

ENKINAESTHESIA: THE FUNDAMENTAL CHALLENGE FOR MACHINE CONSCIOUSNESS

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In this short paper I will introduce an idea which, I will argue, presents a fundamental additional challenge to the machine consciousness community. The idea takes the questions surrounding phenomenology, qualia and phenomenality one step further into the realm of intersubjectivity but with a twist, and the twist is this: that an agent's intersubjective experience is deeply felt and necessarily co-affective; it is *enkinaesthetic*, and only through enkinaesthetic awareness can we establish the affective enfolding which enables first the perturbation, and then the balance and counter-balance, the attunement and co-ordination of whole-body interaction through reciprocal adaptation.

Keywords: Enkinaesthesia; phenomenology; qualia; phenomenality.

1. Introduction

The field of machine consciousness is as vibrant as ever,¹ continuing to address crucial and thorny issues like synthetic phenomenology [Chrisley and Parthemore, 2007; Chrisley, 2009], phenomenal consciousness [Boltuc, 2009; Gamez, 2009], qualia and conscious machines [Haikonen, 2009; Ramamurthy and Franklin, 2009], emotions [Haikonen, 2003; Vallverdú and Casacuberta, 2008; Takanishi, 2009] and imagination and memory [Holland and Marques, 2010].² But there is one issue which it has not yet encountered or considered and the challenge it presents is fundamental. I imagine that it will be a challenge that current theorists feel they are, in some way, already addressing or to which they think an answer will be forthcoming as a result of the satisfaction of the phenomenology, qualia, and emotions problems. My sense is that this would be to seriously misconstrue the essentially co-affective dialogical

¹It is possibly much more vibrant with the launch in June 2009 of the *International Journal of Machine Consciousness*, edited by Antonio Chella and published by World Scientific.

²This area also includes Cotterill [1995; 1998], Aleksander and Dumall [2003], Sloman [2004, 2005], Aleksander [2005], Holland and Knight [2006], and Chella and Manzotti [2007] amongst a great many more.

nature of conscious experience, and to underestimate the magnitude and nature of relational felt experience.

In one sense the point that I will be making is very simple: it is that agential bodies are co-affective sensory-kinaesthetic systems which spill out into the world and into the lives of others. It is essential that we understand this spilling out in relation to an agent's conscious engagement with its world, but with our assumptions about bodies and boundaries this spilling out may at first seem counter-intuitive. Our natural assumption is to see the boundary of the body as the limit of our experiential world, but it is precisely the breach of this boundary that provides us with the possibility of experience in the first place; the skin, over-run with an abundance of receptors — sixty kilometres of nerve fibers, fifteen kilometres of veins, with millions of sense receptors for pain, temperature, pressure and touch — opens us up to the world and discloses it through our inescapable engagement with it [Hoffmeyer, 2008], and the skin is supplemented by the plenitude of visual, proprioceptive, kinaesthetic, auditory, gustatory, and olfactory senses which open us up in their own way, are affected by change or motion within our world and which, with internal feedback, can bring about affective change within themselves.

Embodiment may be a nomological condition for agency [Dobbyn and Stuart, 2003] but it is the agent's capacity to spill over into the bodily experience of others and *vice versa*, which establishes the community and reciprocity of felt co-engagement, and it is this felt co-engagement which is fleshed out in the expressive, meaningful and cognitive bodily dynamics which are, in themselves, the necessary precursor to effective affective social, cultural and linguistic communication in the human agent.

I will adopt the use of the neologism “enkinaesthesia” to refer to the reciprocal affective neuro-muscular dynamical flows and muscle tensions that are felt and enfolded between co-participating human (and, no doubt, animal) agents in dialogical relation with one another. Enkinaesthesia, like intersubjectivity and intercorporeality relates to notions of affect, but in this case it is with the affect we have on the neuro-muscular dynamical flow and muscle tension of the other, including other animals, through our direct and our indirect touch. Direct touch includes the physical touch of a caress, a pat on the back, a hug, or the rebuff of the shrugged pulling away from contact. Indirect touch can be achieved through a look³ where one becomes the object of someone else's subjective attention and experience, for example, in an unspoken admonishment, a papal blessing which can shrive you of your sins, a friend's wave from a departing train, or in the way words and language, as biodynamical engines,⁴ can alter the way we feel.⁵

³For an interesting elaboration of how we can be affected by the look of another read Chap. — 1 of Part 3 of *Being and Nothingness* by Sartre.

⁴That spoken words and language can act as “biodynamical engines” is Paul J. Thibault's phrasing. [Personal correspondence.]

⁵Direct touch may be straightforward to describe but experientially it is as vast and variable in effect and affect as indirect touch; one reason has to do with surfaces, boundaries, and borders, and what we perceive to be the limit of the bodily “self”.

