Relational Process Atomism: Epistemological and Methodological Considerations on the Metaphysics of Transactions

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Abstract "Relational Economics" places the category of *relation* at the center of its conception. This fact requires consideration of how the category of relation relates to other conceptual pillars of "Relational Economics," namely, the (distinct) *transactions* and the category of *event* or *process* ("Relational Economics" draws on Whitehead's "Process Philosophy"). On the basis of a "Business Metaphysics," which is dedicated to the question of "how the economic world works (in general)," the chapter analyses the *epistemological* and *methodological* implications of this theoretical strategy and summarizes the result with the heading "Relational Process Atomism." The chapter argues that only a *realistic* epistemology is suitable to adequately address the controversy between different types of metaphysics. Thus, logically the usefulness of our theories—including our metaphysical theory, how the world works, or our economic theory, how the economic world works—depends on whether they sufficiently represent the "way the world really is." Whitehead's cosmology and Commons' economics now specify these metaphysical implications to the effect that they argue for a "Relational Process Atomism" that assumes "*events*" as "*atoms*" ("actual occasions" or "transactions" as ultimate units) with *internal relations*, which are then referred to as "relational transactions" in "Relational Economics." *Methodologically*, research into the functioning of these "relational transactions" can only proceed through a step-by-step "tinkering" (Popper), which is illustrated by Whitehead with the image of a repeated take-off and landing of an airplane.

Keywords Event · Ultimate unit · Atom · Ontology · External relations · Internal relations · Epistemology · Methodology · Metaphysics · Theory of Relativity · Quantum Physics · Process Philosophy · Social Ontology · Transactions

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1 Introduction: The Lego Universe

Denmark is best known for one product in particular—and that is Lego.[1] Lego is probably the most famous and popular product from Denmark. Each and every one of us played with Lego in childhood and loved it (more or less). Therefore, I will start with some ontological remarks about the Lego universe. Unfortunately, the metaphysical thesis of my chapter will state that the "universe" of modern economics does *not* work like the Lego universe. But nevertheless—or precisely because of this—these notes on the Lego universe are hopefully useful.

If we analyze the Lego universe ontologically, three points can be noted: (1) First of all, the Lego universe consists of bricks. The classic Lego brick is the two-by-four (2×4) brick. But as everyone knows, there are even smaller bricks in the classic Lego universe, and the real basic unit is the one-by-one (1×1) brick.[2]

So there are basic building blocks in the classic Lego universe: ultimate units. These basic units cannot be divided any further. Ontologically, these building blocks are the "atoms" (gr. ἄτομος = "uncuttable," "indivisible") of the classic Lego universe. (2) Secondly, it must be noted that these are pre-fabricated, unchangeable building blocks. They do not change, nor can they be changed without damaging them. They are—to use Isaac Newtons's words—"solid, massy, hard, impenetrable, moveable Particles," which—themselves unchangeable—can form all possible "may compose Bodies of one and the same Nature and Texture in all Ages".[3] Ontologically, it is thus to be stated that there are no processes at all in the ultimate (basic) units of the Lego universe. The building blocks remain substantially unchanged. They do not exist as events, but as ready-made "substances." (3) And finally, they have only external relations, no internal relations. "Internally," such a brick remains the same. If I put two bricks together (= external relation) and then take them apart again, then it is still exactly the same building block which has no internal relations. The relation to other building blocks does not change our brick "internally." So, external relations only.

In the following, I would like to develop the metaphysical concept of a "Relational Process Atomism," which describes the reality in our *real* universe much better than the ontology of the Lego universe. I will also discuss the epistemological and methodological implications of this concept, which leads to a metaphysics of the transaction. Terminologically, "*ontology*" refers to the discipline that is dedicated to

[1] Lego was invented in 1949 by Ole Kirk Christiansen (*1891; †1958) in Billund. The original Lego bricks from 1949 were hollow on the inside, while the classic bricks, for which a patent was applied for in 1958, had inner tubes that made them considerably more stable and also allowed the bricks to be put together in a laterally staggered manner.

[2] Meanwhile there is a myriad of other hybrid bricks that complicate everything enormously. But let's stay with the classic Lego universe for the sake of illustration.

[3] See the first quote in Sect. 2.

the question of what kinds of things exist in our universe.[4] "*Epistemology*," on the other hand, deals with the question of how we acquire our knowledge.[5] "*Methodology*" (from ὁδός = "way") is about the "way to something," i.e., about the approach or the scientific tools on the way to knowledge. After all, the term "*metaphysics*"—I use the word strictly in the sense of the philosophy of science—refers to the philosophical discipline that is dedicated to the question of "how the world works in general".[6] Our way of working out the concept of a "Relational Process Atomism" first leads us to physics, then to metaphysics and epistemology, and finally to economics and methodology.

