The James–Lange Theory of Emotions: A Misnomer We Should Abandon

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Abstract

In the literature on emotions, reference is often made to the "James–Lange theory" from the 1880s. This article clarifies that this term is a misnomer. Although James's and Lange's views shared the centrality of bodily changes in emotion, there were also important differences. There is not one theory, but two, as evidenced by Lehmann's pioneering psychophysiological experiments of the 1890s showing their differential refutability. Moreover, the "James–Lange" labeling of Lange's work emphasizes something that was important to James, the experience of bodily changes, but which received little attention from Lange. Furthermore, the shared labeling obscures two contributions by Lange that are perhaps as important as the shared contribution with James: a dual route model of emotional responding and classical conditioning of emotions. For future mentions, it is recommended to refer to the theories separately or in the plural.

Keywords: emotions; feelings; James; Lange; Lehmann

In textbooks and other publications in psychology and related fields discussing emotions, reference is often made to "the James–Lange theory" from the 1880s (e.g., Craig, 2015; Damasio, 1994; Frijda, 1986; Johnston & Olson, 2015; Rolls, 2023). The APA Dictionary of Psychology (American Psychological Association, n.d.) defines the "James–Lange theory" as

> the theory that different feeling states stem from the feedback from the viscera and voluntary musculature to the brain. This theory hypothesizes that there are as many physiological responses as there are different intrapsychic feelings and that each of these responses precedes rather than follows the feeling.

The purpose of this article is to clarify that the term "the James–Lange theory" is a misnomer and that the dictionary definition is incorrect. There is not one theory, but two different theories, with different claims. The "James–Lange" labeling of Lange's work emphasizes something that was important to James but not to Lange, and obscures two contributions of Lange that are perhaps as important as the contribution shared with James. For these reasons I argue that the term "the James–Lange theory" should be abandoned.

I begin by pointing out that James and Lange published their theories separately, following work on *Gemeingefühl*, and then briefly discuss each theory. Next, I describe Lehmann's psychophysiological experiments that called Lange's theory into question, but not James's (according to James himself), thereby demonstrating that there are two theories and not one. Finally, I point out how the term "the James–Lange theory" has nevertheless persisted to this day, and I recommend breaking with this practice and instead, in the future, referring to the theories separately or in the plural.

Not One Theory, But Two

Bennett and Hacker (2013) suggested in their *History of Cognitive Neuroscience* that James and Lange co-authored a book outlining their theory: "William James, both in his *The Principles of Psychology* (1890) and his subsequent book *The Emotions* (1922), written together with C. G. Lange, propounded a highly influential theory of emotions" (p. 193). Contrary to this claim, however, James and Lange have never written a book together. The 1922 book was a compilation of their separate writings on emotions, edited by Dunlap. The term "the James–Lange theory" was coined by Dewey (1894) in an article in the *Psychological Review*. Dewey discussed James at length, with references to and quotations from James's *Principles*, but he never referred to Lange's (1885) Danish monograph or its German translation (Lange, 1887). An English translation of Lange's book did not appear until Dunlap's (1922) compilation. Dewey seemed to rely entirely on James's extensive and largely confirming comments on Lange's 1887 book to suggest that they shared the same view. However, while James's and Lange's views share the centrality of bodily changes in emotion, important differences also exist. Dunlap (1920) made this clear more than a century ago, but the literature generally continued to refer to "the James–Lange theory". He wrote that

> the "James–Lange" theory of the emotions, as it is called usually, is most frequently stated in James' terms, in which it is a compromise between the scientific view of Lange, and old-fashioned dualism. ... Unfortunately, few psychologists or physiologists have ever read Lange's presentation: the majority have taken James' presentation both of his own and of Lange's views. ... [The] theories are not actually equivalent, and hence the scientific view should be referred to as the "Lange" theory rather than the "James–Lange". (p. 137)

Clearly, Dunlap (1920) had no use for James's distinction between mental feelings and bodily changes, which he described as "old-fashioned dualism". Mental feelings are absent from Lange's psychophysiological process model, which Dunlap called "the scientific view". Angell (1916) discussed "James's theory of emotion", and agreed with Sherrington (1900a) who he said "properly distinguished sharply" (p. 252) James's view from Lange's.