2. The Feeling and Sensing Body

The feeling and sensing body has gained prominence in discussions of consciousness and experience in recent years,⁶ including the work of Damasio [1994; 1999; 2003], Edelman [1992; 2006], Ziemke [2003, 2007a, b], Sheets-Johnstone [1999; 2000; 2003] and, of course, a wealth of robotics work⁷ and, whilst I am generally sympathetic with these theories, they remain predominantly individual-centered and only minimally-activist in character. Noë's view [2004; 2009] comes closest to my own, moving away, though not entirely, from the self-centred view, though he remains a little shy of the full commitment I want to make to the enkinaesthetic reciprocal affective neuro-muscular dynamical flow that is felt between agents in dialogical relation with one another.⁸ Noë writes:

“The locus of consciousness is the dynamic life of the whole, environmentally plugged-in person or animal. Indeed, it is only when we take up this holistic perspective on the active life of the person or animal that we can begin to make sense of the brain’s contribution to conscious experience.

...Human experience is a dance that unfolds in the world and with others. You are not your brain. We are not locked up in a prison of our own ideas and sensations. The phenomenon of consciousness, like that of life itself, is a world-involving dynamic process.” [Noë, 2009, p. xiii]

The moving, feeling, perceiving body is at the core of lived experience. But a non-relationally-situated sensory-kinaesthetics with little consideration of the affectively-laden interpersonal and interobjective world in which the agent finds itself will provide only a partial account of the experiential whole. Noë is right: the agent must be conceived from a holistic perspective, but the essential nature of the organism is not simply its kinaesthetic⁹ unfolding “in the world and with others”; the holistic perspective must embrace the agent not simply as a being *in* the world but as, and always as, a being *with* the world, folding into, enfolding with, and unfolding from those other agents and things with which it co-exists *in utero* to the point at which we depart this life.¹⁰ Ratcliffe [2008] speaks of this experiential entanglement as phenomenologically primitive:

“World-experience is not distinct from how one’s body feels; the two are utterly inextricable. The experiential entanglement of body and world is

⁶For a nice summary of embodied cognition work, though with a little too much emphasis on language for my own taste, see Borghi and Cimatti [2010].

⁷This is just too numerous to mention but a good place to start would be Rodney Brooks’ work and, in particular, 1991a, 1991b and 1991c.

⁸By “dialogical” I mean only the interactivity of agents and not textual, linguistic, or conversational activity.

⁹From here on “sensory-kinaesthetics” will be encompassed in the term “kinaesthetic”.

¹⁰For a commentary and discussion of enactive *in utero* development, see Wood and Stuart [2009]. For a detailed discussion of pre-natal affective exploration see, for example, Piontelli [1992] and Trevarthen and Reddy [2007].

more phenomenologically primitive than experience of either in isolation from the other." [Ratcliffe, 2008, p. 1]

Lived experience is, first and foremost, enkinaesthetic.

3. Kinaesthesia and the Primacy of Movement

So let us lay out the stall.

The cognitivist view of the mind, that presents the mind as symbolic, representational, and reducible to a set of physical states and processes that are fully-explicable through scientific experiment and analysis, has been the predominant explanation for the mind in the second half of the 20th century. At heart it is individual-centered¹¹ and utilizes a substance-state ontology that treats temporality and spatiality as uniform, linear, and regular, consisting of discrete or punctuated events, points, objects, and places. On top of this it maintains the Enlightenment ideal of systematization — carving nature at its joints.¹²

Enactivism, on the other hand, emphasizes the agent's situation and embodiment in terms of its active, ongoing, processual, non-symbolic, non-representationally-based engagement in its world. It is essentially anti-dualistic, but unlike cognitivism's inclination towards a monist materialism, the enactivist ontological commitments are rather more complicated. The agent is embodied and dynamically-coupled to the world of other agents and things; thus, agent, world and action are necessarily intricately interwoven, and the agent's body, experience, action, and world together shape the way in which she deals with her everyday pragmatic concerns. Under this conception mind and world are inseparable, and it is embodied affective practice, rather than cognitive deliberation, that is the hallmark of the agent's engagement with her world.¹³ With only a slight modification enactivism embraces

¹¹Clark provides the starkest example of an individual-centered cognitive approach in his Hypothesis of Organism-Centered Cognition (HOC): "Human cognitive processing (sometimes) literally extends into the environment surrounding the organism. But the organism (and within the organism, the brain/CNS) remains the core and currently the most active element. Cognition is organism-centered even when it is not organism bound." [Clark, 2008, p. 139].

¹²Possibly a phrase originating in Plato's *Phaedrus* 265d–266a.

