CO-CONSTRUCTING THE VREDEFORT DOME: THE ROLE OF MATTER-ENERGY IN EPISTEMIC TRANSLATION

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ABSTRACT: If the creation of knowledge is itself a translation process, as the call for papers for the recent Epistran Conference[1] suggests, translation studies scholars need to be able to account for this process and for the translationality (Blumczynski, 2023; Robinson, 2017) that the process entails. In my view, translation studies does not as yet have a conceptual framework that is able to explain the role that matter-energy plays in the knowledge translation process. It is true that cognitive translation studies follow the 4E approach (Ehrensberger-Dow, Gopferich and O'Brien, 2015; Garcia, 2019; Schwieter and Ferreira, 2017), but even there, there is no clear conceptual framework for how matter-energy outside of the translator's body influences the translation of knowledge. Unless matter-energy is included as a relatum in the translation process, knowledge translation will be explainable as a solipsistic human activity only, excluding living and inert matter-energy, with all the ecological implications of the latter (Cronin, 2017).
KEYWORDS: Epistemic Translation; Vredefort Dome; Semiotic Realism; Intersemiotic Translation; Semiotic Work

1. Introduction

If the creation of knowledge is itself a translation process, as the call for papers for the recent Epistran Conference suggests, translation studies scholars need to be able to account for this process and for the translationality (Blumczynski, 2023; Robinson, 2017) that the process entails. It means that scholars of epistemic translation should, among others, be clear about the onto-epistemological position(s) from which they operate. One of the onto-epistemological issues at stake in epistemic translation is the role that the 'thing' about which knowledge is created plays in the knowledge construction process. In my view, translation studies do not as yet have a conceptual framework that is able to explain the role that matter-energy[2] plays in the knowledge translation process. It is true that cognitive translation studies follow the 4E approach (Ehrensberger-Dow, Gopferich and O'Brien, 2015; Garcia, 2019; Schwieter and Ferreira, 2017), which argues that cognition is embodied, embedded, enactive and extensive, acknowledging the matter-energy in embodied processes of cognition. However, there seems to be no clear conceptual framework for *how* matter-energy outside of the translator's body influences the translation of knowledge. Unless matter-energy is included as a relatum in the translation process, knowledge translation will be explainable as a solipsistic human activity only, excluding living and inert matter-energy, with all the ecological implications of the latter (Cronin, 2017).

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[1] Available at: https://www.epistran.org/international-conference (Accessed: 13 November 2023).
[2] In my limited understanding of physics, it is not clear what the distinction between energy and matter is. I therefore use 'matter-energy' throughout to refer to the non-living things around humans.

Clearly, I am not the first person interested in this topic. Throughout the ages, thinkers have been engaging each other on the realism-idealism debate. Recently, in *Kant and the Platypus*, Umberto Eco provides a fascinating description of the process through which the knowledge about the platypus was constructed by the first groups of Europeans to sail to Australia, arguing that "… in the final instance, facts prevail over theories …" (Eco, 1997, p. 249). Equally, Bruno Latour (1992) writes fascinating texts on the social work performed by doors or scallops or other non-living things. From a biosemiotic-philosophical perspective, John Deely (2009, 2014) suggests that knowledge is created through an entanglement between reality and organism. The entanglement theme is taken up by new materialists like Karen Barad to argue for the irreducibility of reality, observation, and observer in the knowledge creation process. In translation studies, Robinson (2017) considers the role of the socio-neurology of the brain in the creation of knowledge and Bennett (2023) has done foundational work in setting out the parameters of 'knowledge translation' or (inter-) epistemic translation.

In order to delve further into this issue, namely, the translational aspect of knowledge creation, I start with a description of the history of knowledge creation about the Vredefort Dome, a meteorite impact site in South Africa, using a variety of sources from the field of geology. I then explore one of the implications of this description for epistemic translation. I pay particular attention to the implications of Robinson's (2017) recent work in socio-neuroscience and Barad's (2007) work in 'new materialism' with the aim of synthesising the views into something like a 'constructive realism' or, as John Deely calls it, a 'semiotic realism', which is able to account for the role material reality (including the brain) as well as ideation play in knowledge creation.

2. Constructing the Vredefort Dome?

The narrative that I construct here is clearly a simplification of a complex and arduous historical process of about 100 years to construct the facts about the Vredefort Dome.[3] It is also simplified by my non-existent expertise in geology.

