12.
Signifying bodies and health: a non-local aftermath

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1. Coaction and its results

While health and suffering are intrinsic to living bodies, the relevant causes are not always based on the function and dysfunction of living tissue. In human beings, tissue connects microbiology to organs, the skin, the "Self" and a world in which, together, we are moved to sense-making. Remarkably, when the authors of the volume proposed collaboration, this theme had not yet emerged. We had little sense of what would arise from using a biosemiotic lens to view health and health care as relational phenomena. The outcome, *Signifying Bodies,* is the result of coaction. Together, we have used the writing and thinking of others to restructure our thoughts around a striking idea: health is a non-local phenomenon.

In this final chapter, we re-examine the papers of the volume and, building on our theme, consider theoretical and practical consequences that we hope will develop in the aftermath of our collaboration. The central claim is that, though based in bodies, health is irreducible to individual states. Accordingly, we em-

phasise, first, the need for *relational* health care. Second, we trace this to what are termed the principles of non-locality and non-localizability. Whether we are concerned with investigating or aiding the health of living beings, it is important to recognise that their encounters with the world (and with us) shape both the environment and how they act, think and feel. Health arises in a complex, culturally extended ecology (Steffensen, 2009). It is inseparable from how we deal with inert matter while, at times, using language and languaging. We become "Selves" whose being – how we feel, think and act – is co-determined by social and ecological factors deriving from a history of actions by signifying bodies. Health depends not only on the functioning of living tissue but also on how the "Self" draws on a history that stretches back to the beginnings of organic life. In short, health uses interaction with people, technologies and the living world. It animates signifying bodies and, as such, is established, maintained and declines together with the communities that sustain each person's lifespan of interactions.

2. The unifying theme

The contributors to *Signifying Bodies* come from different backgrounds, work in contrasting fields and draw on diverse literatures. Nonetheless, how we approach body, health, mind and interaction reflects, as argued by Alfredo Dinis (this vol.), a *relational turn*. This is clearest when it comes to how we conceptualise 'body'. Even where endorsing the biomechanical view of human functions that dominates Western medicine, as explained below, we reject the Cartesian view of bodily mechanisms. While microbiology makes each of us a system of cells and tissues, we stress that these *live* in an environment where, in different timescales, bodies exchange and share meaning with pro-

cesses beyond the skin. Health is relational, bodies are always in dialogue, and therefore much is gained from biosemiotic description. Far from invoking an immaterial 'mental' sphere, we focus investigations on the lived sense-making. This occurs both within and between humans who, we assume, have co-evolved with their environments. From this perspective, individual bodies are always extending; being-together is carried by intercorporeal resonances. Not only is the body inherently dialogical but the ecology is embodied to the extent that it allows us to be sensitive to the sensitivity of others, or what Stuart (this vol.) calls *enkinaesthesia*. It is this emphasis on human interdependency that differentiates our perspective from much contemporary thinking. Rather than invoke 'embodiment', we turn to bodies whose health and suffering arise as living subjects engage with each other and the world.

The relational perspective draws on a changing view of health. Indeed, it is precisely the success of biomedicine that has brought home the limits of biological models. Not surprisingly, this appears clearly in the 'psychological' problems faced by therapists. Not only are the limits of biomedicine seen in the tradition of relational psychology (see, Dinis, this vol.; Major, this vol.; Oliveira, this vol.) but, in a different guise, they appear in the case studies of DLC (*Distributed Language and Cognition*) presented by Brands et al. (this vol.). All concur on the importance of what Hoffmeyer (this vol.) calls the body's *interface*, the in-between that arises as we enact experience. We rely on relationality and intersubjectivity: while bodies are subject to internal dysfunctions, much suffering and disease spreads as the body's interface connects mind and society. This shapes feeling, action and how we speak or, in other words, produces a *phenomenology* of health. What appear as individual problems – espe-

cially given individualistic Western modes of interpretation – can often be traced to boundary crossing. The health of an individual, let alone a community, turns out to be trans-individual and, in this sense, relational.