¹³It is at precisely this point that the "But you cannot tell that we are not just brains-in-vats, that we only seem to be embodied" objections begin to pour in. In an earlier paper I and my co-author even defended the brain-in-a-vat hypothesis: "Now it is easy to construct a thought experiment in which a brain is disembodied in some nutrient bath and its afferent neural channels, sensory and proprioceptive, are given appropriate analogue stimuli, the process being controlled by a computer model of a 3D world. More elaborately, impulses across the efferent actuating channel could be intercepted and fed into the computer model, feeding back into altered stimulation of the afferent channels to denote movement within, or change to, the world. To all intents and purposes, the unfortunate brain has a body — there is no way that the brain could tell it had not — but this body is not extended in physical space, only in virtual space." [Dobbyn and Stuart, 2003, pp. 195–196], but we were mistaken to do so. As Mejsing [2006] demonstrates we assumed that the neural signals could do everything, not just sending the electrochemical messages along the nerve pathways but also somehow dealing with — in fact ignoring — the humoral signals, chemical messages that are sent by the bloodstream. Given the emphasis placed on the sensory system, the body, kinaesthesia, proprioception, and enkinaesthesia, in this present article, it would be foolish to overlook the crucial role of both types of message and the "body loop" which alters the "body landscape"

enkinaesthesia; the focal point moves from the agent and their individual agency to the necessity of our being co-agential in a co-dynamically continuous, affectively-laden intersubjective and enkinaesthetic processual horizon of experience. “By a ‘way of finding oneself in the world’” Radcliffe says: “I mean a sense of the reality of self and of world, which is inextricable from a changeable *feeling* of relatedness between body and world.” [Radcliffe, 2008, p. 2]

Thus it is that feeling bodies and things together in a dialogue of community and reciprocity with other feeling bodies and things play an integral role in full-bodied pre-linguistic sense-making relations.

“Babies in the womb...send and receive messages without benefit of the words, syllables, and phrases that begin appearing in a year or two after birth. Their daily experiences of communication are punctuated by self-initiated and reactive movements which express needs, interests, and feelings. ...Based on the early development of the senses in the womb, a fetus remains in constant dialog with the surrounding environment.”
[Chamberlain, 1995]

So, the genesis of this activity begins *in utero* and is necessarily co-agential, mother with pre-nate, occasionally mother with two or more pre-nates, and pre-nates with their bodies and the surrounding amniotic environment and beyond. “The maternal womb is an optimal, stimulating, interactive environment for human development. Activity never ceases and a fetus is never isolated,” and Chamberlain adds:

“Between week six and ten, fetal bodies burst into motion, achieving graceful, stretching, and rotational movements of the head, arms and legs. Hand to head, hand to face, hand to mouth movements, mouth opening, closing, and swallowing are all present at ten weeks [Tajani and Ianniruberto, 1990]. By fourteen weeks, the complete repertoire of fetal movements seen throughout gestation are already in evidence [deVries et al., 1985]. Movement is spontaneous, endogenous, and typically cycles between activity and rest. Breathing movements and jaw movements have begun. Hands are busy interacting with other parts of the body and with the umbilical cord.”

[Damasio, 1999, p. 54]. Additionally Cosmelli and Thompson [forthcoming, 2011] argue that we think carefully about the biology of consciousness and what realizes subjective experience and, having done so, they conclude that “Any vat capable of performing the necessary functions will have to be a surrogate body that both regulates and is regulated by the nervous system. In other words, the vat will have to exhibit a level of complexity at least as high as that of a living body with respect to bodily systems of life-regulation and sensorimotor coupling. Thus the entire system (vat plus brain) must satisfy these two basic requirements: (i) it must be energetically open and able to actively regulate the flow of matter and energy through it so as to control its own external boundary conditions (life-regulation); and (ii) it must be capable of actively regulating its own sensorimotor interactions with the outside world (sensorimotor agency). In short, the entire system must amount to a biologically autonomous, sensorimotor agent.” [pp. 28–29].

