Information and Reality: Contributions from the Science and Religion Forum

with Finley I. Lawson, "The Science and Religion Forum Discuss Information and Reality: Questions for Religions and Science"; Niels Henrik Gregersen, "'The God with Clay': The Idea of Deep Incarnation and the Informational Universe"; Michael Burdett and King-Ho Leung, "The Machine in the Ghost: Transhumanism and the Ontology of Information"; Marius Dorobantu and Fraser Watts, "Spiritual Intelligence: Processing Different *Information or Processing Information* Differently*?"; Matthew Kuan Johnson and Rachel Siow Robertson, "A Co-Liberatory Framework for Big Data"; Peter M. Phillips, "Digital Theology and a Potential Theological Approach to a Metaphysics of Information"; and Andrew Jackson, "Peacocke Prize Essay—Towards an Eastern Orthodox Contemplation of Evolution: Maximus the Confessor's Vision of the Phylogenetic Logoi."*

"THE GOD WITH CLAY": THE IDEA OF DEEP INCARNATION AND THE INFORMATIONAL UNIVERSE

by Niels Henrik Gregersen

Abstract. This article explores the relations between the idea of deep incarnation and scientific ideas of an informational universe, in which mass, energy, and information belong together. It is argued that the cosmic Christologies developed in the vein of Cappadocian theology (fourth century) and the Franciscan theologian Bonaventure (thirteenth century) can be interpreted as precursors of an informational worldview by consistently blending "formative" and "material" aspects of creativity. Reversely, contemporary sciences of information can enlarge the scope of the contemporary view of deep incarnation. I propose three hypotheses for showing how and why. First, mass, energy, and information have an equal causal importance for explaining reality. Second, just as transformation presupposes communication, so communication presupposes information. Third, contemporary science can elucidate seminal concerns of the idea of deep incarnation, insofar as informational structures pave the way for information capture, communication, and transformation. At the level of organis-

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mic life, new features of embodied cognition and emotion come up, important for understanding the organismic depth of the concrete incarnation in Jesus of Nazareth.

Keywords: Bonaventure; causality; communication; cosmic Christology; deep incarnation; Gregory of Nyssa; information; organicism; Stoicism; transformation

Introduction

The title of this lecture takes its cue from the great Franciscan theologian Bonaventure who in his *Brief Summary of Faith* (Breviloqium) speaks of "the God with clay" (Bonaventure 2005, 145).[1] When interpreting the implications of the incarnation of the divine Logos in Jesus, Bonaventure argued that logical or formative aspects of divine creativity ("Logos") both include and embrace material aspects of reality ("clay") *in extenso*, not limited to the historical incarnation in Jesus Christ.

This raises the question how this conjunction of formative and material features relate to different aspects of information addressed in contemporary science. In the first section, I argue that aspects of an informational worldview find precursors within classic Christian theologies of incarnation that adopted aspects of ancient Greek philosophy, especially Stoicism. By "precursors" for the informational worldview, I refer to continuous traditions for thinking about the relations between formative and material aspects of reality. I do not hereby suggest that later scientific discoveries of the importance of information derive from philosophy or theology, nor that scientific explanations cannot stand on their own. In some cases, however, philosophical and theological trajectories of thought had heuristic value for scientific findings and were operative for interpreting scientific findings as well. In this sense, a "path dependency" exists between the emergence of the informational worldview in science, and earlier philosophical and theological reflections on the relation between informational and material aspects of nature. Regardless of any such historical trajectories, however, my principal point is that one can hardly explain natural processes without assuming informational structures closely related to material processes—neither in science nor in theology. Among the Greek church fathers, Gregory of Nyssa (c. 331–394) reapplied the important Stoic idea of a mixture of spiritual and material features in humanity and developed a cosmic Christology accordingly. No piece of reality was to be untouched by the divine Logos. Hereby, Gregory developed a strong connection between creation theology and Christology. Bonaventure (1217/21-1274) went further along this line of thought by calling the cosmic Christ the "form of forms" (*forma formarum*), seeing Christ as the generative source of new constellations of information appearing in

the world of creation. Bonaventure combines this dynamical sense of the divine Logos with a likewise strong concept of a divine embrace of the universe, including the fragile dust and clay of the material world. Here, we find an anticipation of the contemporary proposal of "deep incarnation," that is, the view that the concrete incarnation of the divine life in the body and mind of Jesus of Nazareth is a microcosm of the cosmic Christ who is forever internally related to the material world at large.

In the second section, I present a brief history of why the concept of an informational worldview has grown in importance since the nineteenth and twentieth century sciences, from electromagnetism up to quantum theory. Information is increasingly viewed as a causally relevant feature of reality, always combined with mass and energy but irreducible to them. Electromagnetism led to a concept of energetic force fields while thermodynamics pointed to the occurrence of channeling effects that carve out informational pathways with causal and (sometimes) irreversible effects. Leading evolutionary philosophers, too, present biology as an information science of organismic coding structures. More recently, quantum computing has led to the even stronger claim that information takes the lead in instructing pathways of energy exchanges. Against this background, the third section proposes a typology of different aspects of information (differential, structural, and semantic), and I discuss how informational structures pave the way for communicative and transformative processes. The life of plants, far below the level of human consciousness, constitutes an example. In the last section, finally, I offer a more constructive interpretation of what a contemporary Christian theology can learn from the sciences of information. Certainly, one can embrace the informational universe without any religious perspective, staying within an agnostic or even atheist metaphysical framework. Nonetheless, I argue that the informational universe is open for religious interpretations beyond the options provided by a purely mechanical world picture. My particular point is that the interplay between information, communication, and transformation can further clarify the idea of "deep incarnation." Minimally, the idea of deep incarnation is congenial with our existence in an informational worldview. Maximally, the notion of deep incarnation may explicate features otherwise unexplained, especially the role of participation and empathy in evolution.

The Informational Universe: Theological Precursors

Reflections on the relation between form and matter were part of ancient Greek philosophy. In Aristotle, matter and form belongs together in any concrete being, but it was the Platonists and the Stoics who developed the idea of formative causes at a cosmic scale. To my knowledge, no ancient Christian philosopher had quarrels about the Aristotelian view of formative causes inherent in local individual substances. This was the

common sense of the day. However, combinations of (Middle- and Neo) Platonic and Stoic views of form were more important to Christian philosophers when developing theological views of the cosmic presence of God in creation. Christian thinkers easily adopted Plato's idea in *Timaeus* of God as the great artisan, the formative force of the universe. Soon, however, mainstream orthodox theologians were to challenge Plato's correlative concept of a recalcitrant and chaotic matter. In the latter half of the second century, Christian theologians reacted strongly to Platonist and Gnostic denigrations of matter. Rather, the world in its entirety, also the material world, is god-willed, created by God "out of nothing" (*ex nihilo*). Positively speaking, the material world was created "out of divine love" (*ex amore*), as a gift of the overflowing love of God. The world is not a foreign territory hostile to God, for "God saw everything that he had made, and indeed, it was very god" (Genesis 1:31, NRSV).

We find this view of divine love in creation reemphasized in Athanasius' work *On the Incarnation* (Ch. 3.3), the first theological treatise on incarnation written in the 320s (Athanasius 1971, 141). In the Cappadocian fathers (Basil the Great, Gregory of Nazianzus, and Gregory of Nyssa), writing in the latter half of the fourth century, we find the further argument that God created a universe in which spiritual and material aspects were consistently blended in an ordered mixture (*mixis*), even a thorough interpenetration (*anakrasis, katakrasis*). Human beings, in particular, comprise a blending of material and spiritual elements, thus forming a microcosm out of the macrocosm. On the premise of such permeation of spirit and matter, the incarnation in Jesus Christ is anything but a paradox but follows logically from the divine wish to be as close to the world of matter as to the world of spirit and mind. This was the argument developed by Gregory of Nyssa in his *Great Catechism* from the 380s (Gregersen 2020). In consequence, the aesthetic world of the senses and the spiritual world are of "equal value" (*homotimon*), as Gregory put it (Gregory 1994, 480). Accordingly, the divine can be experienced in the midst of the earthly realm.