Since health has a phenomenological aspect, we depend on body-brain-world relations. This echoes how 21st century cognitive science differs from earlier work that relied on systematic comparisons between mind and machine. On the classic view cognition was confined to the individual, within the individual to the brain, and within the brain to encapsulated modules (e.g. Fodor, 1983). Neo-phrenologist approaches mimic physics by positing small units that, together, are said to shape mental function. Today, however, cognition is increasingly contrasted with computation. It is conceptualised as the functioning of complex adaptive systems that draw on and, at times, construct environments. Cognition is embodied, embedded and inseparable from the public resources of the world (e.g. Robbins and Aydede, 2009). On more radical views, cognition is *distributed* or emerges as a body engages with its ever changing ecology. Early elaboration of such views came in studies of Tetris (Kirsh and Maglio, 1994) where experts moved figures on a computer screen to 'see' their size and form. They preferred these *epistemic actions* over so-called 'mental rotations'. Given how acting while perceiving changes our cognitive powers, it is mistaken to identify cognition or problem-solving with neural processes. It is not the brain that thinks, it is the brain-body-world totality that thinks (even if the totality thinks that it is the individual brain that thinks!).

From a distributed perspective, one acknowledges the collective aspect of human cognition and, specifically, the importance of interaction. Of course, the social world affects how we live, feel and enact biologi-

cal change: it affects health and, more starkly, health care. Psychological, social and biological aspects of health and suffering are quite clearly bound up with what we do together. We cannot separate events within the skin ('health') from what lies beyond the border ('health care'). In making this claim, we echo the changes in cognitive science. For, as we have seen, recent work denies that meaning in the skull ('cognition') is separable from meaning as displayed in the world ('communication'). Indeed, it is only in this way that the biological, the individual and the supra-individual can co-function. Accordingly, we rethink *inter*-action ('between'-action). Many approaches to other-directed actions draw on Conversation Analysis (CA) and the micro-sociological tradition of ethnomethodology. By making the assumption that communication is public (and cognition private), interaction is restricted to exchange of meaning through turn-taking. But interaction is all too glibly explained by systematic use of social norms and habits, e.g. in the form of turn-taking "rules" and "word meaning." Our investigations show that the social domain is inseparable from the bio-cognitive. Communicative acts neither *report* inner cognitive life, nor construe communicative meaning. What we do, and especially what we do within a community, is inherently bio-cognitive. Interaction is, among other things, a way of cognizing or, perhaps, ensuring that cognitive resources are shared between people.

This is clear in Pike's (this vol.) work on sufferers from rheumatoid arthritis. By examining how signifying bodies *resonate* we learn much about their lived identity. Signifying bodies serve as a methodological resource for exploring drug adherence (and non-adherence). As cognitive activity, interaction draws heavily on experience. While Pike describes this with

respect to focus groups, the work can be generalized. Thus Galosia et al. (this vol.) traces decision making to how, in simulation, events are coordinated between a 'patient', doctor and nurse. Caring is partly cognitive and, at the same time, has a constitutive role in social context. Indeed, as Pedersen shows (this vol.), organization (and procedures) also influence what people say, feel and do. Taken together, this set of papers brings home the importance of actions performed within a distributed cognitive system that includes more than one human participant. These settings depend on *coaction*: this is so important to human life there is a case for applying the term *cognication* – i.e. *cogni*(tion)-(communi)*cation* – to such distributed activity. In health care settings, we find many examples of cognizing *together* where parties link what is said with fine social and cognitive coordination. This gives rise to the co-action analysis (Steffensen et al., this vol.) that shows unexpected real-time influences on how people care for a 'patient'.

In focusing on bodies, health, minds and interaction, boundaries are found to be "yieldable and mutual" (Stuart, this vol.). All contributors thus deny that *boundaries are absolute*: much health and suffering has 'causes' that are spread across bodies and inseparable from how the organization of the physical and social surround.