From this early stage onward, movement is a primary activity, sometimes begun spontaneously, sometimes provoked by events. Spontaneous movement occurs earliest, probably expressing purely individual interests and needs. Evoked movement reflects sensitivity to the environment. For example, between ten and fifteen weeks g.a., when a mother laughs or coughs, her fetus moves within seconds.” [Chamberlain, 1997]

Our sensed and felt co-agency begins as soon as movement starts for this movement incorporates the sensations of touch, temperature, pain, hearing, balance and orientation, chemosensors of smell and taste, mouthing, and sucking and licking which are used to explore texture, hardness, and contours of objects, and, of course, the pre-nate’s own body and, in the case of twins, the other’s body too. Neither mouthing nor sucking and licking in this context are involved with eating and nutrition, rather they are, as are the others, affective dialogical means of exploration. The greatest advantage afforded the burgeoning agent is to feel as it moves and to move as it feels.¹⁴

As Haikonen [2009] says about the post-natal agent, though he could just as well be speaking pre-natally¹⁵:

“Perception is an active inspection and exploration process that involves physical adjustments of the senses like eye and head motions and hand motions (touch). These motions result in accompanying kinesthetic information about body part positions and motions.” [p. 230]

And I have, up until very recently, said much the same thing:

“The sense of both an inner ‘egocentric’ space [Brewer, 1992] and an affective depiction — the sensation of being ‘out-there’ [Aleksander and Dunmall, 2003] — is formed through the rich interplay of the body’s sensory channels that receive information about the environment,¹⁶ its actuating system that enables manipulation of that environment, and its proprioceptive mechanisms which make it possible to sense the position, location, orientation and movement of the body and its parts.” [Stuart, 2010a]

¹⁴It would certainly not be inconsistent at this stage to say that the enkinaesthetic action of the pre-natal infant, which establishes its “changeable feeling of relatedness” to its world, is the underpinning for later post-natal mirror activity, especially with regard to the third of the somatosensory neurons and the somatosensory proportion of the bimodal (visual as well) neurons occurring in the rostral part of the inferior parietal lobule. There certainly seems to be a strong case for saying that the affectivity of related feeling is ontogenetically prior to the affectivity of related seeing, that is, visual mirroring, see Gallese *et al.* [2002] and Rizzolatti and Craighero [2004].

¹⁵Although “All of the sensory systems, except vision, need outside or exogenous stimulation as part of development *in utero*. The human visual system needs synchronous waves of retinal ganglion cell firing *in utero* but does not need light or vision.” [Graven and Browne, 2008, p. 171], there is good evidence of a pre-natal sensitivity to light: “The fetus can see at the end of the seventh month, and it reacts to changes in lighting and can follow a flashing light” [Kenner, 2007, p. 228].

¹⁶The concept of “environment” is used thickly to refer to the system’s world and its own variable internal states that are the subject of homeostatic functions.

But Haikonen is too reserved about the felt nature of the “kinaesthetic information”, probably wisely given the current lack of any real machine phenomenology, and both he and I omit to mention the enkinaesthetic phenomenology of the agent with their world, and it is this which makes the kinaesthetic information salient in the first place. It is only through enkinaesthetic awareness that the agent can establish the reciprocal affective enfolding required for the timely response and adaptation it needs to survive.

Thus, more recently I have written that:

“We are deeply and naturally kinaesthetic and enkinaesthetic, aware of our bodily movement and our action in the world, but also able to affect others and be affected by them, moving and being moved [Bråten, 2007] within a reciprocal affective neuro-muscular dynamical temporal flow. The way in which these felt somatosensory relations fold and unfold — by bringing forth our world through our kinaesthetic imagination and associated somatosensory expectations — together influences how we will shape and adapt our world, how we will then adapt to those changes, and so on.” [Stuart, 2009, pp. 179–180]

In agent-directed action, whether it is taking a step forward, reaching out tentatively with a hand, or gazing out over the landscape, we are continually, as part of our experiential horizon, asking tacit, non-propositionalized questions about our world and our being with and within it [Cotterill, 1995; 1998].

The feeling of being is, by its nature, a feeling of being *with*.

“We inhabit the other’s activity, for that is how we learn, how we become enculturated, and how we develop our sensory and kinaesthetic and enkinaesthetic imagination that enables us to anticipate what the other might do. It is a process that begins with synrhythmic regulation¹⁷ coupling the ‘volitional and experiential functions of the minds of infant and mother through sympathetic response of their brains to the anatomical forms and dynamics of movement in structures of their body’. [Trevarthen et al., 2006, p. 107]. Thus, the givenness of the infant’s own experience is never in isolation from the givenness of the Other. Enkinaesthetically we experience the feeling of presence of the Other (agential and non-agential alike) alongside the anticipated intentional arc of the Other’s action and movement.” [Stuart, 2011]

Thus, the capacity for enkinaesthetic dialogue is an *a priori* nomological condition for agency and, through the creation of kinaesthetic memories, melodies and

¹⁷ “Synrhythmia” can be defined as the reciprocal co-regulation of well-being or experience. “In each environment the vitality of the child is dependent on regulations across a succession of ‘frontiers’ with the human world, first physiological or **amphoteronomic**, then by the special direct psychological communications which we define as **synrhythmic**, and finally by sharing symbolic awareness of culture and language.” [Trevarthen et al., 2006, p. 69]

imagination [Stuart, 2007; 2010a], the generation of a felt anticipatory dynamics, making possible the effective engagement with object- and movement-dependent sensorimotor contingencies [Noë, 2004]. In our intersubjective openness we do not just possess a transcendental intersubjectivity [Zahavi, 1997], we possess a transcendental enkinaesthesia.