From Augustine to Bonaventure

Let us now move from the Greek into the later Latin theology, from Augustine (384–430) to Bonaventure. In his *Literal Interpretation of Genesis* from 415 (Augustine 1982), he argued that God had eternal ideas for the structure and development of the world of creation (*aeterna rationes*; Book 4.24; 5.13). To this "Platonizing" motif, however, he added a more "Stoicizing" way of arguing that God the creator, at the very beginning of the universe, implanted into the world formative or seminal forms of rationality (*rationes seminales*; Book 10.20; 6.14). These "rational germs" are causing the future unfolding of creation over time (*semina futurorum;*

Book 6.11). According to Augustine, the six-day story of creation in Genesis may reflect some "before" and "after" as to their unfoldment, but God created the universe with the underlying principles of continuity-and-development at once, at a beginning of the universe beyond our rational compression. Augustine's so-called literal interpretation did not assume six days, like our days, for the principles of the six days were created simultaneously from the beginning of the universe (Book 4.1-7). Hereby Augustine combined a Neoplatonic view of divine mind with a more Stoic idea of formative principles of the material world.

Bonaventure, and the Franciscan tradition, went further by calling the cosmic Christ the "form of forms" (*forma formarum*), thus seeing Christ and Spirit as the generative source of the multifarious constellations of information appearing in the world of creation (Bowman 1975).[2] Bonaventure combined this dynamical sense of the divine Logos with a likewise strong concept of a divine embrace of the universe, including the dust and clay of the material world. In Bonaventure (Gregersen 2016), we find a more direct anticipation of the contemporary proposal of "deep incarnation," that is, the view that the concrete incarnation of the divine life in the body and mind of Jesus of Nazareth is a microcosm of the cosmic Christ who forever is internally related to the material world at large.

The idea of deep incarnation thus presupposes an affirmative creation theology. Together with God the Father and the life-giving Spirit, the divine Word or Wisdom (Logos/Sophia) is the creative source of all that was, is and comes into being. This emphasis on Christ as the creative principle of form was not least raised by the Pauline tradition: "In him all things in heaven and on earth were created, things visible and invisible" (Colossians 1:16, cf. 1 Corinthians 8:6). Accordingly, when divine Word/Logos/Wisdom embraced flesh in Jesus of Nazareth, the world was already constituted as the created nexus in which God was internally present as its creator and reconciler (Colossians 1:19–20).

In my interpretation, Bonaventure's image of the God *with* clay creatively brings together the creation story of Adam being formed out of the moisty dust of the earth (Genesis 2,7) with the Johannine claim of God becoming flesh: "And the Word (*Logos*) became flesh (*sarx*, or materiality) and lived among us" (John 1:14, NRSV). The formative power of God was always ubiquitously present in the texture of all material clay. Without claiming that divine nature is constituted *by* clay (so that God could not exist without the world), Bonaventure's point was that God created the world out of love, embraced the material world *of* clay in incarnation, in order to transform the material and spiritual forms of creation into its final unity with God. "This is the whole of our metaphysics: on emanation, on exemplarism, and on consummation," as Bonaventure wrote in his *Collations on the Six Days of Creation* (Book 1.17; 1964, 80).

The Father is the overflowing love of emanation, the Son the exemplary cause of all forms, and the Spirit the fulfiller of all life.

Bonaventure's view of the incarnate Logos with clay was not only about creativity but also about Jesus Christ suffering on the cross and cosuffering with fellow creatures. Bonaventure's vision thus entails an ethical, emotional, and passionate aspect too, insofar as he depicts the God with clay as existing in *community* with all fragile clay, enjoying the life of creatures but also cosuffering with the creatures in their disintegration and downfall. Speaking of Christ as the divine self-revelation means that by existing *as* clay (the body of Jesus as one body among other bodies) God has defined divinity as a life with and for the material cosmos at large. The purpose of divine self-incarnation in Jesus was to unite the temporally evolving cosmos with God's eternal life, that is, to communicate Godself to humans, and to bring about transformational processes within the world of creation. This is only possible under the aforementioned premise that God already dwells in the world, and lives with the material world throughout time and space. In his *Collations on the Six Days of Creation* (Book 2.20), Bonaventure combined a philosophical language of formative causation with a personal sense of the presence of Christ in each and any creature: "The face of the multiform Wisdom is in the vestiges of the divine works" (Bonaventure 1964, 124).

Such personal language is certainly metaphorical, for God is not a person like you and me. The notion of the perichoretic "persons" of Father, Son, and Spirit in the doctrine of the Trinity are not analogies to human personhood. Nonetheless, the personal language about God's relation to the world bears with it a realist intention. First, speaking of God as "personal" presupposes a real *divine interest and engagement* with reality; second, it points to the experiences of being *addressed by God*, spoken to by God as well as through other human beings (images of God) and through more than human creatures (vestiges of God); third, it exemplifies the unavoidable *participatory character* of religious life. Theological language therefore cannot be merely cognitive in orientation but must be based in forms of participative knowledge that includes communicative and emotional engagements with reality, too. Speaking about Christ thus includes a sense of being always already embraced by God, whenever being addressed by God and by more than human cocreatures over time. Similarly, there is a sense of being embraced by divine empathy in situations in which the world is experienced as silent, without manifest meaning, or even experienced as belligerent and repugnant.

The underlying argument is that *if* the fullness of God really became flesh in Jesus Christ (as Christians believe), *then* the incarnation in the historical person Jesus of Nazareth must be a self-expression and self-identification of God's nature and will for all time and space, not limited to geography and temporal epochs. Incarnation thus cannot be

an episodic affair. Incarnation cannot be skin-deep only, confined to the physiological body of Jesus of Nazareth, but must reach into the depth of matter, both in its splendor and in its disintegrative effects. As Rowan Williams reminds contemporary theologians, "The doctrine of Christ's person as developed through the patristic and medieval periods represented a steady trajectory of pulling away from mythological accounts of incarnation as if it were an episode in the life of a heavenly subject" (2018, 10).

In this spirit, the proposal of deep incarnation is an attempt to formulate a cosmic Christology in relation to contemporary concepts of matter and the material world, including the darker sides of experience. As *this* Jesus lived, *as* flesh, *so* the "God with clay" always and everywhere lives together with the material world and for the world of flesh. In this sense, any Christology is borne as a cosmic Christology, insofar as it was the eternal divine Logos who conjoined and revealed itself in Jesus of Nazareth, and God cannot be limited to time and space.

From Theology to the Contemporary Sciences of Information

This inerasable cosmic dimension of Christology is the reason why it makes sense for theologians to reflect upon how the God with clay relates to the material world of mass, energy, and information. In what follows, I will particularly focus on different aspects of information in contemporary science, aiming to show that information is on par with mass and energy in contemporary understandings of living in a material world. I will thus (very) briefly survey the history of scientific concepts of matter and the material, going from the corpuscular theory of matter in classical physics to the centrality of the concept of energy in electromagnetism and thermodynamics. On this basis, I will show why and how the concept of information has gained ever more ground in contemporary scientific explorations of reality, arguing that information is essential for explaining how nature works.

My first thesis will thus be that information should be accorded an equally important *causal relevance* for a contemporary concept of matter as mass and energy. My second thesis is that *information leads to communication*, which in turn *leads to transformational processes*. While the term "information" is a "cold" term compared with the "warmer" terms of communication and transformation, the difference between cold and warm can hardly be avoided, since physics speaks of the world in terms of grandeur but without attention to the emotional life in our shared cosmos. As I will argue, however, all three aspects—information, communication, and transformation—should be present at the same time in order to speak of the cosmic significance of Christ as the divine Wisdom forever incarnate in the world of creation. The third and last thesis of this lecture is that the

Christology of deep incarnation can be elucidated by information theory, especially if one agrees that purely mathematical concepts of information are "not enough" (Brier 2008) but need to include communication and transformation as well. At the level of organismic life, new features of embodied cognition and emotion come up that are highly relevant for the view of deep incarnation. Depth is not only about cosmic scope but also about Christ being materially ingrained in organismic life.

