The theme of this book is the deep continuity to of life and mind. Where there is life there is mind, and mind in its most articulated forms belongs to life. Life and mind share a core set of formal organisational properties, and the formal or organizational properties distinctive of mind are an enriched version of those fundamental to life. More precisely, the self-organising features of mind are an enriched version of the self-organising features of life.

The self producing or “autopoietic” organisation of biological life already implies cognition, and this incipient mind finds sentient expression in the self organising dynamics of action, perception, and emotion, as well as the self moving flow of time-consciousness.

From this perspective, mental life is also bodily life and is situated in the world. The roots of mental life lie not simply in the brain, but ramify through the body and environment. Our mental lives involve our body and the world beyond the surface membrane of our organism, and therefore cannot be reduced simply to brain processes inside the head.

Exactly how are consciousness and subjective experience related to the brain and body? It is one thing to be able to establish correlations between consciousness and brain activity; it is another thing to have an account that explains exactly how certain biological processes generate and realise consciousness and subjectivity. At the present time, we not only lack such an account, but also are unsure about the form it would need to have in order to bridge the conceptual and epistemological gap between life and mind as objects of scientific investigation, and life and mind as the subjectively experience them. To make real progress on explanatory gap, we need richer phenomenological accounts of the structure of experience.

1 The Enactive Approach
3 Cognitive Science and Human Experience
Cognitive science - that part of the science of the mind traditionally concerned with cognitive processes - has been described as having “a very long past but the relatively short history” (Gardner 1985). Scientific concern with the mind can be traced all the way back to Plato and Aristotle, but the term cognitive science did not arise until the late 20th century, as a name for the new, modern, scientific research program that integrated psychology, neuroscience, linguistics, computer science, artificial intelligence (AI), and philosophy. What united these disciplines, and set cognitive science apart from earlier approaches in psychology and philosophy, was the goal of making explicit the principles and mechanisms of cognition.

In recent years, however, it has becoming ceasing the clear to many researchers that cognitive sciences incomplete. Cognitive science has focused on cognition while neglecting emotion, affect, and motivation. In addition, a complete science of the mind needs to account for subjectivity and consciousness.

4 Three major approaches to the study of the mind can be distinguished within cognitive science - cognitivism, connectionism, and embodied dynamicism. Each approach has its preferred theoretical metaphor for understanding the mind. For cognitivism, the metaphor is the mind is digital computer; for connectionism, it is the mind as neural network; for embodied dynamicism, it is the mind as an embodied dynamic system.

13 The enactive approach
Enaction means the action of enacting a law, but it also connotes the performance of carrying out of an action more generally. Borrowing the words of the poet Antonio Machado, Varela described enaction as the laying down of a path in walking: “Wanderer the road is your footsteps, nothing else; you lay down a path in walking”. Boe: Machado

The term the enactive approach and the associated concept of enaction were introduced into cognitive science by Francisco Varela.
The first idea is that living beings are **autonomous agents** that actively generate and maintain themselves, and thereby also enact or bring forth their own cognitive domains. The second idea is that the nervous system is an autonomous dynamic system: it actively generates and maintains its own coherent and **meaningful patterns of activity**, according to its operation as a circular and re-entrant network of interacting neurones. The nervous system does not process information in the computationalist sense, but creates meaning.

The third idea is that cognition is the exercise of skilful know-how in situated and embodied action. Cognitive structures and processes emerge from recurrent sensorimotor patterns of perception and action. Sensorimotor coupling between organism and environment modulates, but does not determine, the formation of dynamic patterns of neural activity, which in turn inform sensorimotor coupling.

The fourth idea is that the **cognitive being’s world is not a pre-specified, external realm, represented internally by its brain**, but a relational domain enacted or brought forth by that being’s autonomous agency and mode of coupling with the environment.

The fifth idea is that **experience** is not an epiphenomenal side issue, but central to any understanding of the mind, and needs to be investigated in a careful phenomenological manner.

14 Mind science has much to learn from the analysis of lived experience accomplished by phenomenologists. Indeed, once science turns its attention to a subjectivity and consciousness, then it cannot do without phenomenology, which thus needs to be recognised and cultivated as an indispensable partner to the experimental sciences of mind and life. This scientific turn to phenomenology leads as much to a renewed understanding of nature, life, and mind as to naturalisation of phenomenology.

16 Phenomenology

Any attempt to gain a comprehensive understanding of the human mind must at some point consider **consciousness and subjectivity** - how thinking, perceiving, acting, and feeling are experienced in one’s own case. Mental events do not occur in a vacuum; they are lived by someone. Phenomenology is anchored in the careful description, analysis, and interpretation of lived experience.

Three phases phenomenology: static, genetic, and generative phenomenology. Static phenomenology analyses the formal structures of consciousness whereby consciousness is able to constitute (disclose or bring to awareness) its objects.