4. Enkinaesthesia

The enkinaesthetic dialogue is rarely, if ever, simply two, though with the influence that language has had on our thinking we do tend to characterize it in this way. We exist within an ongoing processual dialogue from our earliest moments *in utero* to the time in which we cease to feel, and at that point others do not cease to feel, that is, be enkinaesthetically linked with us. This is part of a universal dialogue that consists of an innumerable web of relations of community and reciprocity of sensing and experiencing agents and things, existing in their felt, intentional co-agency. It is this which co-constitutes conscious relations and the experientially recursive temporal dynamics of the non-symbolic, non-representationally-based, pre-conceptual experiential horizon for all agents.

“The organism does not develop in isolation from what happens around it; it is literally created (hence poien) by nature, while at the same time modifying both nature and itself. In this respect, autopoiesis more accurately describes what in the phenomenological structure of Paarung is generally presented as an experiential circularity, because the former stresses that the autonomy of the living [being] is the very result of its contextual dependence.” [Depraz, 2008, p. 240]

Enkinaesthesia may emphasize the neuro-muscular dynamics of the agent, the givenness¹⁸ [Henry, 1963] of its experience, but it also emphasizes the entwined, blended and situated co-affective phenomenological structure of *Paarung*. Unlike the circularity of *Paarung*, enkinaesthetic activity has a recursive dynamics, and it is these experientially recursive temporal dynamics that lead to the formation and maintenance of integral enkinaesthetic structures and melodies. Such deeply felt enkinaesthetic melodies emphasize the dialogical nature of the feeling of being as the feeling of being-with or being-among, and demonstrate the paucity of individuating notions that treat agents as singular.

“If one wants to speak of a commitment to the alive consciousness of others here, one should speak not of a cognitive commitment but, rather, of a practical commitment. Like the baby in relation to her mother, we are

¹⁸We might understand self-givenness in terms of Husserl’s concept of “eidetic intuition”: the direct givenness which “refers to the acts in which ‘objects show up in person’” [Depraz *et al.*, 2003, p. 45] and which primarily reveals itself as a perceptual and imaginative act concerned with disclosing an essence [*ibid.*, p. 55]. Self-givenness is concerned with the revelation of the tight experiential coupling between body and ownership of the experience.

involved with each other. It is our joint cohabitation that secures our living consciousness for each other. We live and work together.” [Noë, 2009, p. 33]

It is certainly our “cohabitation”, our being in affective relations of community and reciprocity, that secures our living consciousness for one another, and the pragmatics of the commitment, of the living and working together, are in a strong sense to do with survival. Describing it as a “practical commitment” emphasizes the bodily, kinaesthetic affective tonalities that underpin and make possible the proto-modal in relationships, what Gendlin calls the “implicit interactional bodily intricacy”.

“There is an implicit interactional bodily intricacy that is first — and still with us now. It is not the body of perception that is elaborated by language, rather it is the body of interactional living in its environment. Language elaborates how the body implies its situation and its next behavior. We sense our bodies not as elaborated perceptions but as the body sense of our situations, the interactional whole-body by which we orient and know what we are doing.” [Gendlin, 1992, p. 353]

Noë and Gendlin present compelling arguments, but their stated positions lack the reciprocal co-affectivity of these feeling states in the interactional dialogue. Such co-affectivity is characterized by being inherently intentional, which is to say that being-with and being-among is necessarily relational and comes already clothed in “aboutness”. The “knowing”, referred to by Gendlin, occurs through the enkinaesthetic affective enfolding which enables the balance and counter-balance, the attunement and co-ordination of whole-body action through mutual reciprocal adaptation. It is this that Maturana refers to as “languaging”, communication which is fleshed out in the expressive, meaningful and cognitive bodily dynamics.

At this stage we should begin to think about the implications of enkinaesthetic affective enfolding for the machine consciousness community.

Aleksander and Dunmall’s “depiction”, one axiom in a set of five¹⁹ that are together necessary for an agent “A to be conscious of its sensorily-accessible world S”, is said to present perceptual states that depict parts of S for A such that the agent has a context, an “out-there” which can be utilized in planning when and how the agent should act [Aleksander and Dunmall, 2003]. A natural agent’s transcendental

¹⁹Axiom 1 (Depiction):

A has perceptual states that depict parts of S.

Axiom 2 (Imagination):

A has internal imaginal states that recall parts of S or fabricate S-like sensations.