Towards the Informational Universe: A (Very) Brief History

Proponents of classical physics such as Isaac Newton (1642–1727) saw matter as fundamentally corpuscular and atomic, for matter is composed of "solid, massy, hard, impenetrable, moveable particles," as he argued in his *Opticks* (Newton 1952, 400). Newton began with the "primary qualities" of solid matter with measurable size and weight, removed the "secondary qualities" such as the perceiver-relative perceptions of color, and then hypothesized universal mathematical laws of nature (not least gravity), assumed to be imposed by God upon matter since the beginning of the universe. In the Newtonian world picture, the combination of corpuscular theory and the existence of universal laws made the assumption of God as creator and lawgiver the most probable, ultimate explanation.[3]

Electromagnetism and Thermodynamics: Field Views of Dynamical Matter

The corpuscular theory of matter was increasingly challenged during the nineteenth century. It began with the discovery of the electromagnetic effect in 1820 by the Danish physicist Ørsted (1777–1851), later developed into a theory of the electromagnetic field by the British physicist Michael Faraday (1791–1867). This field theory of matter did not only pave the way for Albert Einstein's much later general theory of relativity from 1915 but was also backed by parallel developments of thermodynamics in nineteenth-century physics.[4] In his *Remarks on the Forces of Inorganic Nature*, the German natural philosopher Julius Robert Mayers formulated a principle that pointed forward to the fundamental change in the scientific concept of matter. The essential property of force or energy consists of "the unity of its indestructability and convertability," as he put it as early as 1842 (Mayer 1980, 70). With hindsight, this passage is an intimation to the idea of the *constancy of energy* and to the corresponding idea of the *fluidity* of physical particles. A little later, in 1851, the English physicist William Thomson (Lord Kelvin) stated, "I believe the tendency in the material world is for motion to become diffused, and that as a whole the reversion of concentration is gradually going on" (Thomson 1980, 85).

Hereby, intuitions were formed that were soon going to be formulated in the first and second laws of thermodynamics. The first law of thermodynamics states that the amount of energy is always conserved when put into work and converted into heat. Thereby heat appeared to be a general property of matter. In 1865, Rudolph Clausius formulated the second law of thermodynamics, stating that energy exchanges are irreversible in the long run. In a closed system, a portion of energy converted into work dissipates and loses its force to do the same work twice. Thus, energy is at once a constant feature of matter, and an increasingly inefficient capacity of matter, as time goes on. Understanding the universe as a closed system by assuming the first law of thermodynamics, the law of entropy predicts the bleak perspective that the universe is going be less and less capable of producing the heat necessary for living organisms to survive.

Albert Einstein's general theory of relativity from 1915 further generalized the concept of matter-energy by understanding mass and energy as equivalent. In a vacuum, Energy (E) is numerically equal to the product of mass (m) and the speed of light squared: $E = mc^2$. At a closer look, this famous formula can have two different philosophical interpretations. It can mean that "mass" and "energy" are two equal properties of an underlying material system, or it can be taken to mean that energy and mass constitute the same stuff, which then appears with different emphasis in different systems. In some systems the mass-aspect of matter dominates, while at other places matter takes the form of a field. In Einstein's and Infeld's *The Evolution of Physics*, the latter view is expressed as follows: "Matter is where the concentration of energy is great, field where the concentration of energy is small" (Einstein and Infeld 1938, 242; cf. Flores 2004, 4–6).

This distinction between matter and field draws attention to the fact that most matter is invisible, and can only be evidenced indirectly by its gravitational force. Matter is no longer what it used to be, for it turned out to be quite a "dematerialized" concept of matter (Hanson 1962). Also the materialist philosopher Bertrand Russell admitted this insight by pointing out that "[a] piece of matter has become, not a persistent thing with various states, but a system of interrelated events" (Russell 1961, 241).

Religious Interpretation of the Dynamical Field View of Matter

This dynamical concept of matter has philosophical precursors, too. In his *Metaphysical Foundations of Natural Science* from 1786, Immanuel Kant stated in his very first definition, "Matter is what is moveable (*beweglich*) in space" (Kant 1786, A 1; 1957, 25). Accordingly, the empirical space of relations is always on the move (even though we, according to Kant, cannot but think of an absolute space, in which all relative movements are placed). Observable are only the material movements but *not form* itself, which Kant still viewed as a more noetic feature: "Matter, in contrast to

form, is what appears as an object of experience for external sense perception (*Anschauung*)" (Kant 1786, A 2; 1957, 2). On the top of this analysis, however, Kant formulated a generalized view of kinetics by pointing to a "law of antagonisms," in which forces of attraction (*Anziehung*) and repulsion (*repulsive Kraft*) operate in tandem (Kant 1786 A 154–57; 1957, 133–35).[5]

Only a little later, in his *Critique of Judgment* from 1790, Kant gave a new emphasis to the importance of formal features of nature. Insofar as biological organisms involve a natural purpose (*Naturzweck*), such as surviving and thriving, some sense of holism is to be assumed: "the parts are connected to a unity of a whole," in which the parts combine in such manner that parts and whole are "reciprocally cause and effect of their form to one another" (Kant 1790 A 287; 1957, 485). In other words, the whole exists only by means of its parts, and the parts exist only because of and in order to sustain and develop the whole. Hereby, the concept of form was reintroduced into the furniture of science.

The form- and field-oriented concept of matter gave space for new religious interpretations of matter and the material. Kant was the major philosophical influence on the young Ørsted (1777–1851), alongside with his scientific inspirations from Luigi Galvini's theory of "animal electricity" and Allesandro Volta's pile, or battery (Lindborg 1999, 193–96). Ørsted saw a rational divine law operative in the balancing of the centrifugal and centripetal forces of electromagnetism (Schnelders 1990). He therefore gave his last major book from 1850-51 the title, *The Spirit in Nature* (Oersted 1978).[6] In the same vein, Michael Faraday (1791–1867) generalized Ørsted's electromagnetism, and with his background as a Sandemenian Christian, he emphasized the presence of the divine Spirit in the energetic field (Agassi 1971).[7]

Later, Einstein found in Spinoza's pantheism a more satisfying model for articulating his religious sensibilities of a nontheistic divinity (Haught 2022, 18–33). Hereby, Einstein left time and temporal development out of the picture, even to the point of denying the death of people, and the status of individual organisms as real.[8] It remains a stunning fact, however, that biological systems, at local level, are capable to move up against the global stream of energetic dissipation of the second thermodynamic law. This capacity for self-organization against the stream has continued to raise a sense of awe for the built-in creativity in the world of the living, from microevolution to macroevolution.

Biology as Information Science

Quite independent from any religious interest, the evolutionary sciences posed new questions to earlier versions of materialism by bringing informational "codes" into the center of attention. Despite all claims of

causal reduction, physics (not only classical, but also modern) fails to explain the net outcomes of biological evolution. Even if some chemical compounds emerge due to chemical affinities fully explainable by physical laws, there exists no law for the sequences of the DNA macromolecules. Thus, genomes are arbitrary relative to underlying chemical affinities; they are formed as they are due to contingent historical circumstances. If DNA-sequences are causally efficient instructors by virtue of their informational structure, information can no longer be left out of a comprehensive picture of what drives nature. What is causally effective must be given status as something real. Eventually, information codetermines how organisms make use of their available energy budgets, as evident in evolution. This argument was made by one of the leading figures of mathematical Darwinian theory, John Maynard Smith (2000), later followed up upon, and extended into biological communication, by biological theorists such as Bernd-Olaf Küppers (2014). The story of the world has to be told, as it evolves, and continues to evolve. Put in the words of Stuart Kauffman, the sciences of complexity need both a new Newton, explaining the laws of self-organization, and a new Shakespeare who is able to tell the tale (Kauffman 2003).

How Deep Does Information Go?