17 Genetic phenomenology is concerned with how these intentional structures and objects emerge through time. From the perspective of genetic phenomenology, experience has a sedimented structure, and the process of sedimentation needs to be understood in relation to the **lived body and time-consciousness**. Some of the key guiding phenomena for genetic phenomenology -affect, motivation, attention, habit - are familiar from the perspective of mind science, especially developmental psychology emotions theory, and affective-cognitive neuroscience.

Whereas time-consciousness and the lived body are the guiding threads for genetic phenomenology, for generative phenomenology the guiding thread is the lifeworld. The subject matter of generative phenomenology is the cultural, historical, and intersubjective constitution of our human world.

19 **Epoché** - The main methodological step crucial for the phenomenological reduction Husserl called the epoché. This term derives from Greek scepticism, where it means to suspend or refrain from judgement, but Husserl adopted it as a term for the “suspension”, “neutralisation”, or “bracketing” of both our natural attitude and our theoretical believes and assertions about objective reality. From a more embodied and situated first-person perspective, however, the epoché can be described as the flexible and trainable mental skill of being able both to suspend one’s inattentive immersion in experience and turn one’s attention to the manner in which something appears or is given to experience. Suspending one's inattentive immersion in experience implies the capacity to notice such immersion, and thus implies what psychologists call **meta-awareness** (awareness of awareness).
Because Husserl’s theoretical project was based on a radical reappraisal of experience as the source of meaning and knowledge, it necessary take it a constant return to the patient, analytic description of lived experience through phenomenological reduction.

21 Transcendental phenomenology focuses not on what things are but on the ways in which things are given. For Husserl, this means focusing on phenomena (appearances) and the senses or meanings they have for us, and then asking how these meaningful phenomena are constituted (brought to awareness). Second, to address this constitutional problem, transcendental phenomenology tries to uncover the essential formal laws under which experience necessarily operates in order to constitute a meaningful world.

22 Transcendental phenomenology cannot be limited to - and indeed goes far beyond - a philosophy of “egological” consciousness or subjectivity. “Transcendental” signifies a radical attitude, one that aims to regress back to the very roots (conditions of possibility) of our experience in a meaningful world. These roots ramify far beyond individual consciousness into the depths of our lived bodies and out into our social and cultural worlds.

24 In phenomenology, intentional experiences are described as mental acts - acts of perceiving, remembering, imagining, empathizing and so on. Phenomenology conceives of mental life as a temporally extended and dynamic process of flowing intentional acts. These acts are animated by pre-cognitive habits and sensibilities of the lived body. Intentional acts are performances of a person, a living bodily subject of experience, whose cognitive and affective life is constituted by communal norms, conventions, and historical traditions.

25 The correlational structure of intentionality: “Correlational” refers to the invariant structure of intentional act/intentional object. Object-directed intentional experiences necessarily comprise these two inseparable poles. In Husserlian phenomenological language, these two poles are known as the “noema” (the object in its givenness) and the “noesis” (the mental act that intends and discloses the object in a certain manner).

We need to keep this framework in mind when we think about the relation between the phenomenological conception of intentionality and what philosophers of mind today call mental representation. In a broad and theoretically neutral sense, a mental representation is supposed to be a mental structure (concept, thought, image) with semantic properties (content, truth conditions, reference), or a state or process involving such a structure.

Usually, a mental representation is not considered to be an object of cognition or awareness, but rather that by which one cognizes or is aware of something in the world.

Many phenomenologists would agree that intentional experience is representational in this broad sense of having descriptive content - that in intentional experience the world is represented in some particular way or other. Nevertheless, the phenomenological conception of intentional experience has certain other distinctive features. First, in phenomenology intentional experiences are conceptualised not as states having content but as acts having directness. Phenomenologists thus draw a crucial distinction between intentional acts of presentation (Gegenwärtigung) and of representation (Vergegenwärtigung).

26 Let us return to the connection between phenomenology and the enactive approach. The main explanatory tool of the enactive approach is the theory of self-organising and autonomous dynamic systems. Such systems bring forth or enact meaning in continuous reciprocal interaction with their environments.

“Inner” and “outer” are not pre-existing separate spheres, but mutually specifying domains enacted or brought forth by the structural coupling of the system and its environment. This subpersonal account of cognitive systems echoes the personal-level account of correlational structure of intentionality.

27 The correspondence between phenomenology and dynamic systems theory should therefore be understood as follows. External events are really transcendent, for they are certainly not contained within the system, nor are they every product of what goes inside the system.
Nevertheless, they are intentionally immanent, in the following sense: they do not arrive already labelled as external events; instead they are constituted or disclosed as such, and with the significance they have, by virtue of the networks autonomous (self-organising) dynamics.

