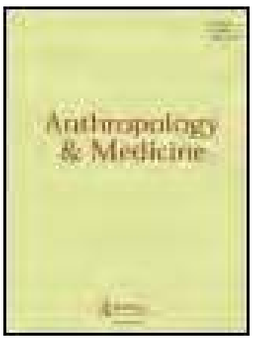

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Towards a science of touch, part I: Chinese pulse diagnostics in early modern Europe

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ABSTRACT *This paper is about a pre-modern 'science of touch'—Chinese pulse diagnostics—which was the aspect of Chinese medicine most admired by physicians in early modern Europe. The paper first provides some historical information on Chinese pulse diagnostics in Europe and then details how it was presented to an 18th-century readership. At last, it points out that Chinese physicians had developed an elaborate system for distinguishing between various experiences of touch. From an outsider's viewpoint, one could say that they already had an idea of calibration and made measurements in respect of a calibrated condition. Since they put their fingertips on the wrist of their patients and actively palpated it, one can say that their 'science of touch' was developed in respect of 'active touch'. This in contrast to the 'science of touch' developed by psychophysicists of the modern West, who have been interested primarily in 'passive touch'.*

Introduction

Science is, in common parlance, a phenomenon of modernity and accordingly one would trace the beginnings of a 'science of touch' to 19th-century experiments on the psychophysics of touch. This now well-established field has set the trend for 20th-century research on touch in the West, and a section at the end of the paper will summarise what this modern science knows about touch and what it tends to neglect. However, 'science' also designates practices that are pre-modern and not necessarily occidental, and the aspects of the 'science of touch' at the core of this article concern a pre-modern attempt to assess in a descriptive way the tactile sensations, perceptions, and experiences that a physician makes with the sense organ of the skin (more precisely, the glabrous skin of the hand and the finger-tips), when he or she engages in pulse diagnostics.

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The Paradox of a 'Science of Touch'

Touch differs in important ways from other modalities of perception: I can see you without you seeing me; I can hear you without being heard. Likewise in order to smell or taste one need not be tasted or smelt—but whatever you touch, touches you too. "In touch, the distinction between touching subject and touched object blurs" (Mazis, 1971). This aspect of touch may explain its prominence both in love relationships and aggression, where it has the emotionally highly laden positive or negative attributes of pleasure or pain. And in turn it may partly explain its prohibition in social behaviour when boundaries between individuals are emphasised. Yet precisely this involvement between subject and object makes it difficult to account for touch in a detached and descriptive way, and because of this it appears paradoxical for pulse diagnostics and, for that matter, any descriptive science to rely on differentiations between sensations of touch.

I am not the first to point to this peculiarity of touch. Merleau-Ponty (1992, p. 316) states that "tactile experience ... adheres to the surface of our body; we cannot unfold it before us and it never quite becomes an object" and he opposes this to visual experience, which "pushes objectification further than does tactile experience". But Merleau-Ponty has in fact little to say about touch in his over four hundred page oeuvre on the *Phenomenology of Perception*.

This melding of subject and object makes touch an excellent non-verbal means for communicating one's own, and recognising the other's, temper and disposition, not only because the social contact is governed by what Hall (1966) called "intimate proxemics", but also because "there is a feeling of control in verbal discourse that is absent with physical intimacy" (Young cited in Autton, 1989, p. 8). Even in situations other than those governed by intimacy, touch has been shown to have great significance in both social interaction (e.g. Montagu, 1971) and therapeutics (e.g. Older, 1982). While these aspects of touch certainly deserve to be more extensively explored, this paper focuses on another aspect, which appears as a paradox of any 'science of touch': one would expect that the experience of touch, marked by melding of subject and object, poses difficulties for its representation in a descriptive and detached, generalising and 'objectifying' way.[a]

Pulse diagnostics is here treated as a form of scientific inquiry that identifies and describes different tactile experiences. In many pre-modern societies it was highly elaborate. Thus, "sphygmology was perhaps the single most important diagnostic aid in Galen's repertoire and the technique to which he devoted most space in his theoretical expositions of medical practice ... a whole series of sixteen books on the pulse" (Nutton, 1993, p. 12). Galen related the tactile experience of the doctor during pulse diagnostics to anatomical and physiological speculation: the pulsations at the wrist were attributed to the movement of the arteries, which in turn had been put into motion by the life-force that came from the heart. His understanding of the pulses was different from our own, and also different from that of the Chinese (Kuriyama, 1986, pp. 40–57, 1999).

I. The Historical Cadre

Attitudes to Chinese Pulse diagnostics

The 17th century saw the first translations of treatises on Chinese Pulse diagnostics into Latin and French, and even if the attitude towards them was not uniformly positive (e.g. Winau, 1978), we find that they were often praised as superior to those of scholastic medicine (e.g. Lu & Needham, 1980, pp. 36–37). Thus Jean Baptiste Du Halde ([1735] 1941) in his *Description of the Chinese Empire* ... begins a chapter on 'The Art of Medicine among the Chinese'[b] with a mixture of admiration and condescension:

> It cannot be said that *Medicine* has been neglected by the *Chinese*, for they have a great Number of ancient Authors who treat of it, having applied themselves thereto from the Foundation of the Empire.
>
> But as they were very little versed in Natural Philosophy, and not at all in Anatomy, so that they scarce knew the Uses of the Parts of the Human Body, and consequently were unacquainted with the Causes of Distempers, depending on a doubtful System of the Structure of the human Frame, it is no wonder they have not made the same Progress in this Science as our Physicians in *Europe*. (p. 183)[c]

Yet the introduction to this chapter ends with an eulogy of Chinese Pulse diagnostics:

> They [the Chinese] pretend, by the Beating of the Pulse only, to discover the Cause of the Disease, and in what Part of the Body it resides: In effect, their able physicians predict pretty exactly all the Symptoms of a Disease; and it is chiefly this, that has rendered Chinese Physicians so famous in the World. (p. 184)

Chinese Pulse diagnostics was certainly the aspect of Chinese medicine that attracted the main interest of the Jesuit missionaries who had travelled to China and were knowledgeable in both medicine and the Chinese language, for several works of 17th-century Europe provide detailed and systematic accounts of it (Grmek, 1962; Despeux & Obringer, 1997, pp. 10–11). In this context, it is worth mentioning that there possibly were precursors: Avicenna (Arabic: Ibn Sina) (AD 980–1037) used vocabulary in his *Canon of Medicine* strikingly similar to that in the later Persian treatise by Rashid ad-Din Fadlallah's (1247–1318) on Chinese Pulse lore, and a chapter in his *Canon* as well as his *Treatise on the Pulses* (*ar-Risala fin Nabad*) are considered to enumerate pulse qualities which resemble the Chinese ones in the *Rhymed Pulse Lore* (*Maijue*) of the 10th century. Although Avicenna nowhere explicitly acknowledges Chinese writings as source material, it is possible that his works testify to knowledge transfer of Chinese Pulse diagnostics into Europe, predating those of the 17th and 18th centuries by more than half a millennium.[d]

Was it the case that Avicenna and some of the later physicians of scholastic medicine considered Chinese Pulse diagnostics superior to Galenic sphygmology? If this was so, what was it that made Chinese Pulse diagnostics so highly

respected? From an empiricist viewpoint, one could argue that the doctrine of Chinese Pulse diagnostics was closely linked with empirical knowledge derived from medical practice, and that the doctors who applied it were therefore therapeutically more successful. However, if one hesitates to attribute much empirical value to either the Galenic or the Chinese form of sphygmology, one has to investigate the social conditions that facilitated its transmission from East to West.

This paper does not seek to answer the above question of why Chinese Pulse diagnostics was so highly regarded in the West, even though it is concerned with Pulse diagnostics as represented in some of the many editions of the *Maijue* (*Rhymed Pulse Lore*) just mentioned. Du Halde renders it in translation as "The Secret of the Pulse" and presents it in three instead of the usual four parts (pp. 184–207).[e] The treatise discusses a whole variety of different Pulses, but in this paper we will discuss only a few sections and focus, in particular, on the editor's introduction to it.

To be sure, this paper is not primarily concerned with the problem of how Chinese Pulse diagnostics were translated into the vocabulary of the scholastic Galenic medicine that was then prevalent nor does it address the equally important question of the history of the reception of Chinese Pulse diagnostics in Europe. Rather, it intends to contribute to an anthropology of sensory or, more precisely, tactile experience. It centres on the problem of how, despite the blurring of subject and object in touch, touch can be described in a detached and 'objective' way. This is done by exploring some examples of how a pre-modern Chinese 'science of touch'—Chinese Pulse diagnostics—assessed tactile experience. However, before turning to the representations of touch in Chinese Pulse diagnostics, let us outline its rationale.

Du Halde's introduction to the Chinese "antick, but erroneous" system of medicine

Du Halde gives a summary of the Chinese "antick, but erroneous" system of medicine in a two-page introduction in small script, without, however, indicating the textual source material on which it is based. Since the information he provides coincides largely with what is currently known from Chinese sources, it is outlined here for the reader unfamiliar with Chinese medical doctrine.[f] Thus, Du Halde remarks that Chinese Pulse diagnostics are based on a conception of the body as a kind of lute:

> They … suppose that the Body, on account of the Nerves, Muscles, Veins and Arteries, is a kind of Lute, or musical Instrument whose Parts yield diverse Sounds, or rather have a certain kind of Temperament peculiar to themselves, by reason of their Figure, Situations, and various Uses; and that the different Pulses, which are like the various Tones and Stops of these Instruments, are infallible Signs whereby to judge of their Disposition, in the same manner as a String, which is touch'd in different Parts either strongly or gently, gives different Sounds, and shews whether it be too slack or too streight. (p. 183)

This comparison of the body to a lute is not given in any of the Chinese texts known to me, but it captures aptly the kind of tactile perception Chinese physicians were interested in, which, from a bio-physiological viewpoint, was primarily vibration. With regard to *yang* and *yin*, Du Halde says that they are the two "natural Principles of Life"; *qi*, which is translated as "Spirits", and *xue*, "Blood", are considered their "Vehicles". Du Halde then proceeds to explain that the Chinese conceive of the body (a) by dividing it into a left and a right part; (b) by dividing it into three parts: an upper, middle, and lower part ("from the top of the Head as far as the Breast", "from the Breast to the Navel", "from the Navel to the Sole of the Feet"); and (c) by dividing it into "Members and Intestines", or "Entrails", elsewhere also referred to as "Springs of Life" (see Table I).

With regard to these "Intestines" or "Entrails", Du Halde says from a bird's-eye view: "After they had establish'd these twelve Springs of Life in the Body of Man, they searched after outward Signs, whereby to discover the inward Dispositions of those twelve Parts." (p. 183) Du Halde mentions the correlations between "the Tongue and the Heart, the Nostrils and the Lungs, the Mouth and the Spleen, the Ears and the Kidneys, the Eyes and the Liver" (without explicitly indicating that they are characteristic of reasoning in terms of the "Five Elements"), and explains that "the Colour of the Visage, Eyes, Nostrils, and Ears", "the Sound of the Voice, and the Relish which the Tongue either feels or desires" are such "outward Signs"; they are found in the head which, according to Du Halde, "is the Seat of all the Senses that perform the animal Operations".[g] Diagnostics in those cases are based on visual and auditory perception, or in the case of tongue diagnostics, according to Du Halde, on the patient's subjective disposition.[h] Du Halde speaks of such diagnostics as relating "outward Signs" to "inward Dispositions".