With the digital revolution since the 1950s, building on the work of Claude Shannon, a new mathematical concept of information came to the fore. Shannon and Warren Weaver defined the mathematical concept of information as the minimal algorithmic compression of any given state of a natural system (Weaver 1949). Some have raised the critical question how "information" can be as fundamental as the mass and energy properties of the material, when we do not have measurable units of information comparable to *grams* regarding mass/gravity and *joules* regarding energy transformation. But arguably, we have in fact such measure in the fundamental units of "bits," that is, the series of *b*inary dig*its* of "0" or "1" needed to compress any available state of information.

Still so, some will argue the mathematical concept of information remains a purely technological concept of information (used only within digital computers). It so happens, however, that the measure for informational probabilities (subsequently to be compressed) builds on algorithms derived from the equations of the second law of thermodynamics in physics. Thus, there must be some inner relation between algorithms and physics. In terms of information theory, entropy can be regarded as measure of ignorance. "Ignorance is the flip side of information" (Davies 2014, 99), the former being the low degree of order and predictability, the latter the compressibility of information in a given system.

Building on the work of John Wheeler and Rolf Landauer, physicist Paul Davies has even hypothesized that "bits" can be seen as prior to the "its" of concrete materializations (Davies 2014, 95–101). The inherited order of mathematical laws, material configurations and information can be depicted as follows:

$$\text{Mathematics} \rightarrow \text{Physics} \rightarrow \text{Information}$$

This series secures the priority of laws in relation to concrete physical manifestations, which then leads to states that may subsequently be digitalized. But what if discrete events are prior to later outcomes? Then we have the following logical order:

$$\text{Information} \rightarrow \text{Laws of Physics} \rightarrow \text{Matter}$$

In this model, the basic furniture of the universe consists of discrete quantum events. Not so much digits, but *qubits* (quantum bits) matter.[9] As argued by Seth Lloyd in *The Computational Universe* (Lloyd 2006), a physical estimate of the "computational capacity of the universe" can be made, if one builds on standard assumptions of quantum physics. Planck's constant is the minimal "bit" (roughly 10^{-65} cm^2) to be put in relation to the fundamental parameter of the given universe (roughly 10^{122}), specified by the statistical laws of quantum theory. These mind-boggling numbers of the small and the big are only treatable by theoretical physicists. But the main idea is clear: Even if quantum events provide the basic "elements" of the universe, these events are no longer locatable with precision. Accordingly, the inherited matter myth has again become obsolete.

Common Sense and Religious Intuitions of an Informational Worldview

How can all of this be translated into human perspectives? Indeed, the advantage of the *corpuscular theory* of matter was that it spoke to everyday assumptions of material things—the chair being there, and the lamp here, and people have been ready to accept that chairs and lamps are constituted by elementary particles far below the threshold of observation. By comparison, the *field theory* of matter and energy requires a more principal farewell to common sense observations; however, it may still resonate with human intuitions of things somehow hanging together, and all things being somehow fluid.

Still speaking from a cultural perspective, I would argue that the idea of an *informational universe* is easier to accommodate from an everyday perspective than the idea of generalized energetic fields. Ordinary users of music and information retrieval of all sorts will know how the same message (such as a symphony of Beethoven, or a Beatles track) can be

heard in different media without losing much information. We have all experienced how the analogical medium of a vinyl LP has been transferred into CDs, and how they have further been transferred into the digital media of a USB or Wifi-streaming. While the focus on energy fields needed to break with the natural attitude of seeing things as discrete entities, most modern people have a customized sense of itemized yet fluid information transfers; the only thing needed is a compatibility between the information systems. In this sense, it is no longer true that "the medium is the message," for the mediums are translatable to one another with only a limited loss of information, apart from the "noise" involved in any physical medium. Curiously, the relative absence of superfluous "noise" in digital media is what is often felt as a loss for people used to analogous media, where one can visibly follow the tracks of the LP (and hear the bumbles), and read the sequences in physical books (and see the layout of discrete, right/left pages).

What about the possibilities of a religious interpretation of the thesis of an informational universe? In my view, there are some natural affinities between the informational universe and religious mentality. The common sense idea is that "information is all up in the air," even as it has a material grounding requiring a substantial amount of energy. Moreover, when the everyday digital user "downloads" something from virtual space in order to "access" some information, such procedure takes place in the accompanying awareness that we have access only to a very limited amount of the total information available. This reminds of the view of religion in Friedrich Schleiermacher's famous *On Religion: Speeches to its cultured Despisers* from 1799. Schleiermacher defined religion as an "intuition of the universe" as a whole (Schleiermacher 1996, 24). The universe exists "in uninterrupted activity and reveals itself to us very moment…[…] … Thus to accept everything individual as part of the whole as a representation of the infinite is religion" (Schleiermacher 1996, 25).

One, of course, can also relate to the informational universe while bracketing any intuitions of infinity. Some of the "new atheists" have expressed a particular uneasiness about any reference to the informational universe. In his book, *God and the Folly of Faith: The Incompatibility of Science and Religion*, physicist Stenger argues strongly against any scientific talk about information as fundamental, and explicitly he targets the theological appropriations of the idea of the informational universe as presented by Keith Ward, John F. Haught, and myself (Stenger 2011, 194–98). Similarly, he dismisses any possibility of top-down causality, as espoused by Paul Davies and other physicists (2011, 215–18). According to Stenger, all that physics needs is mass and energy; likewise, every mental feature is sufficiently explainable by its biophysical conditions, "from below." In principle, Stenger may be right that a future science will be able to explain also the particulars of life and culture in terms of physical energy

exchanges, purely from below. Measured by today's sciences, however, this is not a likely scenario, given that the sciences proceed by a specialization of disciplines, each with their specific explanatory powers.

My own view is that agnosticism is a legitimate intellectual stance, and so is atheism given personal (dis)inclinations. I would add that the committed atheist has nothing to fear from the idea of an informational universe. It is possible to interpret the many causal roles of information as a mere happenstance without any direct, or even indirect, religious implications. At any rate, the thesis of an informational universe will have to stand or fall on its own merits, without any religious or antireligious considerations. This being the case, the openness to religious interpretations of the informational universe should at least not count against the central idea of information in contemporary science, either.

From Information to Communication and Transformation

Discussions of information and different aspects of information theory are burgeoning in philosophical and scientific literature. These discussions move from speculative attempts to reformulate the whole edifice of scientific disciplines, either in terms of mathematical information theory or a pan-semiotic theory (Brier 2008, 35–45) to arguments for sorting out the discrete meanings of information within contemporary science (Floridi 2010; Robinson and Bawden 2013). I myself belong to the latter camp, and I confine myself to give only a few examples of the explanatory value of information, assuming that there will always be distinctions to be made between computational complexity and real-world complexity (Gregersen 2023). Nor do I think that consciousness can be seen as identical with the maximal degree of integrated information, as the Integrated Information Theory has it (Mørch 2019; Sánchez-Cañizares 2022). For my purpose, a piecemeal and conceptual approach suffices, by addressing three aspects of causal information (cf. Puddefoot 1996):

- Information (type1) is the proliferation of fundamental *differences*, based in quantum mechanics.
- Information (type2) is the proliferation of semistable physical or biological *structures*, and
- Information (type3) is causally relevant *semantic meaning*, involving a sense of the significance of the environment for a given organism.

The overall idea is that just as *informational events* (type1-information) are quintessential at the bottom level of quantum reality, so *informational structures* (type2-information) are the driving forces for the historical and evolutionary unfolding of biophysics, similar to the Aristotelian concept of form or structure (though here not restricted to individuals). By contrast,

semantic information (type3-information) always resides in locally rooted organisms. As I hope to show, information capture at this level includes two further aspects of semantic information:

- *Interactive communication* within and between organisms
- *Transformation* in sensitive living beings capable of responding internally to external differences, structures, and communications in the environment.

That information is seminal to quantum mechanics is the main thesis in Seth Lloyd's *Programming the Universe* (2006). Why at all use the term "information" about quantum events in the cosmos? Because each and every quantum event not only *does* something on the basis of the immediate situation of the universe (that is, performs an energy transaction), but by its occurrence it also *instructs* (informationally) the situation immediately following, in which other quantum events are going to occur. That is, quantum events *produce differences* (type1-information); these differences both make up the *status quo* of the universe at any given time, and inform the subsequent cosmic situation. As argued by Lloyd, "information and energy play complementary roles in the universe. Energy makes physical systems do things. Information tells them what to do," so that "the primary actor in the physical history of the universe is information" (Lloyd 2006, 40).