[3] I would like to thank Dr Martin Clark from the Department of Geology at the University of the Free State for pointing me to relevant literature and translating his expertise so that a layperson such as myself can understand some of it.

Translation Matters, 6(1), 2024, pp. 145-163, DOI: https://doi.org/10.21747/21844585/tm6_1a9

Figure 1. Vredefort's location in South Africa

The Vredefort Dome is an impact site in central South Africa where a meteorite of between 5 and 15 km in diameter collided with earth a little more than 2 billion years ago (Dressler & Sharpton, 1999; Hodge, 1994; Reimold & Gibson, 2005).[4] It is located south-west of current Johannesburg, near the village of Vredefort. The original diameter of the crater that was formed in the impact is estimated at between 250 and 300 km, which means that the famous Witwatersrand area with its massive deposits of gold lies within its range, a point to which I return later. The initial crater could have been about 50 km deep, but it quickly collapsed, leaving a crater of about 15 km deep, which has since then been filled up. If you were to drive past or through the area today, you would not notice anything out of the ordinary, but flying over the area in an aeroplane or having access to satellite photos clearly shows the circular shape of the hills and the relatively flat centre of the dome, currently about 90 km in diameter. If you visited the hills themselves, you would observe that they were formed by upturned rock (the rock layers are more or less vertical) and its erosion – that is, if you have a basic understanding of geology.

[4]I base the narrative in this section mainly on Reimold and Gibson, so I do not cite them for every fact but will reference them on important points.

Translation Matters, 6(1), 2024, pp. 145-163, DOI: https://doi.org/10.21747/21844585/tm6_1a9

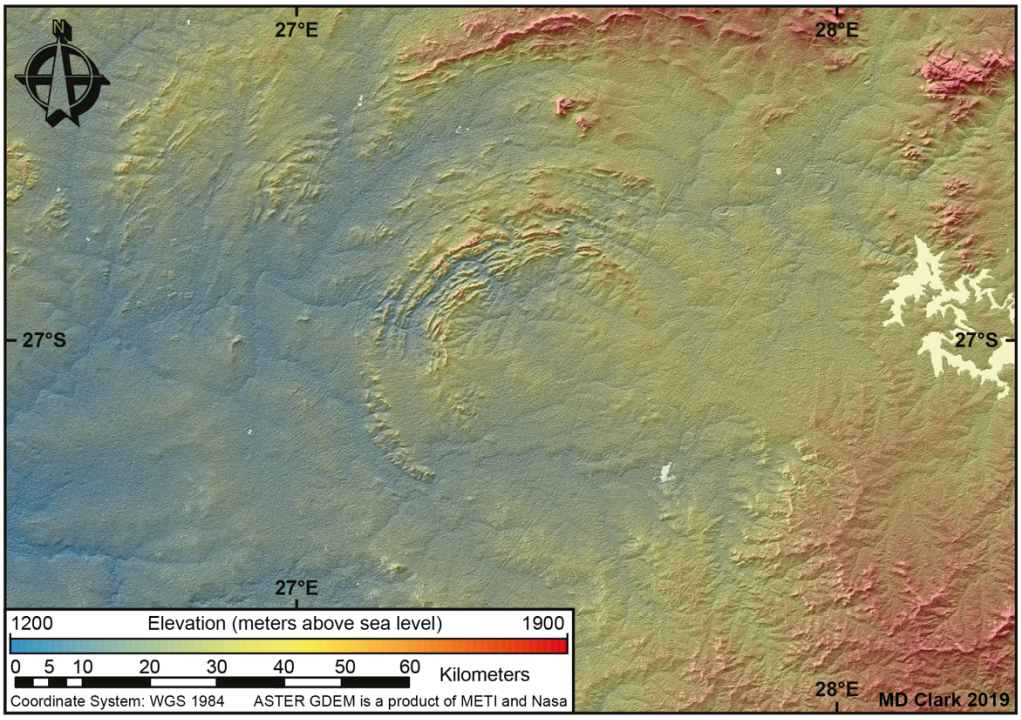

Figure 2. An arial view of the Vredefort Dome[5]