In Pulse diagnostics, one would expect the Pulse patterns to be the "outward Signs" of the "Springs of Life"—they were felt at three positions on the left and right wrist, in analogy to their position in the body (see Table I)—but Du Halde does not take the different Pulses as "outward Signs":

> It is Motion, say they [the Chinese], that makes the Pulse, and this Motion is caused by the Flux and Reflux of the Blood and Spirits, which are convey'd to all Parts of the Body by the twelve Canals [...]. (p. 183)

TABLE I. The Twelve "Springs of Life" (Du Halde [1735] 1741, p. 183).

Left		Right	
yang	*yin*	*yang*	*yin*
Small Guts or Pericardium[a]	Heart	Great Guts	Lungs
Gall-bladder	Liver	Stomach	Spleen
Ureters	Kidneys	The third part of the Body	Gate of Life = Right Kidney

[a]The pericardium is mostly considered a *yin* entrail that corresponds with the *sanjiao*, here given as "The third part of the Body".

Each of these "Canals" or "Passages" or "Ducts" or "Ways", as Du Halde refers to them, have been established because "it is necessary to explain in what Manner they [the Chinese] think this radical Moisture [*yin*] and vital Heat [*yang*] are communicated to other Parts of the Body" (p. 183).[i] Soulier de Morant (1934) called them 'meridians' and this is how they are generally referred to among medical practitioners in Europe. Porkert (1974) speaks of 'sinarteries'; Unschuld (1986) of 'conduits'; Lu and Needham (1980) of 'tracts'; and Sivin (1987) of 'circulation tracts'. One of the reasons why historians and anthropologists of Chinese medicine hesitate to call them 'meridians'—which invokes the metaphor of meridians that are 'lines of orientation' projected onto the body of the globe—is that Pulse diagnostics, unlike the other diagnostic methods mentioned above, is supposed to be based on the investigation of a postulated reality, and not imagined lines of orientation: it detects the motions of the "Blood" and "Spirits" in those Canals or Passages:

> By a thorough Knowledge of these Beatings and Percussions, the Dispositions of the Body, and the Affections which they receive from the Elements are discovered. By these Beatings, one may know the Nature of the Blood and Spirits, with the Defects and Excesses that may happen therein; ... (p. 184)

The "Elements" are not the elements of early Greek philosophers nor of modern chemistry but rather spatio-temporal 'rubrics' (Granet, 1934) according to which the dynamics and changes in the universe are assessed, today generally referred to as "Five Phases" (Porkert, 1974): Wood,[j] Fire, Earth, Metal, Water (see Table II). Du Halde explains that they are "the exterior Bodies, which may cause Alterations in the Body of Man" and that "all these Elements unite in composing the Human Body, which is disposed in such a manner, that one Element prevails more in some Parts than others" (p. 183).

Such were the foundations of Chinese medicine in Du Halde's view. At the time, he could say: "They reason much in the same manner as we do, concerning the Agreement and Disagreement of these Elements with the Body of Man, to account for the Alterations and Diseases incident thereto". He obviously had a different foundation for understanding Chinese medical doctrine, but none the less his outline contained surprisingly similar contents as those currently taught to students of Traditional Chinese Medicine (Hsu, 1999). In one aspect, however, Du Halde's understanding differs from that of present-day interpreters of canonical medicine. This concerns Pulse diagnostics.

The Tactile Experience

Touch and the melding of subject and object

Du Halde stresses that Pulse diagnostics is not based on identifying "outward Signs"—beatings and percussions—and linking them to "inward Dispositions"—the disposition of the body. In this respect Pulse diagnostics differs from

TABLE II. The Five "Elements" (Du Halde [1735] 1741, p. 183).

Thus Fire predominates in the Heart, and the chief Viscera, which lie near it; and the South is the Point of the Heavens that principally hath respect to these Parts, because Heat resides there: They also observe the Affections of the Heart in Summer.

The Liver and the Gall-bladder are referred to the Element of Air, and both have a Relation to the East, which is the Place from whence the Winds and Vegetation proceed; and the Disposition of those Parts ought to be observ'd in Spring.

The Kidneys and Ureters belong to the Water, and correspond to the North; whence Winter is the most proper Time to observe their Indications.

The Lungs and Great Intestines are govern'd by the Metals as well as by the West, and the Autumn, which is the Time of their Indications.

Lastly,[a] the Spleen and Stomach participate of the Nature of the Earth, and are referr'd to the middle of the Heavens, between the four Cardinal Points; and the third Month of every Season is the particular Time of their Indications.