While James's theory revolves around the idea that an emotion is the sensation of bodily changes, Lange's theory focuses on the induction of vasomotor changes and says little about the sensing of them. Wundt (1891) criticized Lange's theory for this. In response, James (1894) emphasized that this criticism applies to Lange's theory, but not to his own. Lehmann's (1892, 1899a) psychophysiological experiments with humans, which Wundt (1920) called "epoch making" (p. 312), challenged Lange's theory, but not James's. However, Wundt's criticism and Lehmann's experiments, which were published in German, were not taken up in the English literature (e.g., Woodworth, 1938; Woodworth & Schlosberg, 1954). Similarly, no mention was made in the English literature of the direct precursors of the views of James and Lange in the French physiological literature of the early 19th-century (Titchener, 1914) and physiological studies on bodily sensations in the German literature (e.g., Weber, 1846), which were considered experiences but not emotions. These studies and discussions about them (e.g., Wundt, 1862, 1874) formed the context for James's (1884) theoretical proposal (Wassmann, 2014).

The *Gemeingefühl*

In the first half of the 19th century, sensations reflecting the internal state of the body were the subject of physiological studies and discussions (e.g., Wundt, 1862). These sensations included those originating from the heart, blood vessels, lungs, stomach, and

bladder, which is now called interoception, and sensations arising from the skeletal muscle state, called proprioception. German physiologists, such as Müller (1835) and Weber (1846), called interoception and proprioception the *Gemeingefühl* (common sensation or sensibility) to distinguish it from the sensations that reflect the external world and that arise from the senses of sight, hearing, taste, smell, and touch. In his work *Der Tastsinn und das Gemeingefühl* (*The Sense of Touch and the Common Sensibility*), published in 1846, Weber reviewed the empirical findings regarding the sense of touch, including his own findings (e.g., Weber, 1834) which demonstrated what would later become known as Weber's law, and regarding proprioception and interoception, particularly the sensation of pain and temperature. Weber's overview was followed by that of Sherrington (1900b), which discussed later 19th-century research on touch and common sensibility in detail and indicated new avenues, thereby laying the foundation for research in the subsequent century.

This 20th-century research has shown that the primary cortical area for proprioception is located in the somatosensory cortex, and for interoception in the dorsal posterior insula (e.g., Craig, 2015; Feldman et al., 2024). These areas receive information about the body state from sensory neurons in the brain stem. As was already known in the 19th century, the sensory neurons also directly connect to brainstem nerve centers that reflexively regulate skeletal muscular responses as well as respiration, heart rate, and blood pressure to keep the body in balance. These motor centers, including the vasomotor center that regulates blood pressure, can also be controlled from the brain. The vasomotor center played a key role in Lange's (1885) theory, while it was not central to James's. Instead, interoception and proprioception were central to James's (1884, 1890, 1894) theory of emotions.

James's Theory

For most of his career, William James (1842–1910) was affiliated with Harvard University in Cambridge, USA, where he taught philosophy and psychology. James first described his theory of emotions in an article in the journal *Mind* in 1884. He began by stating that

> of two things concerning the emotions, one must be true. Either separate and special centres, affected to them alone, are their brain-seat, or else they correspond to processes occurring in the motor and sensory centres, already assigned, or in others like them, not yet mapped out. ... The purpose of the following pages is to show that the last alternative comes nearest to the truth, and that the emotional brain-processes not only resemble the ordinary sensorial brain-processes, but in very truth *are* nothing but such processes variously combined. (p. 188)

Rather than assuming that an emotion as a mental event causes a bodily change (e.g., Wundt, 1863, 1877, 1880), James (1884) argued that the sensation of the bodily change *is* the emotion. We are sad because we cry, and we fear something because we perceive a threat and sense an increase in blood pressure and heart rate. James continued with a statement about the scope of the theory, followed by its central principle:

> I should say first of all that the only emotions I propose expressly to consider here are those that have a distinct bodily expression. That there are feelings of pleasure and displeasure … having no obvious bodily expression for their consequence, would, I suppose, be held true by most readers. ... The case of these feelings we will at present leave entirely aside, and confine our attention to the more complicated cases in which a wave of bodily disturbance of some kind accompanies the perception of the interesting sights or sounds, or the passage of the exciting train of ideas. Surprise, curiosity, rapture, fear, anger, lust, greed, and