Instructional powers of information come to the fore in the world of biology. Quantum events produce distinctive events, whereas the world of the living is constituted by informational structures (type2-information) that build up resonances between parts and wholes. *Note bene*, as long as it goes, for in the end the flattening effect of the second law of thermodynamics takes the upper hand. In this respect, the conflationary powers of energy-exchanges will inevitably rule over the upbuilding powers of informational structures. Still so, pre-formed physical structures are part of the explanation why a group of living organisms persists. Information matters, as also energy does.

However, we also have semantic information (type3-information). This type of information is what we refer to in daily parlance: coming to know about something of importance. In *meaning information*, information is not only about *something*, but is of interest for *somebody* in a given *context*. Biosemioticists such as Hoffmeyer (2008) and Deacon (2014) argue that the concomitant aspects of aboutness and salience are already present at the biological level, even where there is no self-reflexive consciousness present. Plant life may constitute an example.

Information Capture, Communication, and Transformation in Plant Life

The Italian plant experts Stefano Mancuso and Allesandra Viola speak about intelligence in plants in their book, *Brilliant Green* from 2015. Mancuso and Viola argue that while plants do not have eyes, noses, or ears, they nonetheless have their own forms of sight, smell, hearing, taste, and sense of touch, in addition to senses unknown to humans (2015, 50–80). The sense of light is obvious from their capacity of *phototropism*, the leaves seeking the light, while plant roots avoid sunlight as far as possible. Similarly, they smell by their bodies, using *biogenic volatile organic compounds* (BVOCs) as "lexicons" to receive information from their environment. The fact of carnivorous plants presupposes a sense of taste as well, and we find that plants (such as the *Mimosa pudica*) immediately react upon being touched. Plants may not enjoy musical tunes but empirical studies suggest that they react positively to some sound frequencies, especially bass waves between 100 and 500 Hz. In addition, they have humidity gauges, and senses of gravity and electromagnetism important for their growth. Plants, in this sense, are "interested" in their environment because they are concerned about their own flourishing. This description is not unlike Kant's observation of the interdependence of parts and wholes in living organisms (see above).

Moreover, Mancuso and Viola argue from observations that just as a plant communicates with its parts by reorganizing itself due to inner disturbances, they also use electrical, chemical, and hydraulic signals to receive information and communicate with other plants of the same species, and with other species, including animals such as bees (2015, 81–122). On this basis, Mancuso and Viola ascribe a sort of "intelligence" to plants, even if they have no centralized brain systems. Plants are "able to receive signals from their environment, process the information, and device solutions adaptive to their own survival. What's more, they manifest a kind of 'swarm intelligence' that enables them to behave not as an individual but as a multitude—the same behavior seen in an ant colony, a shoal of fish, or a flock of birds" (2015, 5). There is, in other words, an intrinsic relation between *information* capture, *communication*, and (self-and-other) *transformation* in plant life.

How does such information-oriented understanding of plant life relate to more precise mechanistic explanations of growth and development in plants? Recently, a research group of molecular biologist from Aarhus University and the Technical University of Munich has succeeded in giving a biophysical explanation of the growth and development in plants due to the pinformed auxin transporter (PIN-8). Interestingly, the language used in this article (presented in *Nature*, January 4 2022) goes across disjunctions between mechanistic and informational language: "Auxins are

hormones that have central roles and control nearly all aspects of growth and development in plants" (Ung, Winkler and Schulz 2022, 1). Auxin hormones are thus described as examples of a structural information (type2-information). Moreover, the authors carefully admit that there is a lack of both chemical and structural data for understanding the broader molecular mechanisms of PIN-mediated auxins, even though they have presented a biophysical analysis of three important structures of a specific PIN-8 auxin, "Two outward-facing conformations with and without auxin, and one inward-facing conformation." On authority, I take this study as an example of a successful mechanistic explanation of a particular transport system that also involves internal processes of transformation. What the article does not discuss, however, is how to accomplish the full circle of information, communication, and transformation. What they offer is a very impressive *in situ* study of biophysical mechanisms. Concrete hormonal structures have specific causal effects on the proliferation of plant life. At the same time, an understanding of the auxin hormone within the plant itself, and the plant organism in its environments calls for supplementary, broad-scale understanding of plant life, complementing the mechanistic study. Other channels of information capture, and of the internal and external communication responsible for the transformative development (type3-information), are left out of the study, for sound methodological reasons. Here as elsewhere, the reductive approach is successful. Yet how the auxin hormone works at the organismic and environmental level is still an open question, left over to other kinds of studies of plant life.

As we will see in the next section, the semantic aspects of information (type3-information) are particularly important for the idea of deep incarnation. Semantic information is rooted in local organisms with communicative and transformational capacities. Accordingly, I argue that a cosmic Christology needs to be rooted in an organismic form, in the case of Christ the human person of Jesus of Nazareth. According to Christians, he alone lived and died in full resonance with God, and hence embodied divine life in its full presence.

Revisiting Deep Incarnation: From Information to Communication and Transformation

We now return to the theological concerns of deep incarnation in contemporary theology. I begin by depicting the contours of deep incarnation, while situating this concept in relation to other views of incarnation in contemporary discussion. On this basis, I show how the different aspects of information can illuminate the idea of the embodied Logos in the ordinary world of creation, while also pointing to the necessary role of the concrete incarnation in the extended body of Jesus.

Methodological Considerations

A first methodological remark . As already stated, the informational worldview stands on its own with or without any religious support, and does not in itself imply a religious perspective. Nonetheless, concepts of information, communication, and transformation in our informational worldview offer new resources for theological reflection, not as an argument leading from science directly into theological claims (in the vein of a natural theology), but as part of a contemporary theology of nature.

Another methodological point . While the language of science is and should be neutral and a personal, written from a generalized third-person perspective, religious language articulates human apprehensions of reality that include a deep participatory sense of "belonging" to a shared world of creation. Religious language therefore includes not only a *third-person perspective* when interpreting recurrent features of the world of nature (such as the distinctive forms of type1-3 information); similarly, religions address repertoires of shared human existence (such as life and death, meaning and meaninglessness). Alongside its cognitive interests, however, religious language also uses a self-involving *first-person perspective* when engaging with reality. Since religion is a personal affair without necessarily being private, religious language harbors a communal "we" as well as an interpretative "I." Moreover, religion also takes a second-person perspective when seeking to articulate the many ways in which the world "speaks to us," from stars to insects, from mountains to plants. Features of reality come to human experience in the form of an implicit address, and religiously attuned people experience themselves as addressees of an impinging reality that is calling for a response of wonderment and engagement; nature becomes a "you" that speaks to "me" or "us" as resonant and responsive selves. To be a human person is to be a *per-sona*, through whom (*per-*) lights and fluids, vibrations and sounds (*-sonae*) flow. Living in attunements, we become "resonant selves," and being religious is to a wide extent about attuning to the reality to which we belong (Rosa 2019, 258–68).

As we saw in the first section, the reason for speaking of the divine as "personal" is part of this participatory character of religious life: God is the "Thou" experienced in the midst of the vibrating "you" of natural and social occurrences. However, even as a religious perspective takes the form of participatory knowledge, it also entails a self-limiting element. We are both insiders that belong to nature, and outsiders who have parts of the world in front of us. Any speaker and listener is only one voice among many other voices within the nexus of creation, embraced by a mystery beyond any particular voice. The mystery of communication cannot be fully expressed in any particular human language, theology included. Genuinely religious people are therefore inclined to be skeptical regarding attempts to explain reality from a single perspective, be it from a metaphysical, scientific, or

theological vantage point. This also applies to speaking of Christ. There exists no all-encompassing or "correct" Christology.