[a]Despite this adverb, Du Halde (p. 183) thereafter includes one more paragraph on Fire and Water: "The Gate of Life and the third part of the Body are subject to Fire and Water, and receive the Impressions of the Heart and Kidneys, which they communicate to all the other Parts".

diagnostics based on examination of "Colour", "Sound", and "Relish": the motions of the Pulse are considered to be those of the inside processes themselves. Du Halde may have made this distinction because in his understanding that the Chinese Pulses were linked through "Ducts to the Life Springs" in the body in what we are inclined to call a 'mechanistic' way, while Colour, Sound, and Relish related to those Life Springs according to laws of correlative correspondences between the Five Phases. Du Halde may thus have imposed the Galenic understanding of pulsation—as a movement of the arteries that were directly connected to the heart and its life-force—on the Chinese Pulse patterns.[k]

On the other hand, it is worth noting that throughout the history of Chinese medicine the examination of the Complexion has remained closely related to a rationale of five-phase correlations, but not that of Pulse patterns—one may argue that in some early texts Pulses were categorised primarily in respect of the five phases, but hardly in the text known to Du Halde and certainly not in contemporary teachings of the People's Republic of China. In the *Records of the Historian* (*Shiji*, p. 105) from the 1st century BC, which contain the first extant text on Pulse diagnostics (Hsu, forthcoming), Pulse patterns are often directly linked to what Du Halde would have called the Life Springs, and they are ascribed qualities of the five phases. In modern teachings of Traditional Chinese Medicine, however, the rationale of Pulse diagnostics takes hardly any account of Five Phase doctrine: rather, one of the main schemata for attributing Pulses to internal dispositions is that of the "Eight Rubrics" (Farquhar, 1994, pp. 76–83), a schema which is not grounded in exactly the same kind of correlative reasoning that underlies Five Phase doctrine.[l] Admittedly, the teachings of Traditional Chinese Medicine are to a certain extent based on innovations

dating to the late Ming (16–17th centuries), while the *Rhymed Pulse Lore* was popular from the Song to the Ming (960–1644; see above), and Du Halde provides a translation of one of the many versions of the latter. At the time, Pulse diagnostics was definitely not as much dominated by Five Phase correlative reasoning as was Complexion–Colour diagnostics.

It is also possible that in singling out Pulse diagnostics Du Halde pointed to characteristics of tactile experience that are distinct from visual or auditory perception. In the article "The Pulse as an Icon in Siddha Medicine" Daniel (1991) makes a distinction reminiscent of Du Halde's: he explains that the "sign" in Peirce's sense entails a "leaping activity" between two correlates, a "jump" from one universe of discourse to another, i.e. from the correlate of the sign to the sign itself, while the stable relation of meaning between them often presupposes a more or less arbitrarily set-up code.[m] Daniel points out that a Siddha doctor who takes the pulse is not, in effect, detecting a 'sign', in contrast to the doctor who inspects the iris and takes his findings as signs of the patient's inner disposition. Daniel describes a process that has three stages ending in one in which the physician's pulse beat melds with that of the patient. The physician takes on the pulse condition of the patient and through the experience that his own self thereby undergoes he is able to recognise the patient's health condition.

Although in Chinese medicine the process of taking the Pulse is nowhere described as ending in a state of melding or, in Daniel's words, "consubjectivity", no one would deny that the diagnostic method of relying on tactile perception of Pulses consists of a direct contact between the doctor's finger-tips and the patient's wrist (see Fig. 1) and thus, to an admittedly limited extent, a melding between doctor and client. In corroboration of this we notice that Du Halde stresses the great care with which physicians undertook the procedure and that it required "a considerable Time to examine the Beating" (p. 184), time enough for physician and patient to start to feel one.

Of course, the diagnostic value of touch during Pulse diagnostics could also lie in the verbal information elicited through touch: "If you examine people—and that means touching them—they'll often open out and tell you things that they quite clearly wouldn't have told you beforehand" (Older, 1982). This aspect of Pulse diagnostics is certainly not to be underrated as various studies focusing on the micro-social aspects of the clinical encounter have indicated, though without pointing out that touch may have been a constitutive factor (e.g. Trawick, 1987).

Probably touch was not only meaningful for the doctor but also for the patient to whom the encounter may have communicated the doctor's calmness or trust or other feelings conducive to self-healing forces. "When the doctor touches the patient both parties have the 'feeling' that something is being done" (Autton, 1989, p. 55); its diagnostic value may prevail for the doctor while, as electrocardiograms have shown, it has a calming—and hence possibly therapeutic—effect on the patient (Autton, 1989, pp. 81–82).

To summarise, Du Halde's claim that the motions of the Pulses are not to be taken as 'outward signs' of 'inward dispositions' raises the question of the