2 Newton or Heisenberg & Co.? Lego Metaphysics Versus Event Metaphysics

If we now turn from the Lego universe to our real universe, we realize that the real universe was initially imagined to be like the Lego universe. The relevant theory here is the classical physics of Sir Isaac Newton. The universe of Newton's mechanical universe is a Lego universe. Namely, he assumed that the real world consists of unchanging building blocks:

> [I]t seems probable to me, that God in the Beginning form'd Matter in solid, massy, hard, impenetrable, moveable Particles [...]; 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. While the Particles continue entire, they may compose Bodies of one and the same Nature and Texture in all Ages. (Newton, 1730, pp. 375f)

The ontological analysis of Newton mechanistic clockwork universe shows three points: (1) Newton's universe also consists of "ultimate units," namely, his "solid, massy, hard, impenetrable, moveable particles." These "billiard balls" are Newton's "atoms" (gr. ἄτομος = "uncuttable," "indivisible"). (2) Newton's "billiard balls" are solid, hard, and unchangeable. Like the bricks of the Lego universe, they are not "events." (3) And finally, these "particles" have only external relations. The relation to other building blocks in "composing Bodies" of all kinds does not change the particle "internally".[7]

[4] In a nutshell, John Searle (1998/1999, p. 5) defines: "ontology (what exists)". Traditionally, three groups of things are distinguished ontologically: firstly, physical things (stones, bodies, etc.), secondly, mental things (thoughts, feelings, etc.) and abstract things (such as numbers). Searle himself has added a fourth group, which he describes as "social ontology" (see Searle, 2010/2011).

[5] Again Searle (1998/1999, p. 5) defines: "epistemology (how we know)".

[6] See Schramm (2016, 2017, 2022, 2023, 2024).

[7] This way of thinking is still widespread today. For example, the philosopher John R. Searle writes of a "universe that consists entirely of mindless, meaningless, unfree, nonrational, brute physical particles" (Searle, 2004/2007, p. 5).

But then, at the beginning of the twentieth century, two revolutions in modern physics took place: the two Theories of Relativity and quantum physics. First Albert Einstein and later Niels Bohr and Werner Heisenberg came along and said, that there are no "solid [...] Particles," no unchanging "billiard balls": "The elementary particles are not [...] unchangeable, indivisible, basic building blocks of matter."[8] Instead, a new picture has now emerged: it is *energy* that is the basic stuff of the world, because mass or matter is actually energy (see Einstein's formula $E = mc^2$), so that energy is the substance from which all things are made. "Energy is in fact the substance from which all elementary particles, all atoms and therefore all things are made" (Heisenberg, 1958, p. 63). At the same time, energy occurs only in energy droplets, only in "discrete *quanta* of energy" (Heisenberg, 1958, p. 31; emphasis M. S.). So, if energy is the basic stuff of the world and if this energy exists only in droplets, then—because energy is something active—"quantum *events*" (Rovelli, 2014/2016, p. 112; own emphasis) are the ultimate units of which the world is made up.

The ontological analysis of modern quantum physics again provides three characteristics:[9] (1) Still, the quantum universe consists of "ultimate units": the "quantum events" (Rovelli, 2014/2016, p. 112) are the "atoms" of modern physics. (2) But these "atoms" are no "billiard balls" or inert "things." They are dynamic occasions, processes, undetermined actualities (events that "act"), in short: "The World is Made of Events, not Things" (Rovelli, 2017/2018, p. 85). (3) And finally, these events are no "substances" with only accidental relationships. Rather, they are relational through and through:

> The [...] formula: 'every elementary particle consists of all other elementary particles' seems to give a good description of the paradoxical situation we are confronted with in the experiments.[10]

Physically this means that in the process of becoming and perishing of elementary events the energy of other elementary events flows into the new elementary event. So, it's a relational universe we're living in. Relationships are essential for all concrete things (not accidental).[11]

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[8] Heisenberg (1963), S. 3 (author's own translation). The original German version: "Die Elementarteilchen sind nicht, wie man früher etwa angenommen hätte, unveränderliche, unteilbare Grundbausteine der Materie."

[9] See for example Rovelli (2014/2016), pp. 91–121: "granularity, indeterminism and relationality".

[10] Heisenberg (1967), S. 2 (author's own translation.). The original German Version: "Die bekannte Formel: "jedes Elementarteilchen besteht aus allen anderen Elementarteilchen'scheint eine gute Beschreibung der paradoxen Situation zu geben, mit der wir in den Experimenten konfrontiert werden."