> the like, become then the names of the mental states with which the person is possessed. (p. 189)
>
> Our natural way of thinking about these standard emotions is that the mental perception of some fact excites the mental affection called the emotion, and that this latter state of mind gives rise to the bodily expression. My thesis on the contrary is that *the bodily changes follow directly the PERCEPTION of the exciting fact, and that our feeling of the same changes as they occur IS the emotion*. (pp. 189–190)

After the 1884 publication, James discovered that Lange had proposed a theory in 1885 in which the bodily change in emotions also plays a crucial role. In his best-seller *The Principles of Psychology* James (1890) included a number of excerpts from Lange (1887) that he had translated from German. The excerpts concerned Lange's detailed descriptions of the bodily changes in emotions. James, however, did not describe Lange's psychophysiological process model, which made explicit how vasomotor changes are induced by subcortical and cortical stimulus processing pathways and how emotional responses may be learned. Dewey (1894) used the expression "the James–Lange theory" twice (p. 553), referring to James's *Principles*, but not to Lange's book.

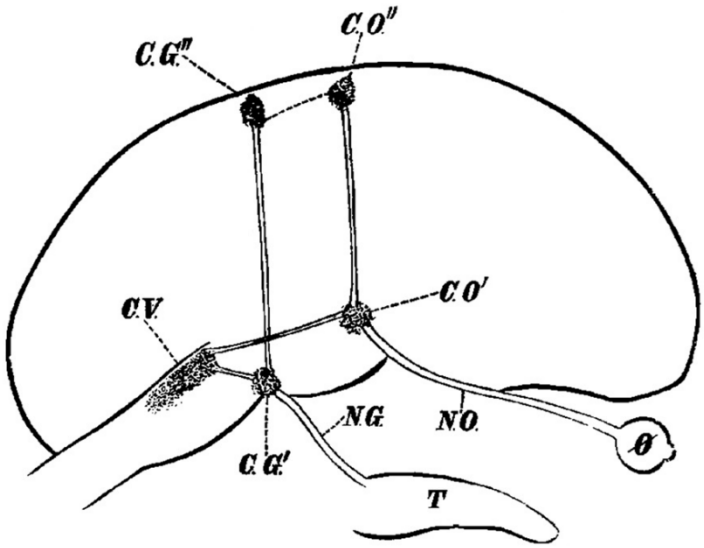
Lange's Theory

Carl Lange (1834–1900) worked for a large part of his career at the University of Copenhagen in Denmark (for biographical information, see Schioldann, 2001). Lange trained as a doctor and was initially affiliated with a number of hospitals, and later had his own neurological practice. From 1875 he taught at the university and in 1885 he became professor of pathological anatomy and general pathology at the medical faculty, a position he held until his death.

In 1885 Lange published his theory of emotions in a book, written in Danish, entitled *Om Sindsbevægelser: Et psyko-fysiologisk Studie* (*On Movements of the Mind: A Psycho-Physiological Study*). The book was immediately considered important and translated into German (Lange, 1887) and French (Lange, 1895). The book contains a critical literature review, extensive descriptions of different emotions, and a psychophysiological process model presented as a diagram. Lange (1885) rejected Wundt's (1877, 1880) view of emotions, who stated that the "external movement always arises from the internal, the affective movement" (p. 58), as quoted by Lange. Lange, on the other hand, argued that the vasomotor changes caused by a stimulus are primary. Figure 1 shows the model of Lange.

Figure 1

Lange's (1885) Psychophysiological Process Model of Emotions



Note. Ø = eye (*Øjet*), NO = optic nerve, CO' = subcortical visual center, CO" = cortical visual center, T = tongue, NG = gustatory nerve, NG' = subcortical gustatory center, CG" = cortical gustatory center, CV = vasomotor center. Picture in public domain.

