brentano 1893 (2009, 122, 1907, 42): «Helmholtz hat das Verdienst, die Bedeutung von Youngs Gedanken zuerst vollauf begriffen und insbesondere durch die glückliche Übertragung auf das Tongebiet durch Analogie wesentlich gestützt zu haben».

[52] Even those who defended Brentano's doctrine, like Géza Révész, recognised its lack of empirical foundation («*Mängel an empirischer Fundierung*»). See Baumgarten 1994, 33 (for this quote) and 34 for Baumgartner's interpretation of this passage, less radical than the one proposed here. On Révész, Brentano and Stumpf see also Kamleiter 1993, 194 ff.

[53] As Ehrenfels notes, it is the sensory nature of the content that decides of the presence of an intensity of the act. Accordingly, judgements and feelings directed to sensory instances would still admit of an intensity. But then, if I look at the inkwell on my table and say «there is a inkwell on my table», this judgement would suddenly cease to have an intensity as soon as I close my eyes. Ehrenfels 1898, 54.

[54] On the fortune of Brentano's doctrine, see Baumgarten 2009.

[55] «Wer, wie ich wenigstens, mit aller Entschiedenheit an der Hypothese der spezifischen Sinnesenergien festhält, der wird nach dem Gesagten nicht umhin können, die Empfindung jedes Sinnesnerven nicht bloß qualitativ, sondern auch örtlich spezifiziert zu denken». Brentano (n.d.) in 1907, 167.

[56] Helmholtz 1856-66; see Kremer 1994, 288.

[57] Mach 1906, 276 (for the english translation; previously, Mach 1885). Mach widely relies upon Ewald Hering's psychological views.

[58] Brentano 2009, 74 (1907, 94).

[59] See the footnote [1905] in Brentano 2009, 74 (1907, 93) .

[60] Brentano 2009, 76 ff. (1907, 94 ff.).

[61] On this basis, Brentano proposes a graphical representation of sounds in terms of his peculiar geometric views. Brentano 2009, 81 and 168 (with the editor's note).

[62] Brentano 1989, 94 [8.5.1890].

[63] Brentano 1989, 95 [21.7.1890]. See Stumpf 1890, vi.

[64] Moreover, according to Brentano, Stumpf fails to consider some important difference between auditory and visual sense (referring to Stumpf 1990, 60-64).

[65] Brentano 1989, 96 [15.11.1890]. Previously Brentano allowed for more difference as to this question: Brentano 1907, 13-14.

[66] Brentano 1989, 77 [22.11.1882]. Lotze allowed for the «contrast-hypothesis» in the case of remembering or imagining chords. See Lotze 1853, 83 f. This theory found some support since ancient times.

[67] Brentano 1989, 97.

[68] Brentano 2009, 150 (2007, 218).

[69] On this aspect of Brentano's criticism see Kamleiter 1993, 101 ff. In a subsequent letter, Brentano welcomes Stumpf's acknowledgement of his good reasons on this point and suggests that this should imply the endorsement of his doctrine as a whole. Brentano 1989, 133 [7.5.1907].

[70] Brentano's claim, in a sense, reminds of the extension proposed in ancient times by Aristoxenus (*El. Harm*., II, 45 f.), who introduced new consonances beyond the octave, previously ignored by Greek theoreticians of music.

[71] Brentano 2009, 150-152 (1907, 218-220).

[72] Brentano 2009, 152 FF. (1907, 220 ff.).

[73] See the footnote [1905] in Brentano 2009, 75 (1907, 232). See also Brentano 1928, 18. In a letter of 1899, Brentano blames Stumpf for focusing too much on the problem of musical pleasure in considering affects: in order to grasp their nobility, he suggests, Stumpf should «elevate them from the sensible sphere to the spiritual one». Brentano 1989, 124.

[74] See the footnote [1907] in Brentano 2009, 152 (1907, 220-221).

[75] Brentano 1989, 77.

[76] Unfortunately, Stumpf's letter seems to be lost. As to the point under discussion, one can infer its general content from Brentano's answer.

[77] Brentano 1989, 132. He also declares himself ready to a public revision of his previous pronouncement. See also Brentano 1989, 151 [30.7.1916], where Brentano charges Stumpf of misunderstanding his doctrine in some essential points, just like he himself did with Stumpf's theory of *Tonverschmelzung*.

[78] Brentano 1989, 133.

[79] Brentano 1989, 133.

[80] Brentano 1989, 133.

[81] For instance, in 1874 Brentano relies upon a complicated calculus of intensity in his demonstration of a critical theorem, namely that no unconscious psychical phenomenon can be given. Brentano 1924, 194.

[82] Stumpf never allowed for a dramatic gap between sensory and intellectual conscience, as implied by Brentano's new thesis that intensity belongs only to the former, but not to the latter realm. In an essay of 1918 devoted to the definition of sensation and presentation, Stumpf affirms that sensations and presentations differ in terms of different degrees of intensity – and then, quite obviously, they both admit of intensity (Stumpf 1918, 27). On the whole question see Martinelli 2003.