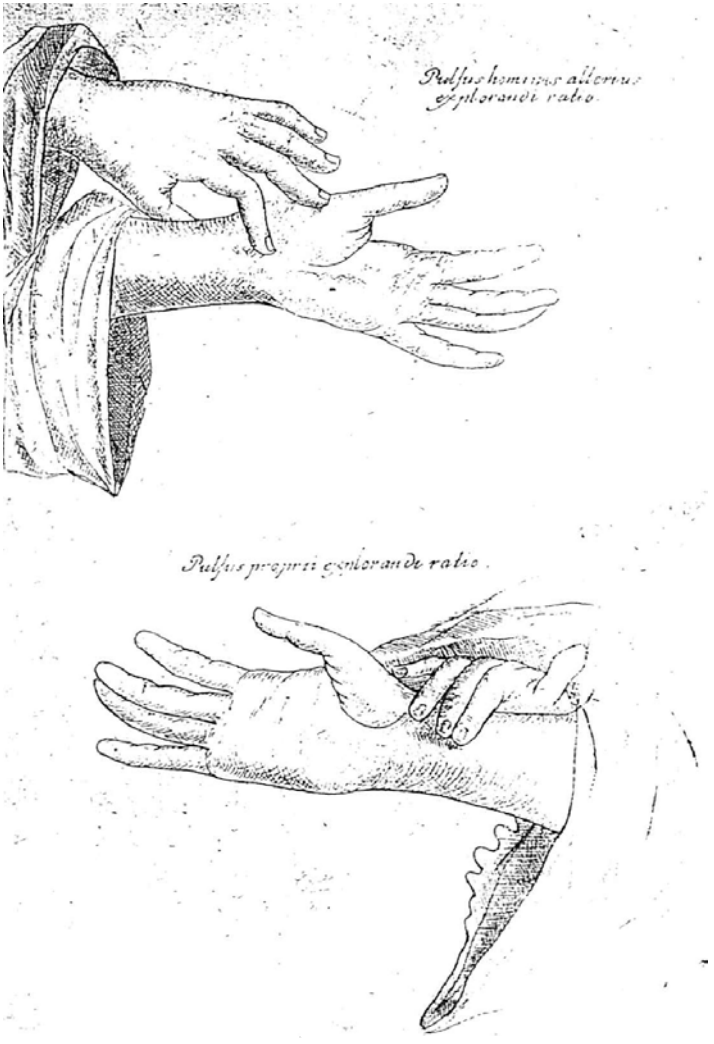

FIG. 1. The positioning of the hands during Pulse diagnostics. The upper illustration is questionable in light of ethnographic observation in contemporary China, because doctors would always use three fingers simultaneously when taking the Pulse, even when they pressed them down independently of each other. The lower illustration is faulty because the finger closest to the hand is always the index, followed by middle and ring fingers. The index finger on the left wrist detects motions of the Heart, on the right motions of the Lungs; the middle finger on the left wrist detects motions of the Liver, on the right motions of the Spleen; the ring finger on the left wrist detects motions of the Kidneys, on the right motions of the Gate of Life. Plate in Cleyer (1682). Photocopy courtesy of the University Library, Cambridge.

premisses on which Pulse diagnostics rely. Possibly, Du Halde's singling-out of Pulse diagnostics may derive from the Galenic anatomy-oriented understanding of pulsation. However, it is also possible that the rationale of Pulse diagnostics began to be separated from that of other forms of diagnostics in the Chinese context itself. As established at the beginning of this paper, tactile perception differs from other sensory perceptions in important ways, and we have seen that

the Siddha doctor exploits this peculiarity of touch: the fusion between two individuals that it entails makes it possible that the patient's pulses (and thereby the clues to his distemper) are transferred to the doctor. Yet Chinese Pulse diagnostics does not claim to rely on a doctrine of touch as a form of melding between two individuals. Is it the concomitant verbal information that makes it viable practice? Is it other non-verbally transmitted information during the process of touching? One wonders how tactile experience, based on a blurring of subject and object, can be assessed in a detached and objective way. It appears blatantly contradictory to the prerequisites of any objectifying science.

The self-calibration of the physician and other instructions for feeling the Pulse

The treatise on the "Secret of the Pulse" seems to address precisely this problem of the melding of subject and object in the section "Seven Cautions to a Physician about feeling the Pulse". This advocates the 'self-calibration'[n] of the physician as one of the first steps towards the Chinese medical 'science of touch':

1. He must be in a calm Disposition of Mind.
2. He must be as attentive as possible, and free from the least Distraction of Thought.
3. With respect to his Body he should also be in a state of Tranquillity, so as to find his Respiration free and regular. ... (p. 190)

Evidently, the physician himself must be in a calm and attentive state of mind. As we will see below (citation from p. 191), it is the physician's respiration that is taken as the standard against which the frequency of the beatings of the Pulses are measured. In the section "The Manner of feeling the Pulse" it is furthermore said that: "The Physician himself should be healthy, and in a State of Tranquillity" (p. 187), an aspect which is elaborated in a letter by John Floyer (1707, pp. 339–424) with contents taken from Andreas Cleyer's (1682) publication: "The Chinese direct the Physician to come to the Patient in the Morning to feel the Pulse, when he is Fasting; and the Physician ought to be Healthful, free from Cares" (p. 340).

The following four cautions in the section "Seven Cautions to a Physician about feeling the Pulse" are rather elaborate in the original and I summarise them by citing the second paragraph of the section on the "Instructions for feeling the Pulse":

> He [the doctor] begins by placing the middle Finger exactly where the Wrist-Bone locks with the *Cubitus*, then claps the two next Fingers, one on each Side. At first, he presses gently [corresponds to caution 4], then a little harder [5], and at last very hard [6], taking Care that his Fingers be rightly adjusted; after which he may proceed to examine the Pulse in the three Places appointed, laying it down for a Principle, that a regular Pulse beats four, or at most five, times to one Respiration [7]. (p. 191)

Obviously, the physician was not only required to calibrate himself, but also to examine a patient by applying standard methods of touching. He was instructed to take the Pulse with each of the three fingers (index, middle finger and ring finger) at different levels by first pressing 'gently', then 'a little harder', and thirdly, 'very hard'. In psychophysical jargon this means that the doctor was told to engage in 'haptics' or so-called 'active touch'. In other words, the 'science of touch' on which Chinese Pulse diagnostics is based is 'active touch', an aspect of touch that has not enjoyed the same attention in the modern Western sciences of touch as 'passive touch'. This becomes obvious by a brief excursus into recent researches on the psychophysics of touch.

The Psychophysics of 'Passive Touch'

E.H. Weber (1795–1878), who conducted experiments on the 'touch-organ' skin with systematic rigour, is now celebrated as a pioneer in the psychophysics of touch (e.g. Stevens & Green, 1996). In particular he applied a now standard two-point threshold task for mapping the different bodily sensibilites with respect to discrimination of sensation, localisation, temperature, and (to a lesser extent) pain onto different skin regions (Ross & Murray, 1996, p. 11), and with it he set up the model case for the investigation of 'passive touch'. Weber's theorising, however, has in parts been revised—at the time none of the cutaneous receptors had been identified, except for the Pacinian corpuscules, though there was doubt as to whether they were sensory organs at all (Ross & Murray, 1996, p. 176). Weber postulated, much in line with Galen, that the skin housed at least two different 'sorts' of 'sensations': pressure or traction and warmth or cold (Ross & Murray, 1996, p. 106). This postulate was increased to four independent sense modalities—for perceiving pain, pressure, warmth, and cold—at the beginning of this century (Krueger, 1982), and several more have since been found.