The model proposes two pathways by which stimuli can elicit vasomotor changes that embody feelings and emotions. For example, a bitter tasting stimulus on the tongue (T in Figure 1) activates a subcortical taste center (CG') via the gustatory nerve (NG). This subcortical center in turn activates the vasomotor center in the brainstem (CV), which then elicits the vasomotor response. According to Lange, this type of processing occurs rapidly and remains unconscious. However, learning can produce vasomotor responses to stimuli that were initially emotionally neutral. Lange gives the example of a child who is given a spoonful of nasty medicine by his mother. Initially, the spoon is seen by the eye (Ø), and via the optic nerve (NO), it activates the subcortical visual center (CO') and then the cortical visual center (CO"), where the spoon becomes conscious. At the same time, the bad taste on the tongue activates the vasomotor center via the subcortical taste center and also activates the cortical taste center (CG"). With repeated reception of the medicine on the spoon, a connection is established between the image of the spoon in the cortical visual center and the represented bad taste in the cortical taste center. As soon as the cortical connection is firmly established, the mere sight of the spoon can activate the corresponding taste in the cortical taste center, which elicits the vasomotor response via the subcortical taste center.

Since Pavlov's experimental studies in the 1890s, the learning process described by Lange (1885) has been called *classical conditioning* of emotions (e.g., Eichenbaum, 2012; Watson & Rayner, 1920). Furthermore, Lange's two routes, a direct subcortical route and an indirect cortical route, anticipated a proposal by LeDoux (1996), who called these the "low road and high road" (p. 164) of emotional processing. LeDoux proposed that an emotional stimulus is processed by the sensory thalamus and that further processing, directly or indirectly via the sensory cortex, goes to the amygdala for an emotional response. Rolls

(2018, 2023) also proposed subcortical and cortical pathways for emotional processing, which, after sensory processing, involve the amygdala and the orbitofrontal cortex, respectively, to arrive at a response. LeDoux assumed that feelings and emotions are conscious when they are represented in working memory, a notion that is absent in James's and Lange's theories.

In discussing his model, Lange (1885) referred to the work of Bechterew, who conducted ablation studies in frogs, pigeons, chickens, rabbits, and dogs to study the effect on emotional expression of removing the cortex or the optic thalamus. Bechterew (1883) noted that removing the cortex preserved expression, while removing the thalamus did not. Lange stated:

> From recent times, there are experimental studies of Bechterew in St. Petersburg (Neurolog. Centralblatt, 1883, No. 4), by which he thinks he has demonstrated that the Thal. optic. "mainly performs the so-called expressive movements and expressive sounds". This certainly does not appear from his experiments. On the other hand, they could perhaps be taken as proof that emotional movements could still be established after the hemispheres have been destroyed. (my translation from Danish, pp. 76–77)

In this context, the 1922 English translation of the 1887 German translation of Lange's 1885 Danish book contains a significant error. The German term *Sehhügel* (p. 91, Danish original *Thal. optic.*, p. 76) is translated into English as *occipital lobe* (p. 89), which is clearly a different area of the brain. Bechterew's (1883) claim concerned the optic thalamus, a subcortical region, and not the occipital lobe, which is part of the cerebral hemispheres.

It is interesting to note that, although Pavlov was probably unfamiliar with Lange's (1885) model, the conditioning studies Pavlov began in the 1890s, and his later ablation

studies, led him to a view remarkably similar to that of Lange. In the *Lectures on Conditioned Reflexes* (Pavlov, 1928), which collected several of Pavlov's publications and a few new chapters, his view, based on the effects of removing parts of the brains of dogs on conditioning, was summarized as follows:

> Thus I repeat that in various experiments by many workers the fact was constantly met that the temporary reflexes occurred only in the presence of the whole or a part of the hemispheres. Consequently, we may accept without misgivings the statement that one of the most *essential functions of the hemispheres* is the elaboration of the conditioned reflexes, just as the main work of the *lower parts of the nervous system* is concerned with the simple, or according to our terminology, the unconditioned reflexes. (p. 195)

Pavlov's view of the cortical hemispheres extended to emotions. In a paper read at the Tenth International Congress of Psychology in Copenhagen in 1932 (the text is reprinted in the second volume of his *Lectures*), Pavlov (1941) stated:

> There is reason to think that the described physiological processes in the cerebral hemispheres correspond to what we subjectively call in ourselves, *feelings*, in the general form of both positive and negative, with innumerable shades and variations, thanks to either their various combinations or their different tensions. Here belong the feelings of difficulty and facility, alertness and fatigue, gratification and vexation, joy, triumph and despair, etc. (p. 100)

James (1884) and Lange (1885) cited empirical evidence to support their theories. However, the evidence remained anecdotal. The first rigorous experimental tests of the theories were conducted by Lehmann (1892, 1899a).