3. Boundaries and the fallacy of simple location

When boundaries are non-absolute, something exists across boundaries. Without wishing to exaggerate, this perturbs Western epistemology and ontology. In speaking against one central tenet of a two millennia old tradition, Alfred Whitehead suggests,

> The Ionian philosophers asked, What is nature made of? The answer is couched in terms of stuff, or matter, or ma-

> terial,—the particular name chosen is indifferent—which has the property of simple location in space and time, or, if you adopt the more modern ideas, in space-time. [...] The characteristic common both to space and time is that material can be said to be *here* in space and *here* in time, or *here* in space-time, in a perfectly definite sense which does not require for its explanation any reference to other regions of space-time. (Whitehead, 1926: 61f.)

Western science typically adopts an assumption of *simple location* by delimiting the here from the not-here or an 'object' from the 'world'. In examining health, we find that this approach impedes understanding. We thus emphasise what Major (this vol.) call *states of becoming* or, in Steffensen's (forth.) terms, what is called the *principle of non-locality*. This denies that states or processes can 'occupy' a determinate space-time zone. It is thus an ontological claim that warns us that even objects like stones exist in a state of change, however slow this change may be. While such processes are not confined to determinate space-time zones, they do nevertheless have a high density in some space-time zones and yet, in others, the processual density becomes indefinitely small.[1] What applies to physical objects also characterises living bodies and human Selves; and since their potentials draw on the past, they evade space-time localization. It is a methodological error, therefore, to ascribe inviolable boundaries to objects. Steffensen (forth.) thus posits the *principle of non-localizability*: it is an epistemological error to ascribe determinacy to scientific 'objects'. We must not seek to localize the non-local.

By accepting the principles of non-locality and non-localizability, we demolish the iron curtain between

[1] For instance, cognition is not "brainbound" (to use an expression from Clark, 2008: xxvii), but extends into the world; however the cognitive density is relatively higher in the human brain than in, say, the mug next to me.

person and world, subject and object, mind and body, substance and quality. First, dualism is traced to a gratuitous assumption that every 'thing' has a simple location. From an observer's perspective, this is readily understood. If I as a person am here (i.e. if I am simply located in a *here* in space-time), then there is a non-I that is not-here. On classic views, this 'world' is said to be separate from who I am (a first person observer): thus, a gap divides a person from the 'world' (or knower and known). Using a phenomenological approach, Hoffmeyer (2008) shows how the skin (the boundary) can, at once, separate us from the world while also being an interface for the non-local. Along similar lines, Timo Järvilehto's (1998) systemic view ascribes ontology to the domain of Organism-Environment Systems.[2]

The epistemological division of subject and object depends on the assumption of simple location. It assumes that a subject (the observer) is bound to a person and an object (the observed) to the world, and that a local(ized) phenomenon "does not require for its explanation any reference to other regions of space-time" (Whitehead, 1926: 62). According to this line of thought, it is possible for an object to be described and explained without reference to a subject: objectivism too derives from a specific spatial ontology. However, since any description is dependent on a describer, it is more precise to see the description as a description of the *relation* between the observer and the observed, between subject and object.

While similar challenges have been raised by sub-atomic physicists, *relational psychology* also challenges the subject-object dichotomy. Pursuing this is

[2] This is a more radical view than, say, Andy Clark's Extended Mind Hypothesis (Clark, 2008) because the latter's functionalist view is indifferent to spatial ontology (see, Steffensen, 2009).

consistent not only with biosemiotics but also the enactive program (cf. Stuart, this vol.) and how human perception and action are conceived within ecological psychology.[3]

The mind-body dichotomy is interwoven with the assumption of simple location. The main criterion that distinguishes Plato's immaterial form and his material phenomena – or Descartes' *res extensa* and *res cogitans* – is whether or not they are localizable. This, however, contrasts with Damasio's widely cited critique of Descartes:

> the abyssal separation between body and mind, between the sizable, dimensioned, mechanically operated, infinitely divisible body stuff, on the one hand, and the unsizable, undimensioned, un-pushpullable, nondivisible mind stuff; [...] the separation of the most refined operations of mind from the structure and operation of a biological organism. (Damasio, 1994: 249f.)