The research of 20th-century skin psychophysics has largely been guided by M. von Frey's (1852–1932) claim of four specific sense receptors for the above four sensory qualities. This claim is flawed (Krueger, 1982), but it was appealing for its simplicity and its goal of localising function in histological and anatomical structure, much in tune with the neurological research of the time (e.g. Penfield & Boldrey, 1937). The sensory receptors that are now depicted, not only in textbooks, but even in children's booklets (Rius *et al.*, 1985?), tend to be attributed very specific functions (Fig. 2): Merkel's disks in the epithelium detect pressure; Meissner's corpuscles, situated in the dermal protrusions where dermis and epidermis interdigitate, detect contact; Ruffini capsules pressure; Pacinian corpuscles, located in the deepest layers of the dermis, vibration. Only the free nerve endings are considered to have a whole variety of different functions: they transduct thermal stimuli or noxious (strong mechanical, thermal, and/or chemical) stimuli as well as specific types of tactile stimuli (when acting as C-mechanoreceptors) (Greenspan & Bolanski, 1996).[o]

Research of the above kind has, however, serious limitations, and more sophisticated investigations have now come to conceive the above mechano-

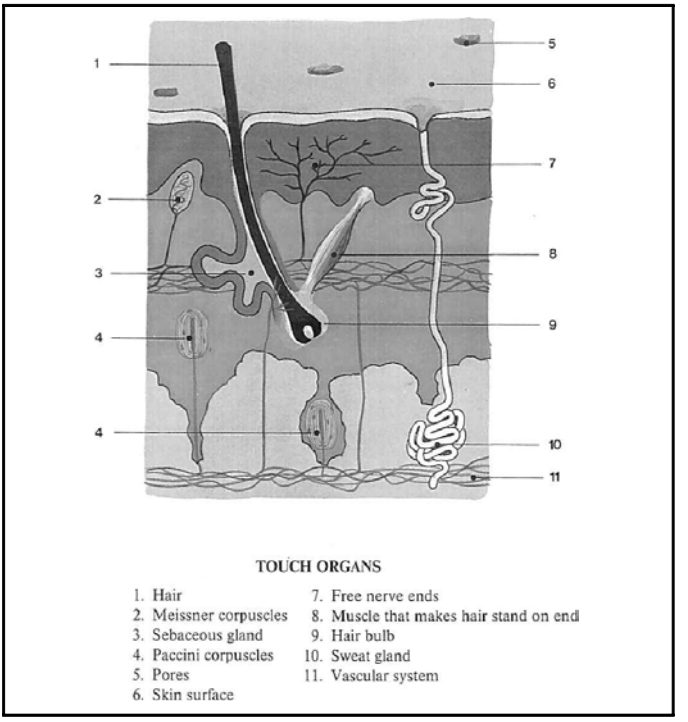

FIG. 2. Sensory receptors of the skin (see Rius *et al.*).

receptors as an ensemble (e.g. Vallbo & Johansson, 1978). The attribution of different tactile functions to independent structures is particularly difficult to maintain in the light of the many different perceptions provided by the sensitivities of the skin. The phenomenon of so-called 'touch blends' highlights this. For instance, the simultaneous application of coldness and pressure to adjacent spots results in the perception of wetness, and the application of warmth and pressure yields the perception of oiliness. "Temperature looms larger at the liquid extreme and pressure at the solid extreme of the series of touch blends: vaporous, wet, oily, gelatinous, slimy, greasy, syrupy, muddy, mushy, soggy, doughy, spongy, and dry" (Krueger, 1982, p. 11). This shows that a science of tactile perception requires more than the exploration of separate stimuli and corresponding receptors. Even Weber, who instigated this kind of experimental research on 'passive touch', was well aware of the interdependence of different stimuli—his prime example was that the "Joachimstaler" placed on the forehead felt much heavier when it was cold (Ross & Murray, 1996, pp. 169–170).

It is impossible to do justice to the 20th-century 'science of touch' on only one page, but this is enough to show that psychophysical research focused on 'passive touch', i.e. the application of external stimuli to the skin, and that it neglected 'active touch', i.e. explorations of tactile perception through movements of the sense organ skin itself. David Katz (1884–1954), a 'psychological phenomenologist', is generally held responsible for stressing the importance of

active touch: "Movement is as indispensible to touch as light is to vision" (Krueger, 1982, p. 8).[p] Katz (cited in Krueger, 1982, p. 2) declared that he was "more concerned with perceptual contents than with the functions through which we apprehend them". He deplored the atomism of the science of passive touch, interested only in identifying receptors for specific stimuli, and emphasised the need to explore more complex phenomena of tactile perception; this led him to investigate the interrelations between different senses and the perceptions they yielded. He pointed out that by moving the hand stimulation was elicited rather than imposed and that movement brought other qualities of tactile perception into play: he was the first to postulate that the skin had a sense modality for vibration separate from that for pressure (the Pacinian corpuscles were only later identified as vibration receptors). The pressure sense established the presence of a surface, but the vibration sense determined its properties.