Axiom 3 (Attention):

A is capable of selecting which parts of S to depict or what to imagine.

Axiom 4 (Planning):

A has means of control over imaginal state sequences to plan actions.

Axiom 5 (Emotion):

A has additional affective states that evaluate planned actions and determine the ensuing action.

enkinaesthesia makes a sense of both being with and being “out-there” a given in experience, for it is only through the touching and being touched, the experiential folding, enfolding, and unfolding that we sense our separateness but also our inseparability from our world. It is only through our enkinaesthetic being-with that we recognize our necessary co-agency with other agents and things within our world. This is the pre-noetic, pre-modal “knowing” to which Gendlin refers, the natural sense of our joint cohabitation according to Noë, and what Aleksander and Dunmall call the “having a private sense: of an ‘out-there’ world” [*ibid.* p. 8]. But Aleksander and Dunmall admit that neither depiction alone, nor together with the other four axioms is sufficient for the artificial agent’s being conscious of or having that private sense of an “out-there” world.²⁰ In fact, with the exception of the fabrication of S-like sensations and the claim that “A has additional affective states”, there is little in the set of axioms that specifies affect, and nothing which underlines the necessity of the continuous affective community and reciprocity that characterizes natural agential experience.

Furthermore their notion of the fabrication of S-like sensations suffers from being underdetermined. An S-like sensation certainly sounds reasonable, but their notion of “sensation” is far from transparent, as is the nature of the “additional affective states”, specified in Axiom 5, or how they come about. One would imagine that a sensation must be qualitatively phenomenal, that is, possessing some kind of raw sensory feel, but what then is the mechanism that simulates the action of a biological organism’s sense-receptors and how are humoral signals (chemical messages conveyed via the bloodstream in natural agents) to be embodied and transported; in short, how is the sensation to be generated? If the skin alone has sixty kilometres of nerve fibers, fifteen kilometres of veins, with millions of sense receptors for pain, temperature, pressure and touch, and, we accept for the moment that, the perceptual states that depict parts of a sensorily-accessible world are only through the biomechanisms of touch, the fabrication of S-like sensations is already going to be massively complicated, and this is without the additional intricacies of hemo-chemical exchange. And then, of course, it is important to remember that rarely are any agents unimodal, that is, operating with a single sense modality. Even a bat operating with — its oft emphasized — auditory echolocation is also making full use of its proprioceptive, kinaesthetic, and haptic senses.²¹

According to Haikonen: “True conscious machines must have qualia, but the qualities of machine qualia need not be similar to the qualities of human qualia.” [Haikonen, 2009, p. 225]. There seems little reason to disagree with this particular claim because it may be that proof one way or the other will always evade our grasp,

²⁰For further discussion of the elusive factor F see p. 15 and following in Aleksander and Dunmall [2003].

²¹The haptic sense in bats is concentrated in the membranous areas of their wings. The touch-sensitive receptors on their wings contain Merkel cells (common in most mammals including humans) with, and this is peculiar to bats, a protruding central hair which is sensitive to subtle changes in wind speed and direction. [Zook, 2005]

but he does offer some guidelines for what could constitute some minimum requirements for machines with qualia:

- In order to facilitate qualia, do not make the system perceive via secondary symbols. Secondary symbols may be used in higher stages of cognitive processing.
- Use direct and transparent perception systems and integrate sensory and motor modalities seamlessly.
- Make the system inspect the world via explorative acts and let the products of the perception system and system reactions reflect the results of this inspection. [Haikonen, 2009, p. 232]

These guidelines fit well with the pre- and post-natal non-propositionalized plenivalent exploration engaged in by a living agent but, as Haikonen himself says: “Unfortunately...this does not explain why and how exactly the feeling of...qualia can arise.” [Haikonen, 2009, p. 229]. And this is the rub. It is fine to use the words “qualia” and “sensation” in this context, but we do need to know how the feeling of qualia arise for the development of machine consciousness, for without qualia the nomological condition for deeply felt co-agency, the reciprocal affective neuromuscular dynamical flows and muscle tensions that are felt and enfolded between co-participating agents in dialogical relation with one another, cannot be met. Without qualia there can be no phenomenologically primitive enkinaesthetic experiential entanglement, that is, no co-agency, and with no co-agency, there can be no conscious agency.²² An agent’s felt-subjectivity depends on felt-intersubjectivity and felt-interobjectivity,²³ that is, the agent’s felt-subjectivity depends on its enkinaesthetic dialogue with objects and other agents with which and with whom it is in a topologically complex web of dynamical, processually affective, intentional and evaluative relations of community and reciprocity.