[11] Carlo Rovelli even advocates a strictly relational interpretation of quantum physics: the so-called "Relational Quantum Mechanics" and explains in this sense: "Reality is relational [...] Reality is reduced to relation." (Rovelli, 2014/2016, p. 115) I am not completely satisfied with this radical relationist interpretation, because it reduces reality to mathematical points. But an elementary event is not an extensionless mathematical point, which consists exclusively of relations. Because that would mean: it is nothing! I come back to this point later.

If we end up asking ourselves "how the world works in general"—after all, that is the question of "metaphysics"—then there's an overwhelming probability, that—compared to Newton's Lego metaphysics—an "*event* metaphysics" is true. And that leads us to epistemological questions.

3 The Cloudy Mountain Peak: Realistic Epistemology and Truth

I turn now to epistemology ("how we know"), to our ways of finding out, and our ways of getting knowledge. As already stated, the topic of "epistemology" is about "how we know" (Searle, 1998/1999, p. 5). How can we discover how the world really works, including the world of business?

1. According to historian Yuval Noah Harari, modernity began with the general discovery that in principle we do *not* know:

   > The Discovery of Ignorance [...] Modern science is based on the [...] injunction [...] 'we do not know'. It assumes that we don't know everything. Even more critically, it accepts that the things that we think we know could be proven wrong.[12]

2. This modern discovery of *not knowing* is also the basis of the epistemology developed by the theorist of science Karl R. Popper, which culminates in the short sentence: "We do not know: we can only guess."[13] Popper illustrates the matter with the example of the many white swans and the one black swan: we see swans and notice that they are all white. At some point, we logically come to the conclusion: "All swans are white!" This is an induction conclusion, where we infer general assertions from various empirical observations. But then we discover a black swan. Thus the original inductive conclusion (our conjecture that "All swans are white!") is—presumably—refuted, falsified. We can never be sure that our "guesses" are actually true. Nevertheless, despite the fact that we can only achieve conjectural knowledge, with Popper, it is possible and also necessary to always *search* for the truth!
3. This possibility of searching for truth is disputed by the U.S. philosopher Richard Rorty. He gave a radical, completely dismissive answer to the epistemological

[12] Harari (2011/2014), p. 279. In explanation he writes: "Premodern traditions of knowledge such as Islam, Christianity, Buddhism and Confucianism asserted that everything that is important to know about the world was already known. The great gods, or the one almighty God, or the wise people of the past possessed all-encompassing wisdom, which they revealed to us in scriptures and oral traditions. Ordinary mortals gained knowledge by delving into these ancient texts and traditions and understanding them properly. It was inconceivable that the Bible, the Qur'an or the Vedas were missing out on a crucial secret of the universe—a secret that might yet be discovered by flesh-and-blood creatures." (Harari, 2011/2014, p. 279 f.)

[13] Popper (1934/2002), p. 278 (emphasis removed, M.S.). The original German version: "Wir wissen nicht, sondern wir raten." (Popper 1934/2005, S. 266; emphasis removed, M.S.)

question "how we can know" anything at all: "[T]here is no way to know our distance from truth, nor even whether we are closer to it than our ancestors were" (Rorty, 1998, p. 3 f.). His argument runs as follows: (a) If we—as Popper has explained, too—cannot be sure that any of our scientific theories or hypotheses are true, then we cannot claim that any hypothesis is closer to the truth than any other hypothesis. And that means: we cannot prefer any hypothesis to another hypothesis, because no hypothesis is more likely to be true than another hypothesis. In the end, this means: "There is no way to find out any objective truth!" Or to put it this way: "We can't know anything (objectively)!" In short, he writes: "[T]ruth is not a goal of inquiry" (Rorty, 1998, p. 3). After this first step, it may seem that Rorty may want to search for the truth, but that a search for the objective truth is unfortunately impossible. But Rorty makes a second step: (b) He dissolves the epistemological idea of objective truth—that there would be something to recognize, how things really are—pragmatically. And he does this in two ways: (b1) First he abandons truth as such: according to Rorty the situation "requires one to abandon the idea that there is one way the world really is" (Rorty, 2000: min. 17:12). For if there is no way to compare the (possible) truth of one hypothesis with another anyway, one might as well throw the whole epistemological idea of objective truth overboard. (b2) The criterion he proposes instead of the epistemological criterion of truth is: *utility* for us humans. If one cannot compare the different hypotheses on the basis of their truth content, then we can, says Rorty, only choose that description of the world which increases the benefit of the people the most. He says:

> "[T]he sole virtue of any descriptive vocabulary is its utility. It can't have a further virtue called getting things right. [. . .] [T]here is no such thing as the search for truth, if that search is conceived of a something distinct from the search for greater human happiness." So, "pragmatists" like Rorty "deny that truth is a matter of correspondence to the way things are—independent of our needs".[14]