In other words, their status as external events for the system (as opposed to their status for an observer of the system) is a function of the system’s own activity. Their meaning or significance corresponds to an attractor of the system’s dynamics (a recurrent pattern of activity toward which the system tends), which itself is an emergent product of that very dynamics.

The external world is constituted as such for the system by virtue of the system’s self-organising activity. Constitutional intentionality corresponds to a kind of self-organisation. This proposal is one of the key guiding intuitions of the enactive approach and neurophenomenology.

Boe: neurophenomenology. vgl. Varela 1996

28 The correlational structure of intentionality belongs to what Husserl called static phenomenology. As his thought progressed, however, Husserl found that he needed to articulate a genetic phenomenology, that is, of phenomenology whose point of departure is not the explicit correlational structure of intentional act (noesis) and intentional object (noema), but rather the genesis of intentional experience in time.

From the standpoint of genetic phenomenology, we need to account for the correlational structure of intentionality developmentally by an understanding how it emerges from inarticulate experience that does not have a clear subject-object structure. One wellspring of this kind of experience is the lived body (Leib); another is time-consciousness. The shift from static to genetic phenomenology thus marks the turn towards the lived body and time-consciousness.

29 Genetic phenomenology also brings with it a different way of thinking about the conscious subject. From a static viewpoint, the "I" is thought of as a kind of "ego-pole" of the noetic-noematic structure, in contraposition to the "object-pole"… The subject has to be seen as having a “life” in all the rich senses of the word - as formed by its individual history, as a living bodily subject of experience (Leib), and as belonging to an intersubjective “life-world” (Lebenswelt).

33 From genetic to generative phenomenology:
Late in his life Husserl began to move in still another direction - from genetic phenomenology to generative phenomenology. Already in genetic phenomenology intersubjectivity had arisen as an important theme, in the form of the dynamic coupling between self and other on the basis of their lived bodily presence to one another.

Generative phenomenology, however, widened the scope of this genetic analysis beyond the self-other relation to include the parameters of birth and death as well as the interconnectedness of generations.

Generative phenomenology concerns the historical, social, and cultural becoming of human experience. If static phenomenology is restricted in scope with respect to genetic phenomenology, then genetic phenomenology is restricted in scope with respect to generative phenomenology: the subject matter of generative phenomenology is the historical an intersubjective becoming of human experience, whereas genetic phenomenology focuses on individual development without explicit analysis of its generational and historical embeddedness.

34 In shifting from a genetic to generative register, the notion of the lived body is complemented with that of the life-world. The lifeworld is the everyday world in which we live. It is “always already pre-given”, serving as the horizon of all our activities, practical and theoretical. Two important aspects of this rich and multifaceted notion need to be mentioned here - the back-and-forth circulation or exchange within the life-world between empirical science and everyday human life, and the life-world as the pre-given horizon and ground of all human activity.

35 Husserl’s terms horizon and ground are metaphorical, at once visual and geological. The horizon is not a thing “out there” but rather a structure of appearance. It therefore implicates or points back to the perceiver for whom appearances are so structured.
In phenomenological language, “horizon” taking noematically as a structure of appearance necessarily implicates “horizon” taken noetically as a structure of consciousness. One could say that the horizon is the precondition for the appearance of anything, except that “precondition” is to static stated in a genetic register, horizon is a dynamic structure of disclosure in which both the object (noema) and consciousness (noesis) partake.

36 Generative phenomenology brings to the fore the intersubjective social, and cultural aspects of our radical embodiment. Individuals are born and die, they develop and constantly change, and they emerge from their forebears and perpetuate themselves in generations to come. Individual subjectivity is from the outset intersubjectivity, originally engaged with and altered by others in specific cultural environments. Individual subjectivity is intersubjectively and culturally embodied, embedded, and emergent.

51 Information and Meaning
Adopting an autonomy perspective brings with it a certain way of thinking about semantic information or meaning. For enactive theorists, information is context-dependent and agent-relative; it belongs to the coupling of a system and its environment.

52 What counts as information is determined by the history, structure, and needs of the system acting in its environment.

According to the received view in cognitive science, in order to explain cognitive abilities we need to appeal to the information-bearing states inside the system. Such states, by virtue of the semantic information they carry about the world, qualify as representations. Cognitivists conceive of these representations as symbols in a computational “language of thought”, and connectionist’s as constrained patterns of network activity corresponding to phase space “attractors” (regions of phase space toward which all nearby trajectories converge). In either case there is a strong tendency to adopt an objectivist conception of representation: representations are internal structures that encode context-independent information about the world, and cognition is the processing of such information.

This objectivist notion of information presupposes a heteronomy perspective in which an observer or designer stands outside the system and states what is to count as information (and hence what is to count as error or success in representation).