From our non-localist perspective, the error is not that of positing an "unsizable, undimensioned, unpushpullable, nondivisible" mind. Not at all. Rather, these are kinds of properties that make the relevant phenomena non-local. The error lies in positing that bodies are localizable, i.e. in failing to recognise that they extend in space-time. A distributed cognitive system is *never* co-extensive with a human body. As we engage with people, artifacts and institutional resources, we establish systems that lack strict boundaries. Descartes' error is not his 'non-local' system but rather the fact that he was unwilling or (or unable to) give up the assumption of simple location. Instead, he returned to a Platonic substance dualism; while he correctly rejected mind-*within*, he failed to conceive

[3] It can be argued that action and perception are two dimensions of the same bundle of phenomena (Noë, 2004).

of mind-*beyond*. Indeed, it was not until the time of Hegel that philosophers proposed that the subjective mind was inherently incomplete (see, Crisafi and Gallagher, 2010) or, in modern terms, that humans make extensive use of *distributed cognition*.[4] As Stuart points out, a "substance-state ontology" rests on the assumption of "temporality and spatiality as uniform, linear, and regular, consisting of discrete or punctuated events, points, objects, and places" (Stuart, this. vol.). It thus seems to be precisely the assumption of simple location that prevents us from grasping, say, the colour of an 'object' relationally (cf. Varela et al., 1991: 157-184). Instead, Western epistemology reifies the colour of, say, a leaf, in terms of qualia (or *states*) that "belong to" ("is simple or located in") a bounded entity. In summary, therefore, let us turn again to Whitehead:

> Of course, substance and quality, as well as simple location, are the most natural ideas for the human mind. It is the way in which we think of things, and without these ways of thinking we could not get our ideas straight for daily use. There is no doubt about this. The only question is, How concretely are we thinking when we consider nature under these conceptions? My point will be, that we are presenting ourselves with simplified editions of immediate matters of fact. (Whitehead, 1926: 66)

We seem to have mistaken an abstracted version of reality – one fit for getting along with everyday concerns such as laundry, food, bike-riding and soccer-playing – as the real, concrete world "out there." Whitehead

[4] Clark too adopts a substance-state ontology: in positing *extended mind*, he sometimes writes as if 'objects' were *part* of the cognitive process. Not only does this strike many as bizarre but it leads Clark to overlook crucial aspects of cognition such as its normative dimension, phenomenology and how verbal language is integrated with languaging (see, Steffensen, 2009).

calls this the "Fallacy of Misplaced Concreteness" (Whitehead, 1926: 64). In emphasising this, we make the relational turn – one that holds promise for our signifying bodies.

4. Universal forces and simple location

To Whitehead, the "Fallacy of Misplaced Concreteness" is an "occasion of great confusion in philosophy" (ibid.). We may agree on this judgment even if, in principle, things need not be so. Just as astronomers do not rely on the sun's 'movements in the sky', philosophers, cognitive scientists, biologists and others can reject substances, qualities and simple locations. Indeed, the scientific enterprise aims at a deeper and broader view of the universe. In spite of this, mainstream science has long been guided by the assumption of simple location that serves our everyday concerns. Not only has this limited the scope of its analyses and theories but, perniciously, it has ensured that its methods have been severely limited.

Following Whitehead, the assumption of simple location entails that if a substance exists in a *here* in space-time, it exists in a given temporal period. Further if that is so, it is equally in existence in any portion of that period or, in his terms, "the material is indifferent to the division of time" (Whitehead, 1926: 63), and "the transition of time has nothing to do with the character of the material" (ibid.). This principle sustains the method of *analysis* or the division of matter into smaller parts. It is a principle, moreover, that can be applied to atoms and planets (as in physics/astronomy) frogs and cells (as in biology), or utterances and texts (as in linguistics). This form of scientific analysis gives rise to formulae and formalisms – modes of describing existence in terms of properties that are said to identify the smallest parts of 'things'. Hoffmeyer

reminds us of the background for Newton's gravitational theory:

> Thomas Hobbes' bold conjecture, that the social atoms, human individuals, posses [sic] *essential properties* from which the appearance of social order among human beings can be explained, was transferred by Newton to the natural world which he saw as constituted, at the micro level, of particles with *essential properties*: hardness, impenetrability, indivisibility and inertia. (Hoffmeyer, 2010: 81f.)