A third observation. It is not possible to speak about God without at the same time speaking about *human* experiences of reality. In this sense, any theology starts out from type3-information also when interpreting type1 and type2 forms of information. We know from experience that we ourselves are fragile creatures ("clay"), and that nothing in the world around us is permanent but part of a vast informational network. In Christology, too, the sense of the personal and the more-than-personal is interlinked. In the Eucharist, for example, the personal address says: "Take this, and eat it, this bread it is given for you." Yet this personal summon is associated with spatial metaphors referring to material objects, when Christ is said to be present "in" and "as" the natural bread, just as the presence of Christ is said to "surround" and "embrace" those who partake in the meal. Just as the personal and the nonpersonal are intertwined, so the spiritual and material aspects belong together in the Eucharist, in which Christ is supposed to be present.

Incarnation between Incarceration and Panincarnationalism

Now to the substantial concerns of the proposal of deep incarnation. Deep incarnation is an attempt to relate the story of the life and death of Jesus (sometimes called the "strict-sense"-incarnation) to the presence of the embodied Christ in the universe at large (the "full-scope"-incarnation).[10] As such, the proposal of deep incarnation is placed in the middle between two more extreme views. On the one side, we have an understanding of incarnation as merely an episodic event of the past, confined to the historical appearance of Jesus Christ; here, incarnation is presented as a kind of *incarceration*. On the other side, we have a *panincarnationalism* that would argue that simply everything is to be seen as a divine incarnation.

Neither Gregory of Nyssa nor Bonaventure could take any of these positions. To them, the divine Logos was fully present in Jesus of Nazareth in a revelatory way, and since Jesus revealed the eternal character of God as compassionate love, Christ cannot be locked into an episodic period in human history. For the Jesus Christ acting and speaking to people in his historical incarnation, and the cosmic Christ, creative and cosuffering, must be one and the same.

The group of contemporary theologians who insist that the Son of God was only embodied in the 30 years, state a principal distinction between Logos in the incarnate Son (Jesus Christ) and the role of Logos as creator from beginning to end. I have earlier argued that the distinction between creation and incarnation, helpful as it may be for pedagogical purposes, turns into a reification when projected upon divinity. There are not two Christs: the eternally unembodied Logos of creation and the incarnate

Logos confined to time and space (Gregersen 2015, 365–68). Such isolation of the historical incarnation is not only an infringement on the unity of Christ, it also makes the Christian idea of incarnation into a miraculous exception, a paradox that defies any understanding. But if the historical Jesus was the full embodiment of divine life, then the character of God's nature must forever be the same in relation to the world *in extenso*—also prior to the historical incarnation, and also outside the Christian church. Nonetheless, I agree that any full-fledged Christology should take its methodological starting point in the concrete Jesus story in order not to lose focus. Only a concrete human person, fully resonant with God, can communicate God in the fullest sense, and thus make transformational processes possible for other humans.Proponents of the singularity of the historical incarnation rightly emphasize that a cosmic embodiment of Jesus Christ is not enough, if Christ is to reveal God to other humans. Revelation, after all, is a relational term that presupposes a semiotic triangle between a *revealer* (Jesus), a manifestation of that which is *revealed* (God), and a *community* to whom it is revealed and who can to some degree absorb what is communicated. For this to happen, we need a particular human life with eye-opening stories, and a death that is identified as a divine sharing of pain and death.

The other side of the dichotomy is the *panincarnationalist* view. In this view, all that exists is an immediate expression of divine nature, revelatory of divine identity. As the embodied world is, so is Christ. This suggests a pantheist identification of the cosmic Christ with the fields of power in the forces of natural systems (and in the social forces of human history as well?). I see two problems with this approach. The first is that the panincarnational approach risks being a mere linguistic duplication of the fact that all physical, biological, and social systems are already embodied, or "incarnate." However, speaking of an incarnational presence of the divine in the world of creation requires that something specific is said about the self-identity of the God who is supposed to be involved in, with, under, as well as *for* the embodied creatures who live in time and space. My point is not to place the divine in a separate realm beyond this world. But with no distinction between God and creature, the term of the incarnate God is used only in a predicative sense, as a theological ornament on ongoing natural processes and systems.[11]

The second problem is more acute from an ethical point of view. Incarnation refers to a divine self-embodiment with revelatory significance. *Incarnation = embodiment + self-revelation*. However, it seems difficult to assume that all informational aspects of reality are revelatory of divine will and nature—at least if we by "God" understand the overflowing power of a love, who is both creatively and compassionately engaged in the experiences of joy and woe of sensitive creatures. Deep incarnation, as we have seen, claims that the God with clay is certainly *omnipresent* in the world of

creation but not that God is *omnimanifest* in the material world at large. At least since Darwin, we have come to realize that the world is a belligerent and sometimes cruel place alongside being a place for natural beauty and splendor. Likewise, it would be a fallacy of misplaced generalization to think that just like the life and death of Jesus is revelatory of God's being and mind, so all other human beings (Hitler, Stalin, Putin, and ourselves) are likewise revelatory of the divine will and nature. There is a fundamental distinction to be made between God as the uncreated Creator, and the very mixed world of creation. As the Jewish prophetic tradition reminds us, not every happenstance resonates with God: "As the heavens are higher than the earth, so are my ways higher than your ways and my thoughts than your thoughts" (Isaiah 55:9).

The Conceptual Framework of Deep Incarnation

The idea of deep incarnation derives its basic concepts from biblical sources. "In-carnation" literally means "going into the flesh," or even "becoming flesh." In the Johannine tradition, "flesh" (Greek: *sarx*, Latin: *caro*) covers three different yet also interrelated dimensions:[12]

- First, we have *sarx1*, that is, the concrete "body and flesh" of Jesus from Nazareth, as we have it in John 1:14: "the Word (*Logos*) became flesh (*sarx*) and lived among us" (NRSV).
- Second, we have *sarx2*, that is, the "sinful flesh," a meaning present not only i Paul (Galathians 5–6) but in John too: "What is born from the flesh is flesh, and what is born from the Spirit is spirit" (John 3:6).
- Third, we have *sarx3*, referring to the realm of materiality in its most general extension—without any prior evaluation, though perhaps with a special note of something transitory and vulnerable to decay.

Flesh is that which both flowers and fades, as we have it in the Jewish conception of *kol-bashar* ("all flesh"). Living as a human being within God's creation *and* living as the Son of God incarnate means to live as an embodied human being (sarx1), while at the same time living in the wider material world (sarx3). Again: not the one without the other! For just as any living organism is communicating with its environment, and is thereby transformed, so was Jesus interacting with his natural and social environments.

The general sense of flesh (sarx3) is well-known both in Greek antiquity and in the Jewish tradition. In Greek philosophy (both Aristotelian and

Stoic), *sarx* referred to the whole material world under the moon, in which earth and water were the predominant physical elements. In the Hebrew Bible, we find references to "all flesh" (*kol-bashar*) approximately 40 times. At the level of ordinary flesh, human beings can therefore be likened to plant life, to grass and flowers: "All people are grass, Their constancy is like the flower of the field…" (Isaiah 40:6-8; cf. 1 Peter 1:24).

The whole point of cosmic Christology is that the divine Logos and Wisdom conjoins the ordinary world of vulnerable flesh (sarx3), so that the face of divine Wisdom comes to shine in any creature, as Bonaventure put it, but also experiences its flourishing and disintegration from within. Observe here that central features of communication and transformation *only* appear in the context of concrete organisms and bodies (sarx1). This is an argument for why the divine incarnation *had* to be local and organismic as well. Communication, however, contains very different signals and messages. Signals of invitation exist alongside signals of fight, while most signals are of an indifferent kind, showing neither positive interest nor competition. This means that experiences revelatory of love and compassion are rare but so much more significant. Only seldom do human beings encounter disclosure experiences in the midst of creation. Such experiences may come up by observing stars, enjoying sunlight, following the beauty of animal movement, being part of a concert, or looking into a newborn child's eye. These are important signals of love and compassion, rare (and sometimes costly) as they are. Accordingly, we find in the New Testament two different meanings of the term "cosmos."