Chrisley [2009] moves enticingly in the direction of a solution to the problem when he analyzes ways in which we might specify the contents of consciousness and, in doing so, presents a means of developing a synthetic phenomenology. He observes that the term “content” is used variously in the literature to refer to conceptual content of a propositional kind, for example, “Bob believes that snow is white” and “Mary is having a visual experience of a red bike leaning against a white fence”, and to non-conceptual, non-propositional, perceptual content. But there is a further use that is not made explicit in the article, but which is at the core of phenomenological enquiry: the meaningful structures which are essential for conscious experience of the lived world or *Lebenswelt* of the agent. For Husserl, for whom phenomenology was the “First Philosophy” [Husserl, 1970], this is a transcendental enquiry in which the

²²The same objection can be made to the ontogenesis of emotion and lack of phenomenology in Browne and Hussey’s article “Emotional Cognitive Steps Towards Consciousness” [2009].

²³It is important to remind the reader of the importance of interobjective entanglement because agents must also be moved by objects, not just agents in their environment, so that they can judge the affordance an object can have for them.

aim is to unearth the nomological conditions that make conscious experience possible. It is these conditions, or meaning-giving structures, which transcendently²⁴ synthesize the phenomenology of a natural agent producing what we think of as experience.

For phenomenological enquiry qualia are an inescapable aspect of experience but they are not its main focus; after all, qualia characterize conscious experience, they are not a condition of its possibility. The object of phenomenological enquiry is the conceptual character or meaning-giving structures of transitive, conscious lived experience and, for Husserl, they include intentionality, temporal and spatial consciousness (perception and imagination), emotion, evaluation, attention, consciousness of oneself and others (intersubjectivity). These structures are, in their transitivity, relational and, in their qualitative sensation, affect-laden, and it is this affective relational being-with, this enkinaesthetic engagement, which establishes, through bodily habits, the agent's capacity for concerned, evaluative, emotional²⁵ responses to its world [Stuart, 2010b]; it is these which must be the concern of a synthetic phenomenology.

In their papers Aleksander and Dunmall [2003] and Chrisley [2009] emphasize the notion of depiction. In the first case it is the depiction of a world for the agent, establishing a point of view with an “out-there” and feeding forward into the agent's planning of subsequent actions from a horizon of possibilities. In the second it is an “enactive depiction”, which is, as Chrisley says:

“...an expectation-based theory of perceptual experience...(in which the non-conceptual content of a visual experience consists in the set of sub-personal expectations that a subject's visual system has relative to a set of relevant possible actions, such as eye movements), then one could attempt to specify a particular visual experiential content by compiling a list of these sub-personal expectations: a list of various actions a subject having that experience might perform, and the expected visual stimulation (input) that would result.” [Chrisley, 2009, p. 57]

In both instances the authors address central features of conscious agential experience, and in both instances these are through conceptual structures — transitivity, temporality, and spatiality — which, through processes of perception and imagination, enable the agent to anticipate what the next possible state or relevant

²⁴ “Transcendentally” is used in the Kantian sense of both *a priori* and synthetic. By “synthesis” Kant means “the act of putting different representations together, and grasping what is manifold in them in one cognition”. (A77/B103) Kant's sense of “representation” refers to “objects” or “things” at any stage in its determination; they can be intuitions (sense impressions at all stages of processing), concepts, and even ideas.

²⁵ “Emotional” is used in Damasio's sense as spontaneous neural and chemical responses to changes in the agent's physiological state and which play a central role in the agent's homeostatic functioning. “[T]he subjective process of feeling emotions is partly grounded in dynamic neural maps, which represent several aspects of the organism's continuously changing internal state” [Damasio *et al.*, 2000, p. 1049]. See also Damasio *et al.* [1991] and Damasio [1994; 1999; 2003].

action might be.²⁶ This is fascinating work which really does engage with the nature of the non-conceptual meaning-giving structures of conscious experience, yet it does so without sensation or affect being present. Ultimately the work accentuates the absence of phenomenal consciousness in the agent by producing something which is functionally capable of engaging with other things and agents, but which is incapable of doing so in terms of affective phenomenal content. Each of emotion, evaluation, attention, and the intersubjective consciousness of oneself and others are just as crucial as temporality, spatiality, and intentionality — according to phenomenological enquiry — for an agent’s conscious lived experience, whether that agent be natural or artificial, and these cannot occur if there is no enkinaesthetic awareness through which we can begin to establish affective interaction through reciprocal, felt adaptation.