Whether we talk about physical matter, living beings or linguistic texts, an analytical approach is radically incomplete. We encounter a pulsing that shapes cellular, subatomic and morphological configuration. A frog's heart beats and it jumps. Under the influence of gravitational forces, atoms vibrate and planets swirl through the universe. Even texts are written by hands, bodies and minds. Something moves, something happens. Hoffmeyer continues:

> Newton also claimed that these essential properties could not by themselves explain natural phenomena in the absence of a causative agent, or force, the force of gravity. Gravity differs from the essential properties of particles in that gravity is not a property of any single particle but an enigmatic *universal property*, unlike anything else known to human experience. [...] Simply by postulating the existence of this one force Newton was able to bring the movements of celestial bodies into harmony with bodies at the Earth, both kinds of movement being calculable by the same set of simple equations. (Hoffmeyer, 2010: 82)

Evidently, the assumption of simple location renders it impossible to analyse what Hoffmeyer terms "enigmatic universal properties." If they are not now-here, they are no-where. Further, if something cannot be analysed, the paradigm deems it irreducible to *explanation*. Given the principle of simple location, ex-

planation excludes, "any reference to other regions of space-time" (Whitehead, 1926: 61f.). Interestingly, Newton realised that, in such terms, he had not *explained* gravity:

> While Newton himself did not think he had explained the phenomena [sic], that he so accurately had described, and spent the last thirty years of his life searching in vain for a true explanation of gravity, most scientists since Newton have conceived of the Newtonian laws as the ideal way to scientifically model nature. The invisible hand of Adam Smith and the Darwinists [sic] conception of natural selection as a source of otherwise mysterious purposeful activity in animate nature are both deeply indebted to the Newtonian idea of gravity as an unexplained (divine?) yet – as the proponents believe – trustworthy force of lawful universal intervention in the senseless machinery of economy or evolution respectively. (Hoffmeyer, 2010: 82)

Where does it come from, this idea that behind the world of simple locations, there are greater forces at play, forces that guide the universe in a way that resembles purposefulness? Hoffmeyer makes a parenthetic reference to the "divine." But, surely, it will be objected, science is free of *that*. However, Whitehead concurs with Hoffmeyer:

> I do not think, however, that I have even yet brought out the greatest contribution of medievalism to the formation of the scientific movement. [...] It is this instinctive conviction, vividly poised before the imagination, which is the motive power of research: — that there is a secret, a secret which can be unveiled. How has this conviction been so vividly implanted in the European mind? [...] It must come from the medieval insistence on the rationality of God, conceived as with the personal energy of Jehovah and with the rationality of a Greek philosopher. Every detail was supervised and ordered: the search into nature could only result in the vindication of the faith in rationality. [...] My explanation is that the faith in the possibility of science, generated antecedently to the development

> of modern scientific theory, is an unconscious derivative from medieval theology (Whitehead, 1926:15f.).

The assumption of simple location – and the theological motivation of seeking, dare we say, supernatural forces in nature – dominated Western science until the rise of subatomic physics. Indeed, it has been overthrown in the philosophy of science only with *structural realism* (see, Worrall, 1989; Ladyman et al., 2007).[5] Until recently, simple location has often been used in suggesting that "mathematical formalizations as expressing the deepest reality of our world" (Hoffmeyer, 2010: 82) or, as formulated by a 20th century linguist:

> In the natural sciences, it is common to adopt what has sometimes been called "the Galilean style"— that is, to construct "abstract mathematical models of the universe to which at least the physicists give a higher degree of reality than they accord the ordinary world of sensations." [...] There is no reason to abandon the general approach of the natural sciences when we turn to the study of human beings and society. Any serious approach to such topics will attempt, with whatever success, to adopt "the Galilean style." (Chomsky, 1980: 217ff.)

[5] Structural realism can be traced to Worrall (1989) and is closely associated with James Ladyman's work. In his most recent book, together with colleagues (Ladyman, Ross et al., 2007) suggest that 'belief in the unobservables of scientific theories' (e.g. electrons) entails belief that the theories are 'at least approximately empirically relevant'. Thus, 'there really are relations among the phenomena that theories attribute to the world.' Provided we adopt non-Humean causation, "we need not go as far as belief in objects, unobservable or not. [...] The positing of stable modal relations among the phenomena will do as well" (2007: 106).