Lehmann's Experiments and James's Response

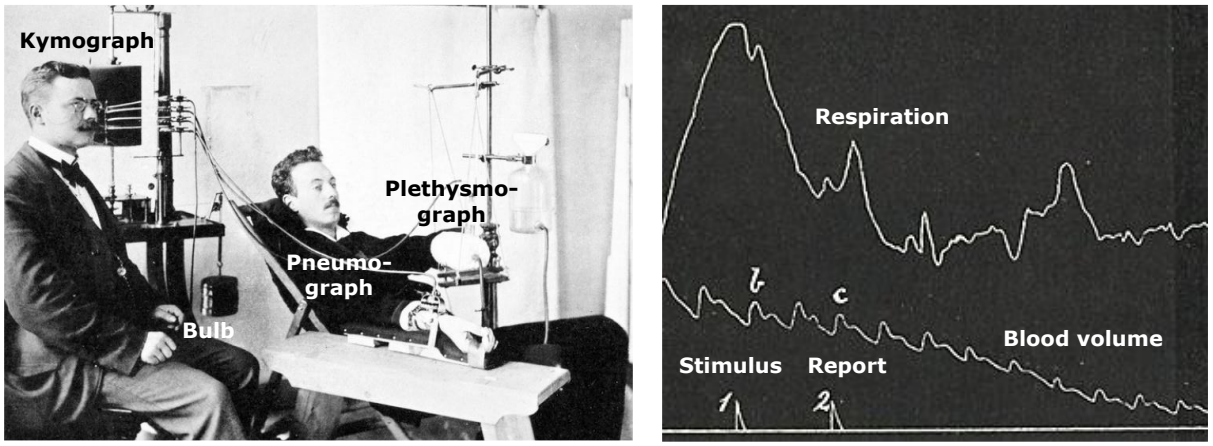
Alfred Lehmann (1858–1921) was associated with the University of Copenhagen throughout his career (for biographical information, see Pind, 2019). After completing an engineering training, Lehmann obtained his doctorate in 1884 with experimental research into aesthetic feelings in color perception. In the academic year 1885–1886, he spent a winter semester in Wundt's laboratory for experimental psychology in Leipzig (e.g., Roelofs, 2024), in the same class as James McKeen Cattell. Wladimir Bechterew, who at the time was working on the physiological basis of emotions in animals, had been there during the summer semester of 1885. Like all students, Wundt gave Lehmann a research assignment, which for him consisted of repeating an experiment that tested Weber's law. He had done so well that Wundt encouraged him to start his own lab in Copenhagen, which he did. Lehmann headed a private laboratory for experimental psychology from 1886, adopted by the university in 1892. Despite his brilliant work, Lehmann did not become a full professor at the university until the age of 61, two years before his death.

Lehmann first reported experimental tests of the theories of James (1884) and Lange (1885) in a book entitled *Die Hauptgesetze des menschlichen Gefühlslebens* (*The Main Laws of Human Affective Life*), which appeared in 1892. James (1894) called the book "highly praiseworthy" (p. 519). More extensive tests were reported in 1899 in a book entitled *Die körperlichen Äusserungen psychischer Zustände* (*The Physical Manifestations of Psychological States*), the first volume of a series of three, together with a large folio-sized atlas that graphically documented the psychophysiological recordings (Lehmann, 1899b). The measurements included the pulse in the forearm, which indicates the heartbeat. While Weber (1834) studied the pulse and later modeled it mathematically, Mosso (1881)

established a connection between the pulse and mental processes, and Lehmann measured the pulse and respiration to experimentally test theories about feelings and emotions. He used a kymograph for this purpose, a device with a rotating drum that records physiological changes as waveforms on carbon black paper. The drum containing the paper rotated automatically under the force of a weight. The desired rotation time could be set, so that time information regarding the events of interest was available. A pneumograph around the chest of a participant measured volume changes during respiration and a plethysmograph registered volume changes in the forearm to record blood volume, including the pulse. The pulse is reflected in the small regular deviations in the blood volume curve. The left panel in Figure 2 shows Lehmann's experimental setup, with the kymograph (left back), pneumograph (around the participant's chest, right), and plethysmograph (left arm). The experimenter's left hand holds a rubber bulb to mark the onset of the stimulus and, when the participant uses it, to report the onset of the feeling or emotion.