- *Cosmos1* refers to the attractive world of creation as we have it in John 3,16: "God so loved the world that he gave his only Son."
- *Cosmos2* is the negative designation of a world in endless strife and fight, as in John 17:16: "They [the disciples] do not belong to the world, just as I do not belong to the world."

Much like sarx3, cosmos1 refers to the realm of materiality in its most general extension. This world is affirmed by divine love, and both embraced and assumed in incarnation. Yet, the world also designates a world of strictures and sin (sarx2). This is particularly manifest in the human world. Speaking of Christ, Paul emphasized that God "sent his Son in the likeness (*en homoiōmati*) of the sinful flesh" (Rom 8:3). Similar negative meanings of *sarx* also appear in the Gospel of John.

These negative connotations raise the question of the relation between "flesh" as designating the evils of sin (sarx2 alias cosmos2) and "flesh" designating the world of creation as affirmed and loved by God (sarx3 alias cosmos1). As indicated above, the problem of panincarnationalism is that it speaks in rosary terms about a world that is not always very rose-like but is experienced as a mixed bag of beauty and ugliness, good and evil.

Deep Incarnation and the World of Embodied Forms: From Information to Transformation

Astonishing parallels between the informational worldview and the view of deep incarnation come up, both at cosmic and at organismic level. Deep incarnation is thus both about the full scope of informed material existence and about the depth of organismic life that involves communicative and transformational processes.

Let me begin with type1-information leading to type2-information. It so happens that the Greek term Logos (in Western theology usually translated as "Word") means "speech" but also "decision" and "resolution" (Brill Dictionary 2015, 1249). In the biblical creation account, divine Logos makes distinctions (type1-information) and recollects the differentiated features into formative patterns (type2-information). Thus, Genesis 1–2 depicts divine creativity as separating light from darkness, day from night, thereby opening up the space of creation for physical structures (heaven and earth, sun and moon, etc.) as well as for the multifarious world of plants, birds, land creatures, including humans. Moreover, the work of the Creator is described as entangled with the internal dynamics of creation. God "saw" what had come up with enjoyment (Genesis 1:31), and remained committed to the world of creation. Michael Welker puts it as follows, "The creating God is not only the acting God, but also the reacting God who responds to that which has been created … God's action [is] action that reacts, that lets itself be determined" (Welker 1991, 61).

In the Prologue to the Gospel of John, the divine Logos is likewise described as creator, since "all things came into being" through the Logos (John 1:3). But the Logos also "became flesh" (1:14); this can be seen as a divine reaction, or countermeasure, to the fact that the history of evil has prevailed, or it can be seen as a creative response to a world that is still unfinished, in need of flourishing and of overcoming its inner strictures. So, the debut of the Johannine Jesus into the public realm was exactly about enhancing the joy at a wedding feast where the hosts went short of wine for the guests (John 2:1-11). Yet, the incarnation was also about the divine Logos counteracting the dark forces of the world, bringing and spreading "the true light, which enlightens everyone" (John 1:9-11). The divine wish is to "communicate" the light into the human world in order for them to be enlightened, or "transformed." Incarnation is here related to the type3-information of the communication of meaning and transformation. Again, incarnation means God being radically present at the roots of creaturely existence, but also present in a communicative and self-revealing manner for the purpose of achieving a transformation of human minds and hearts.

We began in creation theology. The divine Logos is the everlasting *creative source* of all the informational differences (type1-information) that

emerge in the history of the universe. At this level, one cannot separate divine creativity from ongoing creative processes in the world of creation. God is at work in, under, and trough self-generative or "autopoietic" processes (Gregersen 1998). When speaking about the divine Logos as the creative source of type1-information, I thus refer to the same informational universe that quantum physicists speak about. In the same manner, when Genesis 1 speaks about God letting a multifarious world of living organisms appear, it refers to aspects of type2-information that actually come to the fore in semistable structures of biological life. However, as we have seen, religious and other forms of human language cannot but speak of the shared world of creation from the perspective of a semantic interpretation, type3-information.

A theology of creation and incarnation adds two perspectives, not contrary to but complementary to physics and biology. First, speaking of God as creator presupposes some latent meaning and intentionality already at the level of physical processes. Such assumption of meaning cannot be part of scientific descriptions of physical events and biological structures. Second, the religious perspective of incarnational thinking includes an ethical concern as well, which goes beyond purely mechanistic descriptions of organismic life. However, the interlacing of the three aspects of information is important, since we live in a world in which formative and material aspects belong together; we "feel" reality, alongside "knowing" about it, and therefore make evaluative judgments about ethical options. Such ethical evaluations seem to dovetail on aspects of type3-information in prehuman organisms. As soon as sensitive organisms begin to "feel" and "react" to distinctions between light or darkness, food and nonfood, primitive forms of evaluations emerge. The spiritual dimension of material life begins, when the natural sense of what is proficient for the organism, and what is detrimental to it, crops up. With sensitive organisms, we reach a merger of spiritual and material aspects already within the world of nature.

Deep Incarnation and the Problem of Theodicy

This raises the problem of natural evil for any theology of creation that understands God to be the creator of all-that-is. Divine creativity coincides with fundamental aspects of type1- and type2-information, as we saw. Disintegration and death, pain and suffering, therefore constitute a religious problem within monotheistic religions such a Judaism, Christianity, or Islam. There are two easy ways out, however. One is to say that *God doesn't care*: God is indifferent, for "God" is just another name for natural processes. This is the pantheist solution that refrains from speaking about the divine in personal terms. Another is to say that *God can't*, for God is only responsible for the formative features of reality, but not for the material world which eternally exists as a chaotic principle prior to any formative

influence by God. This is the Platonic solution, revived by contemporary process theism.

The Christian idea of incarnation takes a third route by staying with the problem rather than looking for outlets. The Logos who became incarnate is the Logos who is (part of) creating the world. Moreover, God continues to take interest in the self-interested creatures who experience the zest of life but also feel disintegration, pain, and suffering in their own bodies. The organismal perspective is here central. What happens in the "historical" incarnation of Jesus Christ is that God takes on the costs of the package-deal of joy and pain by experiencing the joys and woes of organismic life from the inside (Gregersen 2001). God does not only "know" of pain and death, but "feels" the reality of natural evil. The incarnation of the divine Logos is thus both an affirmation of our shared material world, and a response to the dark aspects of creaturely life, including individual suffering (Southgate 2008, 48–79).

The Importance of the Organismic View: The Extended Body of Jesus

The divine feeling of creaturely existence from the inside perspective presupposes the *organismic incarnation* of the divine Logos in Jesus Christ. Jesus lived as a *concrete body* (sarx1) with a *human mind*. Only with organismic life do we reach the semantic threshold of type3-information, and only by being a full human person did Jesus have access to the extensive scope of self-reflection that opens up the capacity to understand others from the standpoint of others.

In the perspective of deep incarnation, it is both trivial and of central importance that Jesus lived as an "extended body" (Gregersen 2012)—breathing in and out; following pathways between mountains, flat land, and lakes; seeing and enjoying birds and lilies, seeing the sky as open. Likewise, he lived as a "social body," with families and followers, sharing the company with strangers, social outcasts, and ethically problematic persons too. It was to people of mixed provenance and ethical status that he communicated the gospel of the reign of God, and invited them in. He communicated to them about the uncompromising law of divine mercy, telling them parables of ordinary life imbued with spiritual meaning. He lived as he taught, and did not seem to have been plagued by the tendency to attack when being attacked, or to hide in face of impinging dangers. The gospels describe him as an observant Jew but also as a prophetic critic of aspects of contemporary Judaism related to the temple cult, and to the domestication of law among Pharisees and Sadducees.

Increasingly, he experienced resistance from Jewish and Roman authorities, and worst of all: from the ordinary people to whom he belonged. The execution of Jesus may be a probable result of these factors. But the gospels emphasize that he himself accepted the way to pain and death, and

did so out of the conviction that this was his appointed role. As he lived so he died right out of the heart of God, as it were, but without separating himself from others. When dying he even forgave those who had tortured him.