4. In my view, Popper's metaphor of the clouded mountain peak is epistemologically helpful to see where Rorty is right and where he goes wrong (in my view):

> The status of truth, in the objective sense, as correspondence to the facts and its role as a regulative principle, may be compared to that of a mountain peak usually wrapped in clouds. A climber may not merely have difficulties in getting there—he may not know when he gets there, because he may be unable to distinguish, in the clouds, between the main summit and a subsidiary peak. Yet this does not affect the objective existence of the summit; and if the climber tells us 'I doubt whether I reached the actual summit', then he does, by implication, recognize the objective existence of the summit. The very idea of error or of doubt (in its normal straightforward sense) implies the idea of an objective truth which we may fail to reach. Though it may be impossible for the climber ever to make sure that he has reached the summit, it will often be easy for him to realize that he has not reached it (or not yet reached it); for example, when he is turned back by an overhanging wall. (Popper, 1963/1985, p. 226)

[14] Both quotes Rorty (2000), min: 18.19 and 20.44.

The crucial point of this metaphor for epistemology is the following: although the hiker never knows if he has reached the main summit of the mountain, "this does not affect the objective existence of the summit." The mountain peak is—as John Searle would say—"ontologically objective" and therefore "epistemologically objective" too. "We do not know." But because of this epistemological objectivity, "we can only guess," which is objectively true!

So, on the one hand, I agree with Rorty that "there is no way to know our distance from truth"—just as it is "impossible for the climber ever to make sure that he has reached the summit" (Popper). But on the other hand, that doesn't mean "abandoning the idea that there is one way the world really is" (Rorty). Our epistemological uncertainty does "not affect the objective existence of the summit" (Popper), and does not affect the objective truth.

And I would like to address this important fact, namely, that it is useful to search for the truth, using the example of time in modern physics. (1) Newton advocated the (everyday) concept of an "absolute time": "[T]ime, space, place, and motion are very familiar to everyone [...] Absolute, true, and mathematical time [...] flows uniformly" (Newton, 1687/1999), p. 408). Everywhere in the universe, we have the same time, absolutely the same time.[15] (2) But then Einstein came along and realized that Newton's metaphysics of time cannot be true. According to Einstein's Theories of Relativity, time is relative to speed ("Special Theory of Relativity." 1905) and gravity ("General Theory of Relativity." 1915), so that "the concept of time had to be relativized by giving to each inertial system its special time."[16] Let's illustrate this astonishing fact with a device that we use every day in our smartphones or cars: the "Global Positioning System" (GPS).

It takes four satellites (theoretically only three, but practically four) to locate a car or smartphone accurately. The localization of a car (or a smartphone) is done by the satellites constantly sending signals to the car. The distances between the car and the satellites are measured by time measurements, by measuring how long the signal takes to travel from the satellite to the car (distance measurement by time measurement). So, it is crucial that this time measurement (of the length of the signal path to accurately determine the location of the car) is quite precise. But here's the problem: unfortunately, time does not pass equally fast everywhere in the universe. Newton's view, that "[a]bsolute [...] time [...] flows uniformly" is therefore wrong. Rather time passes differently—on the one hand relative to the *speed* of an object (according to the "Special Theory of Relativity") and on the other relative to *gravity* (according to the "General Theory of Relativity"). This means the following for the GPS: (a) On

[15] By the way: Newton's idea of an "absolute, true and mathematical time" is not a result of empirical observations, but a metaphysical hypothesis.

[16] Einstein (1934/2005), S. 147 (author's own translation). The original German version: "[...] daß der Zeitbe-griff relativiert werden mußte, indem jedem Inertialsystem seine besondere Zeit gegeben werden mußte." Again: Einstein's insight was of theoretical nature, because he came to this conclusion before one could measure with sufficiently exact clocks that time passes at different speeds at different places. However, in the meantime these differences have been proved empirically many times.

the one hand, the satellites, which are in a geostationary position, have a longer path when the earth rotates. So, the (geostationary) satellites have a higher speed than the car. And according to Einstein's "Special Theory of Relativity" from 1905 this means that time passes a little *slower* on the satellites than down on Earth in the car. (b) On the other hand, the satellite is further away from the gravitational center of the earth, so that the attractive or gravitational force is lower than on the surface of the earth. And according to Einstein's "General Theory of Relativity" from 1915, this has the consequence that time passes significantly *faster* in the satellites than down on Earth. (c) If both time effects are taken together, the result is that time passes *faster* in the satellites than on Earth. So, the engineers of a GPS system have to slow down the clocks of the satellites, namely, 38 microseconds per day. If this (seemingly tiny) *time* deviation is now converted into the corresponding length determination, then the following errors in *position* determination would result, if the engineers of the GPS system would not consider both Einstein's Theories of Relativity: about 13 centimetres after every second of measuring time, almost 500 metres after an hour and about 11.4 kilometres after a day.