While debatable that abstract mathematical models presuppose analysis of units into component parts,[6] this is the practice – not only of Chomsky – but of many who extend science into the domain of human life. If we are to take the principle of non-localizability seriously, we are bound to reject any appeal to a "higher degree of reality."

5. The life sciences and the living

While the Galilean framework is powerful, it cannot reduce the world to little things. In the life sciences, at least, we deal with the living (and the dying). Whatever the contributors to *Signifying Bodies* think about the Galilean style, our work is post-Cartesian, post-Baconian and post-Newtonian. Indeed, in turning away from how objects function, we embrace biosemiosis, development, social organization and languaging. In turning to the living, our interdisciplinary work spans a range of traditional fields. While committed to science, none of us seek to begin with 'objects' that occupy a simple location. Nor do we assume (pseudo-divine) secrets of nature that Man uses science to unveil. Rather, the domain of the living is seen as depending on organism-environment relations. It is non-localizable and, at the same time, bound up with more than the 'parts' and 'mechanisms' we attribute to biological systems.[7] There is, of course, variability, in terms of

[6] Mathematical models need not presuppose entities: they can characterize process dynamics. While some would argue that this too represent a Gallilean style, this matter need not concern us here.

[7] In important work, Bechtel (2008) proposes that we redefine the 'mechanisms' that contribute to psychological phenomena in terms of – not just parts and mechanisms (or 'procedures'), but as involving 'modes of organization'. It could be argued that these 'modes of organization' are exemplified by concepts like protein synthesis, biosemiotics, languaging and even professional alliances (see, Pedersen, this vol.).

how the general principle is framed. In this context, however, we stress that each one of the contributors takes as a starting point one of the following three assumptions of simple location:

- The existence of absolute *boundaries*
- The *per se* existence of *individual* entities
- The description of such entities in terms of *essential properties*

Accordingly, we can distinguish between three groups of non-local theories. The first group of non-local theories stresses the processual spatiality of cognition. Cognitive processes – that are traditionally ascribed to the brain – are regarded as non-local. The locus (or non-locus) of cognition is so central that these theories are named in spatial terms: thus, one finds Andy Clark's *Extended Mind Hypothesis* (Clark, 2008), and Ed Hutchins theory of *Distributed Cognition* (Hutchins, 1995; Dror and Harnad, 2008; Cowley, 2007, 2009). Both *extended* and *distributed* are spatial terms used to challenge 'brain-bound' views. However, while *extension* presupposes an originary core (in the organism), *distribution* invokes a field theory (cf. Steffensen, 2009) in that it posits no localized centre. Another non-local theory that transgresses boundaries is *bio-semiotics* (Barbieri, 2007; Hoffmeyer, 2008, 2010, this vol.; Kull et al., 2009). For instance, Hoffmeyer's (2008: 17-38) treatment of the skin emphasises permeable boundaries that yield two way crossing. Likewise, the biosemiotic emphasis on *signs* and signification processes moves the perspectives from intra-boundary processes to inter-boundary processes. When Kull et al. claims that "*The semiotic—non-semiotic distinction is co-extensive with the life—nonlife distinction*" (Kull et al., 2009: 168), they echo Maturana and Varela's central intuition. As Capra (2002) puts it, "The central insight

of the Santiago Theory is the identification of cognition, the process of knowing, with the process of life. […] cognition is the very process of life" (2002: 30). There is, however, a difference. In identifying life with cognition, the enactivist posits a *systemic* ontology and a unified cognitive system; in emphasising signification, Kull et al.'s ontology depends on sign-exchanging *relata*.