With Finger-tips on Ducts: 'Active Touch'

It is noteworthy that modern research on touch paid little attention to vibration and that the recognition of its importance came only with David Katz and his emphasis on active touch. Vibration is, however, an aspect of touch in which people in pre-modern societies took great interest.[q] Chinese Pulse diagnostics, which is directed towards identifying different properties of the surface of the patient's wrist, primarily informs us about perceptions made with the vibration sense.

The translation of the "Secret of the Pulse" in Du Halde advised the physician to engage in vertical rather than horizontal motion, by pressing with three different strengths onto the "Ducts". Considering that earlier works on Chinese Pulse diagnostics had encouraged the doctor to move his hand with a horizontal motion over the skin (*Shiji*, p. 105, case 19, uses the word *xun*, to stroke, to describe this motion; see also *Suwen*, p. 18), it is possible that differences in the pressure and vibration that a doctor could feel at the wrist were eventually viewed as more informative than differences in the texture of the skin. The horizontal active touch had informed the Chinese physicians about variables like the skin's warmth, humidity, or hairiness which can vary considerably with individual constitution and ephemeral circumstance and are therefore, from a biomedical viewpoint, not always to be taken as reliable signs of the patient's illness condition.[r] The vertical active touch, by contrast, detected the motions of the "Ducts" at the wrist. Although the Chinese physicians did not conceive of the body in biomedical terms, the movements of the "Ducts" that they sensed at the wrist may well have coincided with those in the biomedical arteries. From an empiricist viewpoint, one may therefore postulate that over time the differences in heart beat and pulsation were considered to provide more relevant information about the patient's disposition of health and illness than the variables of skin texture, and that therefore Chinese physicians were told to focus on the perceptions made by a vertical rather than a horizontal active touch.[s]

Among Chinese physicians, tactile perception was geared not only towards

identifying the frequency of pulsations—though its importance in Chinese Pulse diagnostics cannot be overstated (see above quote from p. 191). Rather, they were interested in an integrated assessment of the Pulses by examining the properties or qualities of "Pulse" or "Vessel movements" (*maidong*), the term used in the *Classic of Difficult Issues* (*Nanjing*; Unschuld, 1986), or by identifying their individual appearances, as the current wording "Pulse images" (*maixiang*) would suggest (*TCM Diagnostics*; Deng Tietao, 1984, p. 72). In contrast to Western physiologists interested in the psychophysics of passive touch, who until recently conceived of touch as a composite of separate modalities of sensation for which they have found separate anatomical structures, Chinese physicians aimed at an integrative assessment of their tactile experiences. An example of the ingenious ways of accounting for them will be given in Part II of this paper, which will discuss four modes of representing the tactile perception of the "Seven Chinese Pulses indicating Danger of Death" (see forthcoming December issue, Vol. 7, No. 3).

Discussion

Given that touch consists of a partial melding of subject and object, tactile experience is difficult to describe. Tactile experiences would therefore seem quite unsuitable to establishing a descriptive science. Indeed, Siddha pulse diagnostics exploits precisely the mutual involvement of subject and object in touch, which allows the skilled doctor to merge with the patient to the extent that he experiences the patient's internal disposition. However, Chinese physicians intended to objectify the tactile perceptions of Pulse taking to a common standard, and they provided descriptions of generally discernible Pulse movements. Simultaneously they formulated rules in account of the difficulties in obtaining such standard Pulse movements. From an outsider's viewpoint it looks as though they spoke of the necessity to 'calibrate' the physician.

According to Du Halde's understanding of Chinese Pulse diagnostics, the motions that a doctor would sense at the wrist were those of the internal "Springs of Life" themselves; they were not outward signs of an inward disposition in the same way as, for instance, the different hues of a patient's "Complexion". Signs, in Peirce's sense, can be quite unrelated to the correlate of the sign; they depend on convention, as for instance the convention that relates the Complexion–Colours of the "Five Phases" to conditions of the internal "Springs of Life". The tactile perception of different movements in the "Ducts" was, in Du Halde's rendering of Chinese medical doctrine, considered to permit a far more direct access to the internal states of the body. Regardless of whether or not Du Halde may have imputed a Galenic understanding of the Pulses into Chinese Pulse diagnostics, he simultaneously highlighted peculiarities of tactile experience.

Chinese physicians, with finger-tips on "Ducts", were trying to detect motion—they engaged in 'active touch' by applying different degrees of pressure to the skin's surface. While much of the 'science of touch' of modern psycho-

physics conceives tactile perception as a composite of sensations evoked through stimulation of specific structures in the skin, the 'science of touch' of Chinese Pulse diagnostics was interested primarily in recurrent patterns of motion detected by touch. It notably has affinity with the phenomenologist approach to touch, which speaks of 'tactile perception' in terms of an integrated 'tactile experience'. By postulating that there are movements of Pulses, Chinese Pulse diagnostics aimed at providing an integrative assessment of a doctor's experience of touch.

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Notes

(a) The relation between objectivity and subjectivity is at the centre of Merleau-Ponty's writings. Objectification is seen as a process of increasing the distance between the perceiving subject (which is always embodied) and the world. On touch, see pp. 315–317.

(b) This chapter on Chinese medicine comprises also extracts from the *Pen tsau kang mu* ([Hierarchically] Classified Materia Medica) (1596) and other *materia medica* (pp. 207–236) and a discussion of "*Chan seng*: Or, The Art of procuring Health and Long Life" (pp. 236, 229–235). See Du Halde (1741), Vol. II, pp. 183–236 and 229–235 [erroneous page numbering].

(c) In citations the spelling, with all its inconsistencies, is rendered as given in the original; throughout this paper capital letters have been used to refer to specific Chinese medical concepts; the 'Pulse' that the Chinese doctor perceives is not the same as the 'pulse' that a Galenic, scholastic, or biomedical doctor takes.