Now back to epistemology: with respect to time we have two different hypotheses, namely, Newton versus Einstein. If we ask ourselves which of the two theories is (probably) closer to truth, then we must indeed concede that we have no idea what the exact distance is (a) between Newton's absolute theory on time and our epistemological goal (objective truth) or (b) between Einstein's relativistic theories of time and the objective truth (= the knowledge how the world really is) (Fig. 1).

But: the crucial point is that it is not necessary "to know the distance from truth" (Rorty). The only relevant question is: what's more likely, Newton or Einstein? Furthermore, Rorty's turn to the criterion of utility—he replaces "the search for truth" by "the search for greater human happiness"—also goes nowhere: the (presumably greater) truth of Einstein's theory of relativity does not depend on the question whether GPS is useful or not. Logically, it's the other way round: GPS is useful *because* it is true.[17] Therefore, it is important to know how the world (probably) works!

There is also an evolutionary argument for a realistic epistemology, formulated by the paleontologist George Gaylord Simpson this way:

> To put it crudely but graphically, the monkey who did not have a realistic perception of the tree branch he jumped for was soon a dead monkey—and therefore did not become one of our ancestors. (Simpson, 1963, p. 84)

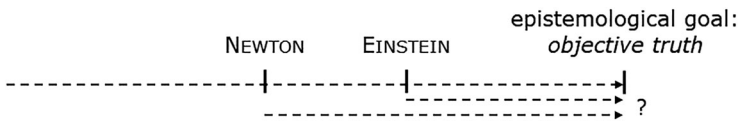

Fig. 1 Theories and objective truth

[17] In terms of scientific theory, the sentence should read: GPS is useful because it is (sufficiently) true—probably.

It *is* important if our epistemology is sufficiently realistic or not! Logically the usefulness of our theories—including our metaphysical theory, how the world works, or our economic theory, how the economic world works—depends on whether they *sufficiently* represent the "way the world really is." So, according to this realistic epistemology, we should have a (sufficiently) realistic ontology to know how the world works ("metaphysics").

4 Relational Process Atoms I: "Actual Occasions" in Whitehead's Metaphysics

The mathematician, physicist, and philosopher Alfred North Whitehead (*1861; †1947) created a very complex philosophy, usually called "Process Philosophy," but named by himself as "The Philosophy of Organism," which integrated natural sciences, aesthetics, ethics, and religion. In his metaphysical cosmology "process" and "creativity" are the fundamental or ultimate notions:

The first fundamental "metaphysical [...] principle is that the very essence of real actuality [...] is *process*. [...] There is no halt".[18] "In the philosophy of organism this ultimate is termed 'creativity'" (Whitehead, 1929/1979, p. 7).

1. The physical quanta of energy he transformed metaphysically into "actual occasions," also called "actual entities": "'Actual entities'—also termed 'actual occasions'—are the final real things of which the world is made up" (Whitehead, 1929/1979, p. 18).
2. All the more permanent things that the evolutionary process generates (atoms etc.) are "societies" of these elementary events: "The real actual things that endure are all societies. They are not actual occasions" (Whitehead, 1933/1967, p. 204).
3. If we now do our usual ontological analysis, again three characteristics emerge:

   (3.1) Whitehead's cosmos also consists of "ultimate units," and the "actual occasions" are the "atoms" of this universe:"[A]ctuality is incurably atomic" (Whitehead, 1929/1979, p. 61). But "atomism does not exclude complexity and universal relativity. Each atom is a system of all things." (Whitehead, 1929/1979, p. 36)

   (3.2) As already stated, Whitehead's "atoms" are "actual *occasions*." That means they are processes or "events." "[T]he ultimate facts of nature [...] are events" (Whitehead, 1919/1925/2011, p. 4).

   (3.3) And finally, these events have not only external (accidental) relationships, but internally they are genetically *related*: "In other words, it belongs to the nature of a 'being' that it is a potential for every 'becoming.' This is the 'principle of relativity'" (Whitehead, 1929/1979, p. 22). Like in physics

[18] Whitehead (1933/1967), p. 274; Whitehead (1929/1979), p. 22; Whitehead (1926/2007), p. 112; Whitehead (1938/1968), p. 140.