The second group of theories emphasises the systemic and supra-individual dimension of non-locality. Rather than begin with 'objects', the investigator asks how what Bang and Døør (2007) term 'individualities' partake in (and are constituted by) larger, systemic wholes. Like many others, this systemic approach derived from Norbert Wiener and Ludwig von Bertalanffy's *General Systems Theory* (Bertalanffy, 1969). Today, systemic approaches appear in biology, sociology, geography, psychology, and other disciplines. We include in this grouping, for example, systemic psychology (Järvilehto, 1998), ecological psychology (Gibson, 1979; Hodges and Baron, 1992; Hodges, 2007, 2009) and a family including Complexity Theory, Complex Adaptive Systems Theory and Non-Linear Dynamical Systems Theory (Van Orden, 2007).

The third group takes a non-essentialist, relational view. In pursuing this approach to non-locality, there is a tendency to emphasise subject-object relations, and thus epistemology. A number of thinkers approach the living (and the human being) as an experiential subject. For this reason, they look at how experience (and cognition) depend on the human condition, or, in other words, a living human body in the biosphere known as the Earth. This is illustrated by the theoretical overviews of Dinis (this vol.) and Major (this vol.) as well as the discussion of development (Leal, this vol.), and suffering (Oliveira, this vol.). In parallel, Stuart's (this vol.) enactive starting point emphasises the embodied

character of cognition, or how a living "Self" takes in a relational stance to their surroundings:

> Organisms do not passively receive information from their environments, which they then translate into internal re-presentations whose significant value is to be added later. Natural cognitive systems are simply not in the business of accessing their world in order to build accurate pictures of it. They actively participate in the generation of meaning in what matters to them; they enact a world. Sense-making is a relational and affect-laden process grounded in biological organization. (De Jaegher and Di Paolo, 2007: 488)

There are both commonalities and striking differences between these ways of exploring the non-local; there are however, few, if any, attempts to integrate them. Though the principle of non-locality has been independently established in a range of fields, it has not yet been generalized. Even more strikingly, it has not been applied to science itself. It seems that we must look to the future to bring us a trans-disciplinary, non-local approach to bodily, cognitive and interactional processes. The emerging contours of a hyper-paradigm (cf. Steffensen, 2006) suggest that each approach can give and take from other non-local views. It is also clear that the variety of what each theory works with makes it unlikely that any higher degree of reality pertains to mathematical models of things and relations. Rather, let us strive for a scientific *unitas multiplex* (cf. Morin, 1987: 27) or a "unity in diversity" which is also a "diversity in unity." If we are to engage in science as a trans-disciplinary dialogue, we must recognise its own reflexive nature. Science itself is non-local. It is a self-organizing enterprise that, like life (Markoš et al., 2009), is its own designer, while at the same time – also like life itself – formed by societal dynamics:

> Science or scientific praxis is nothing more or less than a particular historical, social praxis and part of a specific socio-cultural order. Different cultures create different forms of science and every dominant praxis organizes its people and problems in ways and by means that aim at the same ends as the culture as a whole. (Bang and Døør, 2000: 53)

6. Investigating signifying bodies: the distributed health interaction program

While based in biology, health cannot be identified with bodily functions. Biomedical focus on tissue damage needs to be balanced by due concern for *health interaction*. Once we adopt the principle of non-localizability, we can trace how health plays out as signifying bodies exploit their states of becoming as living "Selves." We are both our biological functions and products of a history of engaging with each other and the world. Neither brain nor body function can be separated from past, present or even potential actions. As we go about our lives, our bodies function, we live through situations and integrate language with our modes of action. It may seem surprising that health is so non-local. It will, we think, seem less controversial to stress the non-locality of health care. Just as health connects people, technologies and the living world, it is established, maintained and declines across a lifespan that relies on the changing practices of a community. Both health and health care are prominent examples of a non-local phenomena.

We have applied the principle of non-localizability not only to health but also to interaction, mind and body. Its scope includes the whole of the domain of the living and, perhaps in different forms, of many inorganic processes. While these claims are philosophical, they have very practical implications for how science is to be applied to the study of health and health care.