(d) See Lu and Needham (1980, pp. 35–36), their cross-references to various volumes of *Science and Civilisation in China*, and Terzioglu (1978). See also the summary of current research in progress by Zhu Ming and Felix Klein-Franke, IASTAM Newsletter 1998: Avicenna apparently also included items of Chinese *materia medica* in his writings.

(e) Du Halde attributes it to Wang shu ho whom the translator P. Hervieu, "an ancient Missionary in China" (p. 184), presents wrongly as having "lived under Tsin shi whang" and as "the most antient Author on this Subject" (p. 196): Qin shi huang di ruled the Chinese empire, after having unified it, between 221 and 207 BC and Wang Shuhe lived in the 3rd century AD. The translated treatise, known as *Wang Shuhe Maijue*, was not composed by him but is attributed to a certain Gao Yangsheng (10th century) (Li Shizhen [1564] 1956, p. 140) and considered one of the many versions of the *Maijue* (Rhymed Pulse [Lore or Canon]) that were then in circulation (Lu & Needham, 1980, p. 277) but have now lost in significance. Its contents do have affinity with Wang Shuhe's *Pulse Canon* (Maijing) (3rd century AD) and also with the *Canon of Difficult Issues* (Nanjing) (2nd century AD), but some of its contents cannot be traced to either of these two classics of Chinese medical doctrine.

(f) When Du Halde stresses aspects of Chinese medicine not emphasised elsewhere to the same degree, footnotes have been added.

(g) Du Halde here appears to allude to a combination of an Aristotelian and a Galenic rather

than a Chinese viewpoint. According to Aristotle, "Animals had senses; but the distinctive characteristic of humans was the faculty of reason" (Synnott, 1991, p. 62); and according to Galen, the central organ of perception (and mental activities) was not the heart, but the brain (Siegel, 1970, p. 175). See also Lloyd, 1996, pp. 126–137.

(h) In general, however, tongue diagnostics are considered to be based on visual perception—Cleyer's (1682) *Specimen medicinae sinicae*, Part 6, contains a systematic account of it.

(i) Du Halde's terms "radical Moisture" and "vital Heat" are again reminiscent of Aristotelian natural philosophy: "Aristotle rated the heart as the hottest region of the body, harboring the vital fire, while the cool elements, earth and water, prevailed peripherally" (Siegel, 1970, p. 175). The "Canals" refer to the Chinese term *mai* or *jingluo*.

(j) Notice that Du Halde (p. 183) speaks of "Air" instead of "Wood"; his understanding of the Five Phases is clearly tainted by the Aristotelean understanding of Elements.

(k) Kuriyama (1986, 1999) has repeatedly contrasted this Galenic definition of pulses (linked to anatomical knowledge) with the Chinese conception of Pulses.

(l) It is, for instance, specifically used in medicine and does not have as evident politico-philosophical implications.

(m) Daniel also discusses the biomedical notions of the objective 'sign' (as perceived by the doctor) that is opposed to the subjective 'symptom' (as communicated by the patient) and points to flaws in-built to them.

(n) Calibration is a problem central to experimental science; see for instance Shapin and Schaffer (1985, p. 244ff.).

(o) Psychophysics of this kind may explain the use of tactile perception in pre-modern medicines. In Galenic medicine, for instance, touch was used in three ways: "in taking the pulse, taking the temperature, and in palpating the body" (Nutton, 1993, p. 11). In respect to "taking the pulse" (and to a certain extent also "palpating the body"), the finger-tips were important, and we note that those stand out for their slow adaptation to continuous stimulation or, in other words, their high sensitivity that persists over time (see Greenspan & Bolanowski, 1996, p. 34). The temperature tended to be taken with the palm, which was said to be the "best-tempered", and hence the best measuring rod to evaluate temperature (Nutton, 1993, p. 13). Psychophysics confirms that the palm rather than the back of the hand is highly temperature sensitive (e.g. Ross & Murray, 1996, p. 119).

(p) E.H. Weber's first postulate in his summary of *De Tactu* reveals awareness of the importance of 'active touch' when he said that "Tactile acuity depends partly on the structure of the organ and partly on movements of the organ made deliberately and consciously" (Ross & Murray, 1996, p. 106), but his experiments did not explore it.

(q) Classen (1997) has emphasised this repeatedly, though it is misleading to say that the Hopi emphasise "the sensation of vibration". The Hopi make a linguistically encoded distinction between punctual events and the repetition of the same event: for instance, *yo'ko* (he gives one nod of the head) is distinguished from *yoko'kota* (he is nodding), and Whorf comments that "The Hopi actually have a language better equipped to deal with … vibratile phenomena than is our latest scientific terminology" (Whorf, 1956, p. 55). Whorf speaks of "vibratile phenomena" in a metaphorical way, and from an outsider's point of view.

(r) In China, the temperature of the patient is now indirectly established, for instance, through Pulse patterns marked by high-frequency pulsation (Deng Tietao, 1984, p. 72). Terzioglu (1978, p. 79), in contrast, contains a plate from Persia which shows that the temperature was taken by laying the palm onto the patient's front.

(s) Along such lines of argumentation, the empiricist can explain why biomedicine, Galenic medicine, and 17th-century Chinese medicine all converge in their method of taking the pulse by means of applying vertical active touch to Ducts (in Chinese medicine) or arteries (in the biomedical and Galenic sense): the heartbeat and pulsation that are thereby detected may indeed contain empirically valid information about the patient's condition, more than many other signs that can be obtained from a non-invasive examination. Why all three traditions converge in detecting heartbeat and pulsation at the wrist may, however, depend on other factors.

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