Figure 2

Lehmann's (1899a) Experimental Setup and a Psychophysiological Recording



Note. Left: Setup for measuring bodily changes in feelings and emotions. Right: Time course of presentation of an unpleasant stimulus (marked by 1), feeling report (marked by 2), and respiration (upper trace) and blood volume, including the pulse (lower trace). Pictures in public domain.

Lehmann presented participants with stimuli that evoked simple feelings or emotions, such as a spoonful of a sweet or bitter substance that evoked pleasant or unpleasant feelings, or a frighteningly loud noise or announcement that evoked fear, and so on. Most of the experiments using explicit affective reports focused on feelings of pleasure and displeasure. Lehmann used taste, smell, touch, temperature, pain, auditory, and visual stimuli. He observed that the physiological response always developed several seconds *after* the feeling of pleasure or displeasure was reported and therefore could not be the cause of the feeling. The right panel in Figure 2, for example, shows that the change in respiration and blood volume, including pulse height and frequency, occurred after the report of unpleasantness

induced by a spoon containing a bitter substance. Lehmann viewed his findings as a refutation of the theories of James (1884) and Lange (1885).

In response to Lehmann (1892), however, James (1894) argued that the psychophysiological findings did not refute his theory. He emphasized that his theory pertained to emotions such as fear and anger (i.e., "*emotional seizure* or *Affect*"), but not to the feelings of pleasure and displeasure ("primary feeling"). He had already made this point clear at the beginning of his 1884 article (see the earlier quote). Reiterating this earlier position, James rejected Lehmann's assertion, saying:

> Dr. Lehmann enters into an elaborate argument to prove (as he alleges, against Lange and me) that primary feeling, as a possible accompaniment of any sensation whatever, must be admitted to exist. ... Such objections are a complete *ignoratio elenchi* [irrelevant conclusion, missing the point], addressed to some imaginary theory with which my own, as I myself understand it, has nothing whatever to do, all that I have ever maintained being the dependence on incoming currents of the *emotional seizure* or *Affect*. (pp. 524–525)

Lehmann (1914) returned to this issue when discussing the literature on feelings and emotions. He acknowledged that, if this was indeed a limitation of the scope of James's theory, his psychophysiological findings regarding pleasure and displeasure did not, in fact, refute the theory. After Lehmann had quoted James's above rejection of his assertion, he wrote:

> These words at least can hardly be misunderstood, and it is therefore quite incomprehensible why James should continue to be considered the originator of the peripheral theory of feelings. Lange, on the other hand, takes a different position. One would hardly be able to find anything in his book that directly targets the elementary feelings; but I know from a personal conversation with him about this

> question, which lasted several hours, that he saw his theory as valid for all affective phenomena. (my translation from German, pp. 54–55)

Earlier, Lehmann (1899a) had apologized by stating that he was not the only one who had misunderstood the scope of James's theory. However, not everyone misinterpreted James. Referring to the limitation of the scope of James's theory, Sherrington (1900a) stated that James "urges his theory as one which is completely competent only for the 'coarser' emotions, among which he instances 'fear, anger, love, grief'" (p. 392).

The limitation in the scope of James's theory has also been overlooked in the modern literature (e.g., Craig, 2015). Recently, Berkovich and Meiran (2023, 2024) provided evidence that stimulus-induced pleasant and unpleasant feelings obey Weber's law, which they considered "one of the strongest pieces of evidence supporting James' perceptual theory" (p. 1213). However, as James (1884, 1894) pointed out, his theory applies to emotions, but not to elementary feelings. Since Berkovich and Meiran studied the elementary feelings of pleasure and displeasure, their findings do not support James's theory. In Roelofs (2026) I discuss this point and also refer to meta-analytic neuroimaging evidence that emotional stimuli do not activate the primary interoceptive and proprioceptive cortical areas (i.e., the dorsal posterior insula and the somatosensory cortex), which does contradict the theory of James and modern followers (e.g., Craig, 2015; Damasio, 1994).