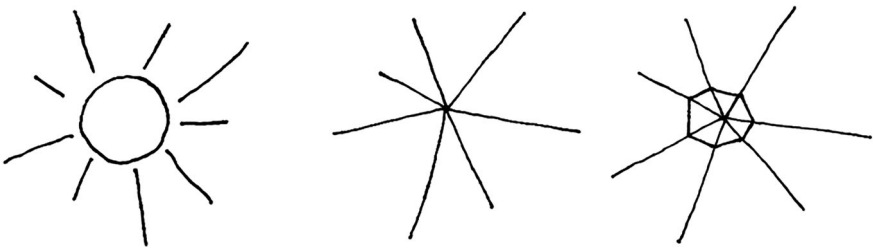

Fig. 2 Three metaphysical models of ultimate actualities

> "actual occasions" have *internal* relations. In the process of becoming and perishing elementary events, the energy (or in Whitehead: the "creativity") of other elementary events flows into the new elementary event and influences its becoming.[19] And it's the network of all these relational events that creates the world, including space and time.[20]

If we graph the three metaphysical models of ultimate actualities discussed so far then the following picture emerges (Fig. 2):

(a) The model on the left shows the metaphysical idea of Newton's clockwork universe: a "solid, massy, hard, impenetrable, moveable Particle" with only external or accidental relations.[21] This model has been falsified by modern physics.

(b) The model in the center shows a *strictly relational* interpretation of quantum physics, for example, the "Relational Quantum Mechanics" by Carlo Rovelli in which an actuality is nothing but its relations, in which "[r]eality is reduced to relation" (Rovelli, 2014/2016, p. 115). But that would mean that reality is reduced to mathematical points which have no extension, neither in space nor in time. But that in turn would mean that the ultimate actuality is nothing! But from a *metaphysical* point of view, this radical relationalist view is *not* convincing because an elementary event is not an extensionless mathematical point which consists *exclusively* of relations. Sure, the ultimate units of modern physics do have internal relations and insofar are relational beings. But at the same time, they are entities, quanta of energy, "atoms," not just extensionless mathematical points.

(c) Finally, the model on the right depicts Whitehead's metaphysical idea of the ultimate entities in this universe: the "actual occasions" or "events" mentioned above. His "events" *are* relational beings (as described in his "principle of relativity"), but they are not just extensionless mathematical points, but "actual *entities*." If the world were made up of mathematical points only (from

[19] In the sense, Whitehead (1929/1979, p. 21) stated famously: "The many become one, and are increased by one."

[20] "Time and space [...] express relations between events." (Whitehead, 1919/1925/2011, p. 61).

[21] The illustration can also be applied to the so-called "metaphysics of substance".

"nothings"), then the whole actuality would be nothing. But it is the network of all these relational occasions or events that creates the world of our cosmos, including space and time.

5 Relational Process Atoms II: Economic Transactions

I now turn to the ultimate units or events of the economic world and economics. Before I can do that, there is a fundamental question to consider: what do the events of the *economic* world have to do with the events of the *physical* world? And the answer is: the universe in which we live in is exactly one.[22]

With regard to this question, some insights from the theory of so-called "social ontology" by philosopher John R. Searle are useful.[23]

1. Firstly, the whole "world" of our modern economy—as well as the "world" of politics, etc.—exists only because it has been *invented* by humans: "we are inventing a reality out of nothing" (Searle, 2010/2011, p. 105). So, "*social* ontology" is not natural ontology, but a human invention of a *social* reality. It was not nature ("*natural* ontology") that created banknotes or corporations, but human society ("*social* ontology").[24]

But although certain events are "*social*-ontological" in nature (e.g., payment transactions or management decisions), they can nevertheless only gain *concrete actuality* as physical and therefore "*natural*-ontological" events. For it belongs to the characteristics of the one world we're living in, that there can be no *concrete* realities without *physical* concretions.[25] For example: "[M]oney has to exist in some physical form or other. [...] Institutional facts exist, so to speak, on top of brute physical facts" (Searle, 1995/1996, p. 34 f.) or "basic facts" (Searle, 2010/2011, p. 108 f.). Therefore the "social ontology" of the economic system can only be realized in physically concrete transaction processes, in "some physical realization" (Searle, 1995/1996, p. 35).[26] Everything, so to speak, "has to reach a rock bottom" (Searle, 1995/1996, p. 56) in order to become concrete or actual. An event of the economic world, a transaction, has to become physical to be real. And this in turn shows that

[22] "We live in exactly one world, not two or three or seventeen." (Searle, 1995/1996, p. xi).

[23] See Searle, John R. (2010/2011). Searle considers his "social ontology" as a part of "the metaphysics of [...] social relations." (Searle, 1995/1996, p. 3)

[24] The same is true for political offices, soccer matches, market competition, democracy, marriage or companies. "God can create light by saying 'Let there be light!' Well, we cannot create light but we have a similar remarkable capacity. We can create [...] corporations by saying [...] 'Let there be a corporation!'" (Searle, 2010/2011, p. 100)

[25] However, there are other *ontologically objective* "things" besides the *concrete* realities, because there are also *abstract* entities like numbers or the possibilities (which are called "eternal objects" by Whitehead).