Information looks different from an autonomy perspective. Here the system, on the basis of its operationally closed dynamics and mode of structural coupling with the environment, helps determine what information is or can be.

53 From an autonomy perspective, individual neurones do not detect objectively defined features. Rather, assemblies of neurones make sense of stimulation by constructing meaning, and this meaning arises as a function of how the brain’s endogenous and non-linear activity compensates for sensory perturbations.

54 The distinction between autonomous meaning-construction and heteronomous information-processing needs to be placed in the broader context of the embodied dynamicist way of thinking about information. To explain this way of thinking, it will be helpful to go back to ideas introduced by Howard Pattee (1977). Pattee made an important distinction between two modes of description of a complex system - the linguistic mode, which describes the system in terms of discrete, rate-dependent, symbolic elements, and the dynamical mode, which describes the system in terms of continuous, rate-dependent processes, and thus explicitly includes the flow of time.

Pattee raised the following question: how do we know we are not interpreting certain structures as descriptions, only because we recognise them as consistent with rules of one of our own languages? In other words, how do we know our linguistic descriptions are not simply observer-relative, but rather correspond to symbolic structures that belong to the system itself and play a role in its operation? And he answered: we must further restrict our model of a complex system to remove the case of the external observer reading a message that is not really in the system itself. This restriction is achieved by requiring that the complex system must read and write its own messages.
The difference between autonomous meaning-construction and heteronomous information-processing:

Information is formed within the context rather than imposed from without. Gregory Bateson used to say, “information is a difference that makes a difference”.

We could elaborate this insight by saying that information, dynamically conceived, is the making of a difference that makes a difference for somebody somewhere. Information here is understood in the sense of informare, perform within (Varela 1979). An autonomous system becomes informed by virtue of the meaning formation in which it participates, and this meaning formation depends on the way its dynamics specifies things that make a difference to it.

Identity and Sense-making
In the needful freedom of metabolism, according to Jonas, we find the immanent purposiveness of life. Metabolism is the constant regeneration of an island of form amidst a sea of matter and energy. Metabolism establishes a self with an internal identity marked off from the outside world and whose being is its own doing. Metabolism operates according to internal norms that determine whether otherwise neutral events are good or bad for the continuation of the organism. In these ways, Metabolism is immanently teleological.

An organism must subordinate every change it undergoes to the maintenance of its identity and regulate itself and its interactions according to the internal norms of its activity. Life is thus a self-affirming process that brings forth or enacts its own identity and makes sense of the world from the perspective of that identity. The organism’s “concern”, its “natural purpose”, is to keep on going, to continue living, to affirm and reaffirm itself in the face of imminent not-being.

“Organic individuality” is achieved in the face of otherness, as its own ever challenged goal, and is thus teleological” (Jonas 1968).

The theory of autopoiesis can be called upon to complement this account. According to this theory, immanent purposiveness, the organisms “concern”, is not an extrinsic and heteronomous purpose or adaptive function, as in neo-Darwinism, nor any special vital force or entelechy, as in vitalism. Rather it is the twofold purposiveness of identity (self-production) and sense-making (adaptivity and cognition), based on autopoiesis.

The Mind-Body Problem
In finding our way to this problem, we have to jettison the traditional Cartesian vocabulary of mental versus physical entities and properties. The lived body is the living body; it is a dynamic condition of the living body. We could say that our lived body is a performance of our living body, something our body enacts in living.

An important philosophical task is to show how there can be an account of the lived body that integrates biology and phenomenology, and so goes “beyond the gap”. The scientific task is to understand how the organisational and dynamic processes of a living body can become constitutive of a subjective point of view, so that there is something it is like to be that body.

For the enactive approach, this task takes the form of trying to understand a lived body as a special kind of autonomous system, one whose sense-making brings forth, enacts, or constitutes a phenomenal world.

The human mind is embodied in our entire organism and in the world. Our mental lives involve three permanent and intertwined modes of bodily activity - self-regulation, sensorimotor coupling, and intersubjective interaction.

Self-regulation is essential to being alive and sentient. It is evident in emotion and feeling, and in conditions such as being awake or asleep, alert or fatigued, hungry or satiated. Sensorimotor coupling with the world is expressed in perception, emotion, and action. Intersubjective interaction is the cognition and effectively charged experience of self and other.

The human mind is crucial for these three modes of activity, but it is also reciprocally shaped and structured by them at multiple levels throughout the lifespan.
If each individual human mind emerges from these extended modes of activity, if it is accordingly embodied and embedded in them as “dynamic singularity” - and knot or tangle of recurrent and re-entrant processes centred on the organism - then the astonishing hypotheses of neuro-reductionism (Crick) - that you are “nothing but a pack of neurons” - is a category error and biologically unsound.

On the contrary, you are a living body list subject of experience and an intersubjective mental being.

281 Ernst Mach – visual field