I'll stop retelling the gospel stories here. My point is that *if* the eternal divine Logos was really "incarnate" in Jesus of Nazareth, *then* this means that the eternal identity of the divine *includes* physical pain, biological death, mental anguish, and social loneliness—all aspects characterized the life and death of Jesus. Not only creativity and inventiveness, but also suffering and the experience of dying and death are forever part of the nature and life of the eternal God. In a transparent (or "revealing") manner, Jesus was the *iconic presence* of his heavenly Father, living in a constant *resonance* with the life-giving divine Spirit by following her callings. At the same time, he also *represented* the Father by pointing away from himself, saying that God is greater than him.[13]

Alongside this "vertical" axis of Jesus' life, enacting the will of the Father and following the promptings of the Spirit, there is also a "horizontal" axis in Jesus' way of life, living down to earth, and even deep down into the earth. He was composed of the same biochemical elements as the earth, microorganisms and stars: His blood was red due to iron from bygone stars; he vegetated like plants; he was always on the move, sharing the life form of wandering dogs and flying birds, a homeless having his home everywhere. He was enjoying the flights of the bird (without himself flying). All these earthly elements reappear also in his death. At the cross, he was suffering while being bound to a tree, similar to the constriction of lambs and pigs before they are slaughtered. In all respects, Jesus was a microcosm of the macrocosmic world of physical elements and biological organisms.

There is much more to say about the implications of the cross of Christ, but the important point here is that it became his fate to share the conditions of animal and human suffering, until his life was reduced into nothingness. There is also much more to be said about the resurrection of Jesus, but a few points are particularly important from the perspective of deep incarnation: First, by being "raised from the dead" (in the passive form) he was dependent on the life-giving Spirit, himself being dead. Second, he was "raised" into the eternal life of God, who is present everywhere in the universe. Thereby, the suffering, dying, and passive experiences of Jesus were taken up into the eternal life of God. Accordingly, God is not only creative, and also more than merely compassionate (from a higher position, so to speak); rather, God carries suffering and disintegration, death and the experience of dying within divine life itself. Third, Jesus was not raised into God as a mere individual, in splendid isolation. Rather, in the perspective of deep incarnation, also humanity, and the more than human world of living organisms, has a place within the divine life.

In the terminology of classic Christian theology, we may say that there is a twofold divine "assumption of the flesh" (*assumptio carnis*): "Incarnation" refers to the divine embrace and assumption of the material world. "Resurrection" refers to the divine embrace and assumption of the extended body of Jesus, with all his cosmic lineages, into divine life.

In this sense, the cosmic Christology of deep incarnation is internally related to the idea of the singular incarnation in Jesus. What I have argued is that while the type1- and type2 forms of information may suffice for speaking about the concerns of cosmic Christology in general, the type3-forms of information (information capture, communication, and transformation) only appear at organismic level as iconically exemplified in the Jesus story. As we saw, one needs the type3-forms of information in order to speak of Christ, both as the creative logos and as the suffering God. Otherwise, the identity of Christ would disappear and break up into an abstract creative principle, on the hand, and a tragic human person, on the other.

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Notes

1. The expression "the God of clay" in Bonaventure's *Breviloqium* IV.4 (2005, 145) was earlier used by Bernhard of Clairvaux in a sermon on the "Nativity of the Lord" (Bernhard 1862, 98).
2. Bonaventure was here using resources from the Greek fathers, notably the mystic Pseudo-Dionysius (late fifth to early sixth century) but also Maximus the Confessor (c. 580–662). Recent scholarship has pointed to the continuity between Patristic and Scholastic thought, in particular regarding Maximus and Bonaventure (Pino 2014; Tollefsen 2015). On Maximus' cosmic Christology, see Tollefsen (2008).
3. As Newton wrote in his *Optics* from 1704: "All these things being consider´d, it seems probable to me, that God in the Beginning form´d. Matter in solid, massy, hard, impenetrable, moveable Particles, of such Sizes and Figures, and with such other Properties, and in such Proportion to Space, as most conduced to the End for which he form´d them; and that these primitive Particles, being Solids, are incomparably harder than any porous Bodies compounded of them; even so very hard, as never to wear or break in pieces; no ordinary Power being able to divide what God himself made one in the first Creation" (Newton 1952, 400).
4. On thermodynamics, I reuse material presented in longer form in Gregersen (2014, 415–18) adding new philosophical perspectives.
5. In *Matter and Motion* from 1877, Maxwell began in delineating physics to particulars. In physical science, so Maxwell, "the first step is to define the material system which we make the subject of our statements," while "leaving the rest of the universe out of account" (Maxwell 1991, 2). On this basis, Maxwell went on to describe "the laws of motion" in thermodynamics. In the end, however, Maxwell addressed more universal features in his "third law of motion": "Reaction is always equal and opposite to action, that is to say, the actions of two bodies upon each other is always equal and in opposite direction" (Maxwell 1991, 40), while pointing to "the interplay between forces of attraction and forces of repulsion" (1991, 41–42).

6. Curiously translated into English under the title *The Soul of Nature*: "The laws of nature in the material world are laws of reason, revelations of a rational will… Soul [Danish: Spirit, *Aanden*] and nature are one, seen from two different sides: thus we cannot cease to wonder at their harmony" (Oersted 1852, 384).

7. In the German theologian Wolfhart Pannenberg, we find a similar interpretation of the energetic force field, building on Faraday (Pannenberg 1994, 79–84).

8. See Einstein's letter to the family after the death of his close colleague and friend, Michele Besso (March 15, 1955): "Now he has departed a little ahead of me from this quaint world. This means nothing. For us faithful physicists, the separation between past, present, and future has only the meaning of an illusion, though a persistent one." Here rendered in Max Jammer's translation of the German letter (Jammer 2002, 161).

9. I here present, in brief form, the more extended discussions in Gregersen (2014, 423–30).

10. Since I framed the concept of deep incarnation as a theological response to evolutionary suffering (Gregersen 2001), I have had the privilege of developing the idea in collaboration with many like-minded scholars and sympathetic critics. Many of these voices are present in the explorative debate book, *Incarnation: On the Scope and Depth of Christology* (Gregersen 2015). For excellent critical analyses and concise overviews, see Lenow (2018) and Edwards (2019). Within theology, discussions have rightly pointed to the need for developing ideas of a corresponding "deep pneumatology" (e.g., Celia Deane-Drummond and Elizabeth A. Johnson). Johnson's work has been particularly helpful for articulating a view of "deep resurrection," adding new perspectives to the original proposal (Johnson 2010). Other scholars have been important for further developing the evolutionary and ecotheological implications of deep incarnation (Henriksen 2014; Johnson 2018; Edwards 2019). Ernest Lee Simmons has developed deep incarnation in relation to aging, illness, and pandemics (Simmons 2019, 2021).

11. I have with great interest followed Matthew Eaton's work on ecotheology and deep incarnational thinking (Eaton 2014). While I share his general criticism of anthropocentrism, I think that the humanity of Christ remains important for any Christology, but calls for an interpretation beyond anthropocentrism. I look forward to see his forthcoming book, *Incarnate Earth: Deep Incarnation and the Face of Christ* (Routledge 2023). Will he somehow qualify or further strengthen the pantheistic orientation of some of his earlier work?

12. I here recapitulate the terminology laid out in greater detail in Gregersen (2015, 228–39).

13. In *God and the World of Signs* (Robinson 2010), Andrew Robinson has used the semiotic philosophy of Charles Sanders Peirce to develop an impressive theological interpretation of the Trinity, including incarnation and anthropology. It would take another article to give full justice to Robinson's interpretation. At fundamental level, he interprets the incarnation in Jesus as an "iconic qualisign," insofar as Jesus embodied the very quality of God's being (2010, 124), but Robinson also admits that Jesus is an "indexical sign" referring to the Father (2010, 126–27). Deep incarnation would add an emphasis on the relation between the life of Jesus and the cosmos. Thus, the biophysical life of Jesus is both an iconic presence *and* an indexical reference to the creativity and fragility of the material world, which the divine Logos conjoined and embraced as an inescapable part of the incarnation event.

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