[26] Even if it's just a digital transfer of money, for example, there has to be some physical substrate for it to become a real transaction.

the metaphysical question of how the world works in general is of fundamental relevance for economic theory. According to realist epistemology, we should have a (sufficiently) realistic ontology of transactions to know how the economic world works ("Business Metaphysics").

For the ontological analysis of a transaction, I am guided by the transaction economics of John R. Commons. (1) Again, the economic world consists of "*ultimate units*" and therefore of economic "atoms," which are the "transactions":

> Thus the ultimate unit of activity which correlates law, economics and ethics must contain in itself the three principles of conflict, mutuality, and order. This unit is a transaction. A transaction, with its participants, is the smallest unit of institutional economics. (Commons, 1932/1996, p. 454; also Commons, 1934/2009, p. 58)

Transactions are the "steps" by which the economy moves forward. At the same time, the transaction must be a whole. (Just like when walking: you can't take a half step, to move forward, you have to take whole steps.) So, there are no half transactions. This fits the fact that Commons declared a corporation to be a "*going* concern."[27] A corporation re-produces itself step by step by generating a network of transactions: "[A] corporation [. . .] now became an economic going concern existing in its transactions" (Commons, 1934/2009, p. 53).

2. Secondly, Commons describes transactions as "*events*": "These [...] transactions are to economics what Whitehead's [...] 'event*[s]*' are to physics" (Commons, 1934/2009, p. 96). And the nature of the whole economy is "process" because the events keep the whole thing going.

Here we have a fundamental difference to neoclassical economics, in which the stasis of an equilibrium is described as the "natural" tendency of the economy. Innovations must be treated here as "exogenous" shocks that briefly throw the economy into turmoil (deform it) until a new equilibrium is reached again. But that's not the way the (economic) world works.[28] The computer scientist John Henry Holland puts it this way: "In fact, if the system ever does reach equilibrium, it isn't just stable. It's dead."[29] What Carlo Rovelli says about the "quantum events," i.e., the ultimate units of the physical world, also applies to the world of economics: the economic world is also made of events, not things.

[27] He even gives a German translation of his term "going concern": "gutgehendes Geschäft" (Commons, 1934/2009, p. 69, fn. 102). With both "going" and "gutgehen", you have to take whole steps. Complete transactions are therefore required as "ultimate units".

[28] For a more in-depth critique of this neoclassical equilibrium thinking see Beinhocker (2006), pp. 21–75.

[29] John Henry Holland, quoted in: Waldrop (1992), p. 147.

3. And thirdly, the nature of "transactions" is "*relational*." Terminologically, only some occasional hints can be found in Commons, but in terms of content, however, Commons clearly advocates a relational ontology of transactions.[30] For a more detailed elaboration of the relational aspect we can turn to "Relational Economics":

> "[T]he basic paradigmatic unit of relational economics is the transaction as relation, that is, the transaction as an attractor of polyvalent contexts, decision logics and sources of value creation" (Wieland, 2018/2020, p. 21). "The relational transaction is the basic unit of relational economics (here the connection between this definition and Whitehead's process philosophy, which is characterized by the primacy of relation and the concept of the relational constitution of everything in existence, is self-evident. [...])." (Wieland, 2018/2020, p. 46)

The analysis of the relational ontology of transactions shows that the world of business is a continuously generated network of transactions, with the legacy of previous transactions flowing into the new transaction. That's the more Whiteheadian aspect of a transaction's ontology, because—as already mentioned—Whitehead's "principle of relativity" is meant *genetically*: every past event is a potential for every becoming event. The decisive hinge for Josef Wieland's conception, however, is the fact that each transaction works as an "attractor" for stakeholders and their polyvalent resources.[31] If you take the two perspectives (Whitehead and Wieland) together, the result is that the legacy of previous transactions and new resources of the stakeholders (economy; society) flow into the new transaction and thus drive the evolution of the dynamic network of transactions.

5.1 "Tinkering" Methodological Consequences

The conceptual outline of a micro-analytical description of polydimensional transactions in the modern economy and the pragmatic governance of their networking has methodological consequences. From the outset, the approach of "Relational Economics" is not designed to offer blissful "Geisteshostien" ("consecrated spirit hosts")[32] to the educated public. Rather, Wieland's theory is quite pragmatic about

[30] See Commons (1934/2009), pp. 386 ff: "relativity"; Commons (1950/1956), pp. 117 ff: "relativities".

[31] "Every stakeholder invests specific resources in a firm, which are required for the completion of a transaction and/or the theoretically infinite continuation of the firm's existence." (Wieland, 2018/2020, p. 71). In this sense, Commons spoke somewhere about the transaction as a "meeting point". However, I have not been able to verify the quote.