My detailed description of Lehmann's experiments and James's response makes clear that there was not one theory, but two. Lehmann's psychophysiological findings challenged Lange's theory, which applies to both primary feelings and emotions, but did not challenge James's theory, which is only about emotions.

The Persistence of the Term to Date

For a branch of science to which researchers from different countries and languages contribute, it is important to have a common language, a *lingua franca*. When the common language changes from one language to another, insights can be lost unless they are written up again in the new common language (e.g., Montgomery, 2013). Weber originally described his findings on touch in Latin (Weber, 1834) but later in German (Weber, 1846), as that was increasingly becoming a leading scientific language, alongside French. The language changed again at the end of the 19th century, from German and French to English. Untranslated works, such as Lehmann's books, were lost in the process (e.g., Roelofs, 2024). As a result, discussions of emotions were often informed only by evidence reported in English (e.g., Wassmann, 2010, 2014). This already began when the term "the James–Lange theory" of emotions was coined by Dewey (1894) in the *Psychological Review*, where he discussed only the view of James, without referring to Lange's (1885) model and Lehmann's (1892) experiments. An exception to this trend was the article by Sherrington published in 1900.

In ablation studies in dogs, Sherrington (1900a) observed that when communication between the brain and the body's sensory and motor centers in the brainstem, including the vasomotor center, was severed, the dogs still expressed emotions through their head, face, and ears, whose nerves had remained intact. In motivating these studies, Sherrington referred separately to the theories of James and Lange, noting the overlap but also pointing out important differences. He referred to Lange's book in Danish, German, and French, and he also referred to the studies of Mosso and Lehmann. Sherrington stated that the views of James and Lange "have common to them this, that according to them the psychological process of emotion is secondary to a discharge of nervous impulses into the vascular and

visceral organs of the body suddenly excited by certain peculiar stimuli, and depends upon the reaction of those organs" (p. 392). However, he also noted important differences:

> Professor James's position in the matter is, however, not wholly like that of Professor Lange. In the first place, he does not consider vasomotor reaction to be primary to all the other organic and visceral disturbances that carry in their train the psychological appanage of emotion; ... In the second place, Professor James seems to distinctly include other "motor" sensations and centripetal impulses from musculature other than visceral and vascular, among those which causally contribute to emotion. Thirdly, he urges his theory as one which is completely competent only for the "coarser" emotions, among which he instances "fear, anger, love, grief." For Lange ... the basis of apparition of all feeling and emotion is physiological, visceral, and organic, and has seat for the former authority exclusively, and for the latter eminently, in the vasomotor system. (p. 392)

The third point referred to James's (1894) comment on the scope of his theory, which includes emotions but not the elementary feelings of pleasure and displeasure. Sherrington (1900a) claimed that his work had refuted Lange's theory: "A vasomotor theory of the production of emotion seems at any rate rendered quite untenable" (p. 402). But he was more cautious in drawing conclusions regarding James's theory:

> The picturesque incisiveness of all that comes from Professor James's pen, renders the more persuasive any argument that it pursues. His suggestive chapters led to the above attempt at examination of his theory, an examination the incompleteness of which I wish to unreservedly acknowledge. (p. 403)

Three decades later, in an article entitled *The James–Lange Theory of Emotions: A Critical Examination and an Alternative Theory*, Cannon (1927) discussed James's theory, Lange's theory but not his psychophysiological model, and Sherrington's (1900a) findings in

dogs, but not Lehmann's (1892, 1899a) psychophysiological studies in humans, even though these were clearly relevant. There, and in a book chapter titled *Emotion as a Function of the Optic Thalamus* that appeared two years later, Cannon outlined his own theory of emotions. This theory showed similarities to that of Lange (i.e., his model) by assuming subcortical and cortical processing pathways and cortical conditioning. Cannon (1929) stated:

> An external situation stimulates receptors and the consequent excitation starts impulses towards the cortex. Arrival of the impulses in the cortex is associated with conditioned processes which determine the direction of the response. Either because the response is initiated in a certain mode or figure and the cortical neurones therefore stimulate the thalamic processes, or because on their inward course the impulses from the receptors excite thalamic processes, they are roused and ready for discharge. That the thalamic neurones act in a special combination in a given emotional expression is proved by the reaction patterns typical of the several affective states. (pp. 368–369)

In a subsequent article in the *Psychological Review*, again discussing "the James–Lange theory", Cannon (1931) included a diagram he had made for this theory. The diagram is at odds with the diagram Lange (1885) himself proposed. Cannon's diagram shows neural connections between the cortex and the viscera and skeletal muscles, which Lange did not assume, and it omits subcortical connections, which Lange did assume.

Three decades later, in an experiment reported in *Psychological Review*, Schachter and Singer (1962) injected participants with epinephrine (which led to increases in blood pressure, heart rate, and respiration) and noted that the emotion felt (i.e., euphoric or angry) depended on the experimental situation and the information given to participants. The results suggested that cognitive factors are an important determinant of emotions, which is in line

with Lehmann's (1899a, 1914) conclusion, but no reference was made to Lehmann's work. Schachter and Singer discussed the James–Lange theory, describing the view of James (1890) but not of Lange (1885).

In celebration of the centennial of the *Psychological Review*, co-founded by Cattell, James's 1894 article was reprinted and the editors invited experts to discuss "the James–Lange theory" of emotion (Kintsch & Cacioppo, 1994). While Ellsworth (1994) focused entirely on James's theory, Lang (1994) also briefly discussed Lange's (1885) theory. Lang noted that "whereas James made conscious emotion the central focus of his theory ... for Lange, emotion *was* its physiology, and conscious experience was of little importance, if not entirely epiphenomenal" (p. 212). Neither review mentioned Lehmann's work, which would have reinforced the fact that there was not one theory, the "James–Lange theory", but two theories, one by James and another by Lange.

The focus on James's theory continues in the literature to this day. I illustrate this with three final examples. In *Descartes' Error*, in which Damasio (1994) emphasized the importance of bodily changes in emotions, James is discussed but Lange is absent. Similarly, in *The Emotional Brain*, LeDoux (1996) discussed James, but not Lange. And in a review of ideas about emotion in psychology from 1850 to the present, Gendron and Barrett (2006) discussed in detail the ideas of about twenty researchers. They are all Anglo-Saxon researchers who published in English, with the exception of Wundt. Lange (1885, 1922) is mentioned in the text, but not discussed in detail. And in all three cases, a discussion of Lehmann's work is missing.

Summary and Conclusion

My description of the history should make clear that not much was known in the English literature about the second name in the term "the James–Lange theory" of emotions. Furthermore, nothing was known about Lehmann's experiments that highlighted that there were two theories, not one: His findings refuted Lange's theory, but not James's. After Dewey (1894) coined the term "the James–Lange theory", other researchers used it while referring only to James's articles and not realizing that James's and Lange's views were different. In the early literature, by contrast, Lehmann (1892) and Wundt (1907) referred to James and Lehmann separately, as did Sherrington (1900a), Angell (1916), and Dunlap (1920).

I argued that there are three main reasons for referring to James and Lange separately. First, Lehmann's (1892, 1899a, 1899b) physiological experiments with humans refuted Lange's theory, but did not contradict James's, showing that their theories are different, as James (1894) stressed and Lehmann (1899a, 1914) acknowledged. Second, the "James–Lange" labeling of Lange's work emphasizes something that was important to James, the experience of bodily changes, but that did not receive much attention from Lange. Sensing bodily changes was missing from his psychophysiological process model. Third, the shared labeling obscures two contributions by Lange that are perhaps as important as the shared contribution with James: a dual route model of emotional responding (e.g., LeDoux, 1996) and classical conditioning of emotions (e.g., Pavlov, 1928).

The expression "the James–Lange theory" of emotions is well established in the literature and has become a standard way of referring to the supposed primacy of bodily factors in emotions. We therefore need a minimal change that nevertheless does justice to the

different views of James and Lange. This can be achieved by referring to James and Lange separately as the James (1884) and Lange (1885) theories, or by using the plural form, “the James–Lange theories”.

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