One final short set of examples should make this clear. Imagine that you suddenly become aware that you are being watched, that you are the object of someone else’s gaze. You might feel awkward, your muscles tense, your heart-rate increases, and your temperature increases just a little. You become self-conscious and you might even begin to wonder how long they have been watching you and examine what you had been doing that they might have observed. Now think of walking into an unfamiliar room, perhaps you are attending a conference in another university and you have arrived early. You enter the room and no-one else is there yet. You are a little uncertain that you are in the right room, after all, you had expected others to be there, but then you relax. Your muscles lose a little of their tension, your heart-rate steadies, and your body-temperature returns to normal. In short, your homeostatic functioning establishes its equilibrium and you look around to find the best seat, the one near the power outlet socket, the one from which there will be a good view of the speaker, and so on. In each case it should now be apparent that our rich enkinaesthetic experiential history influences our present and anticipated emotional, evaluative perturbation, balance, counter-balance, and attunement with our circumstances. In the first case our attunement might only occur when our observer drops his gaze or we recognize the observer as a friend. In the second case attunement is likely to occur more quickly because we do not have the additional perturbation of reconciling the experiential intrusion of another agent’s perception. An artificial agent which can experience the difference between these two sets of circumstances will have a synthetic phenomenology indeed. However, in neither the depiction nor the enactive depiction could the artificial agent make a distinction between these two courses of engagement; so, for now, we must resist calling their engagement phenomenally conscious experience.

Perhaps the machine consciousness community should be concerned less with qualia as the grail of conscious experience. Perhaps it is true that qualia can take care

²⁶ “Imagination” is also referred to throughout the work of [Stening *et al.* \[2005\]](#) and [Holland *et al.* \[2007\]](#). Further work might analyze their use of the term as something distinct from the more commonly used notions of creative, cognitive, and kinaesthetic or motor imagination.

of themselves and the concern should be with the meaningful structures Chrisley addresses and the ones he does not: emotion, evaluation, attention, intersubjectivity, and the affective relational felt basis for them all: enkinaesthesia.

5. Conclusion

The concern in this article has been with the feeling and sensing body conceived in its crucial role within the nonindividual-centered, enactivist dialogical nature of thought, mind and agency. As Merleau-Ponty says: “[T]here is no inner man, man is in the world, and only in the world does he know himself” [Merleau-Ponty, 1962, p. xii]; we are always, without fail, in dialogue with our world: all action is interaction. We cannot act without our action being the result of processes that continue to move, shape, and direct us, and in our acting we move, shape, and direct the world: all action is reciprocal interaction.²⁷ This dialogue is with objects and agents with which and with whom we are in a topologically complex web of dynamical, processual affective co-ordinative, orientational, intentional, and evaluative relations of community and reciprocity or, as Maturana states: “We operate in a domain of reciprocal co-ontogenic structural coupling through reciprocal structural perturbations” [Maturana, 1988, Sec. 9.5]. We are not simply “in” our world as individuated agents acting upon the other things in our world as though they are discrete entities, separate and separable from us; we are irreconcilably *with* and *within* our world, as much affected and effected by it as we effect and affect it.

We are endogenously intersubjective, folding enkinaesthetically into the being-in-time of the other. There are occasions when this enkinaesthetic engagement is not evident, for example, when someone’s behavior is pathologically unfeeling and unengaged, but these are the anomalies, the exceptions that prove the rule, and the subject of another paper altogether.

As Chrisley [2009] says: “An important goal of the field of machine consciousness ... is to make substantial contributions to the science of consciousness” [p. 53]. In this paper I would hope to have done just that, not by saying that machine consciousness is not possible — I remain agnostic about that possibility — but by suggesting that to-date we have seriously misconstrued the essentially co-affective enkinaesthetic dialogical nature of conscious experience.

²⁷ “Reciprocal” in this context does not imply equivalence of influence, feeling or response; rather, to take a Kantian line on this, objects and agents, “so far as they coexist, stand in thoroughgoing community, that is, in mutual interaction” [Kant 1787/1929, A212, p. 233]. The Kantian thesis of community and reciprocity of interaction carries with it the notion of “de-termination”, so that “Each substance...contain[s] in itself the causality of certain determinations in the other substance, and at the same time the effects of the causality of that other; that is, the substances must stand, immediately or mediately, in dynamical community” [*ibid.*, A213/B260]. Kant’s emphasis on “dynamical community” or commercium is exactly right, but his concern is with perception and time determination, whereas ours is with the enkinaesthetic affect which co-determines substances — agents and objects.

Afterthought

Let me clarify and respond to one possible objection to the notion of enkinaesthesia; enkinaesthesia is not heterophenomenology by another name.²⁸ Heterophenomenology is simply the capacity to adopt an intentional stance with regard to others and to wait for some relevant empirical evidence by which their mentality can be verified. Enkinaesthesia has, I hope, been shown to be a great deal more than that.

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²⁸For more on why I think the notion of heterophenomenology is absurd, see Stuart [2011].

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