[32] I take the term "Geisteshostie" from the book "Alte Meister" ("Old Masters") by the Austrian writer Thomas Bernhard, in which he describes the attitudes of the German philosopher Martin Heidegger in a very amusing way. Commenting on a famous interview by the editor of the magazine *DER SPIEGEL*, Rudolf Augstein, with Heidegger, Bernhard writes (in the German original): "Selbst ein berühmter und gefürchteter norddeutscher Zeit-schriftenherausgeber kniete andachtsvoll vor ihm mit offenem Mund, als erwartete er in der untergehenden Sonne von dem auf

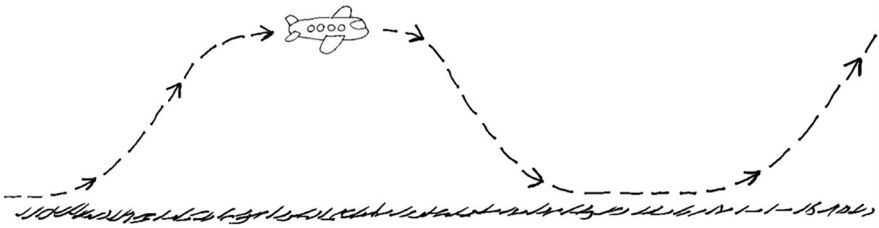

Fig. 3 Whitehead's methodology ("The Flight of the Aeroplane")

how polyvalent transactions should be built appropriately. It's about learning from our experiences, generating ideas from these experiences, and then using these ideas to make new experiences and learning from them in order to improve things step by step.

1. Wieland's methodology therefore corresponds to that of Whitehead (Fig. 3). In *Process and Reality*, Whitehead illustrated the scientific method with a repeated take-off and landing of an airplane:

> The true method of discovery is like the flight of an aeroplane. lt starts from the ground of particular observation *[or: the ground of a problem; M.S.]*; it makes a flight in the thin air of imaginative generalization; and it again lands for renewed observation rendered acute by rational interpretation. (Whitehead, 1929/1979, p. 5)

The logic behind this method is as follows: (i) You have to look for empirical evidence ("particular observations"). (ii) Then you have to start your "flight," i.e., you come up with creative hypotheses or theories with which you try to explain how the world works ("imaginative generalizations"). These are Popper's "guesses." (iii) After your "theory flight" you land back on earth and check to what extent the hypothesis works or not ("renewed observations"). In this way, you are trying to learn from your mistakes. Then you start the next flight, i.e., you think up improved hypotheses. And so on and so on . . . In short: If you want to know how the world works you have to look what works! And what works is useful because it is (sufficiently) true—probably.[33]

seiner Hausbank sitzenden Heidegger sozusagen die Geisteshostie" (Bernhard, 1985/1988, S. 94). My translation: "Even a famous and much-feared North German publisher of periodicals kneeled before him devotionally and open-mouthed, as though he was expecting, sitting there under the setting sun, in a manner of speaking, the consecrated spirit host from Heidegger on his bench before his house." The interview, conducted in 1966, was published after Heidegger's death in 1976 under the title "Nur noch ein Gott kann uns retten" (cf. Heidegger, 1976).

[33] As said above: the (presumably greater) truth of Einstein's theory of relativity does not depend on the question whether GPS is useful or not. Logically, it's the other way round: GPS is useful because it is sufficiently or probably true.

2. Theorist of science Karl R. Popper has aptly expressed this methodical approach—especially with reference to the social sciences (such as economics)—by the beautiful German words "Herumbasteln" ("piecemeal tinkering") und "Fortwursteln" ("muddling through").

> "The characteristic approach of the piecemeal engineer is this. Even though he may perhaps cherish some ideals which concern society 'as a whole'—its general welfare, perhaps—he does not believe in the method of re-designing it as a whole. Whatever his ends, he tries to achieve them by small adjustments and re-adjustments which can be continually improved upon. [...] The piecemeal engineer knows, like Socrates, how little he knows. He knows that we can learn only from our mistakes. Accordingly, he will make his way, step by step, carefully comparing the results expected with the results achieved".[34] Sure, some people may be "dissatisfied with 'piecemeal tinkering' and 'muddling through.'" (Popper, 1944–45/1957/1961, p. 74)

But that's the way (ὁδός = "way") "in the social as well as in the natural sciences" (Popper, 1944–45/1957/1961, p. 58). It is the methodology which fits ontologically to the metaphysics of "Relational Process Atomism." And modernity has done well with this method so far.

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Relational Economics and Organization Governance

Jacob Dahl Rendtorff
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