Above all, adopting the principle of non-localizability permits us to adopt the orthodox scientific approach to making models while, at the same time, rejecting the rhetoric of a Galilean style that gives access to a 'higher degree of reality'. Rather, we see these models as heuristic models that capture aspects of the world that demand to be understood as both relations and systems. Our challenge is to unify these and to do so in a way that has practical relevance for both those who are ill or suffering and also for others who, as friends, family, administrators and health professionals, can change their lives. Our approach thus endorses *relational health care*.[8]

Contributors to this book have established an international network called *Distributed Health Interaction* (DHI).[9] Using a relational approach, the aim is to improve health by linking studies of bodily function with the distributed nature of human biosemiosis, interaction and cognition. The group's most general goal is that of taking best practices to a range of different contexts. The DHI network thus links health practitioners with academic researchers who relate narrowly biomedical issues to the kinds of non-local phenomena described in fields such as biosemiotics, linguistics, ethnography, organizational studies, sociology, psychology and cognitive science. By developing research that focuses on *health interactions* we aim at ensuring that the work has practical consequences for educators, health practitioners and patients. Given our non-local axiology, we aim at uniting good science with valued practice and ways of organizing and managing health practices. The study of cognitive processes (problem identification, medical diagnosis, decision making and emotion work) is thus taken to be insepa-

[8] This term was originally proposed by João C. Major.

[9] For details on the program, visit: www.sdu.dk/dhi.

rable from work based on observation of interactions between practitioners, patients and technologies. By taking a relational view, we aim to promote local health practices by encouraging new approaches to organization, healing and patient safety and care.

By placing practical concerns within a systemic theory, our work has implications for health organizational structures, cultures and procedures. As shown by Pedersen (this vol.), Galosia et al. (this vol.) and Steffensen et al. (this vol.), health practice and health education is of immense importance for both patients' and practitioners' health, well-being and safety. Thus while some in the *Distributed Health Interaction* program are pursuing how interactions in local and situational domains (i.e. on relatively rapid time-scales), interface with larger societal settings (i.e. relatively slow time-scales) others prefer to see how material and organizational factors constrain what people do. This allows us to stress that health is personal, inter-personal and also super-personal: it demands the use of non-local, trans-disciplinary theories and methods. While *Signifying Bodies* is a step towards connecting health and well-being with interaction, biology and social organizations, it is just the beginning! We hope that, in the aftermath, we will have a part in correcting serious imbalances arising from our overdependence on the Cartesian-Baconian-Newtonian tradition. There is an urgent need to connect biomedical knowledge with lay and professional abilities to use insights into health and health care. In this endeavour, we do not set up a localizable scientific goal but, rather, aim at moving in better directions in an attempt to realize values (cf. Hodges, 2007). We hope that our focus on suffering and caring can contribute to better science while, at the same time, bettering the ecology, society and the lives of many people.

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2010 â€œSignifying bodies and health: a non-local aftermath.â€ In Signifying bodies: Biosemiosis, interaction and health, ed. by Stephen J. Cowley, Sune V. Steffensen, Joao C. Major and Alfredo Dinis, 331â€“356. Braga: Portuguese Catholic University Press. Steffensen, Sune V. and Alvin Fill. The body changes with aging because changes occur in individual cells and in whole organs. These changes result in changes in function and in appearance. (See also Overview of Aging.) Aging cells. As cells age, they function less well. Eventually, old cells must die, as a normal part of the bodyâ€™s functioning. Old cells sometimes die because they are programmed to do so. The genes of cells program a process that, when triggered, results in death of the cell. Signifying bodies and health: a non-local aftermath. SV Steffensen, SJ Cowley. Signifying bodies: Biosemiosis, interaction and health, 331-355, 2010. 59. 2010.Â Signifying bodies: Biosemiosis, interaction and health. SJ Cowley, JC Major, SV Steffensen, A Dinis. Catholic University of Portugal, Braga, 2010. 23. But they were unable to rule out that someone more locally might have said that it would not have been a problem for Mr Seed to stand. They said: "Due to a historic driving offence that has come to light, the candidate has been disbarred from becoming the police and crime commissioner." Mr Seed, a Wiltshire councillor, said he had been advised by his party that a 30-year-old drink driving offence would not affect his application and that he had believed he was eligible. He said he withdrew his candidacy earlier on Sunday. Mr Seed said he was "bitterly disappointed" that he will now no longer b