Scientific work on the Vredefort Dome started in the 1920s when Louis Nel mapped the different rock types in the area in detail. It was realised that the rock in this area is actually from deep inside the earth's crust and that is must have been formed under huge pressure and heat. This realisation raised the question: How did this rock come to be at the surface? Two possible explanations crystalised: the dome was caused by internal upheaval, i.e., something like a volcano, or the dome was caused by external upheaval, i.e., something like a meteor. In South Africa, the internal explanation held sway until the late 1980s when undeniable evidence of meteorite impact was provided. Since the mid-1940s, interest grew in the crater structures on the moon, and the idea arose that they could be akin to similar structures on earth. When the Sierra Madera crater in Texas was drilled to a great depth, scientists found that the surface rock structures 'died out' as they went deeper, which argued against the view that the structure was created from inside the earth. In addition, Dietz argued that the conical structures of rocks found in similar structures would indicate an explosion from above. It was also found that the quarts found in these sites had to be formed under high pressure. However, in the meantime, overseas scholars also took an interest in the Vredefort Dome in the 1960s, and much work was done on the microscopic deformations in the minerals in the area. Another piece to the puzzle was the evidence about the difference in the rims of volcanic structures (from inside) and impact craters (from outside). The latter was formed by raised bedrock from deep inside the earth. With the space race in the late 1950s and 1960s, scientists had to start thinking about the influence of shock waves on the materials of the vessels they wanted to send into space.

[5] Clarke Martin, Department of Geology, University of the Free State. Personal communication on 8 May 2024.

This line of thought brought together three lines of evidence: "information about rock deformation sustained under 'normal' geological conditions, from suspected impact structures, and from experimentally deformed rock" (Reimold & Gibson, 2005, p. 140). This led to the formation of the concept of shock metamorphism. It was demonstrated that many impact structures showed evidence of shock waves, which meant that during the 1960s the Vredefort Dome case was closed in international research. For them, Vredefort was caused by impact by a body from outside of earth.

In South Africa, however, the internal explanation still held. One of the reasons for this was that attempts to date the Dome offered confusing results. The outer granite rock dated at about 3080 million years while the inland rock dated at about 2800 million years. This suggested that there was more than one deformation. The geology and geophysics of the wider Witwatersrand area was then also linked to the Vredefort Dome. In 1987, an international conference on the Dome was held in South Africa. The conference could not concur on an explanation, but one of the benefits of the conference was strengthened collaboration between South African and international geologists. In 1993, Hugue Leroux provided evidence that settled the matter. He found proof (at the Dome) of a crystal called 'Brazil twins' which can only be formed from hot aqueous solutions, which did not occur in Vredefort, or can be 'caused by enormous pressure of a shock wave running through the mineral' (Reimold & Gibson, 2005, p. 150). In addition, he found traces of a mineral that could only have originated in a meteorite, not on earth. Thus, Reimold and Gibson (2005, p. 154) concludes: "It [settling the arguments about the origins of the Vredefort Dome] involved the synthesis of numerous observations and analytical data from a range of disciplines, including mining geology, structural and metamorphic geology, geophysics, geochemistry, geochronology and minerology, just to name a few".

In addition to the massive body of geological information that can be inferred from the Vredefort Dome, it also offers substantial information about human settlements. Evidence of settlement during the Middle and Late Stone Age, i.e., from between 200 000 to 2000 years ago, has been found. The caves that resulted from the meteorite impact offered shelter to early settlers. The area is also rich in water, with the Vaal River having carved a winding route through the Vredefort Dome, and plant and animal life, providing a fruitful environment for humans. In addition, there is evidence of settlement during the Iron Age, as well as modern settlement.

In terms of geology, the meteorite impact that caused the Vredefort Dome impacted not only the visible dome of about 80 km in diameter. Its impact can be seen in an area with a diameter of about 300 km. Geologists argue that the gold deposits of the Witwatersrand is a direct effect of the meteorite impact in that the upheaval caused very deep gold deposits to be moved closer to the surface of the earth. In other words, the meteorite impact did not only cause effects in the earth's geohistory, but also in South Africa's political and economic history. Here one can think about the gold rush in the late 1800s, the Anglo-Boer War that revolved around the control over these riches, the migrant

labour that was caused by a need for labour that disrupted indigenous South African social life, and many more.

My point here is that, as much as the Vredefort Dome was constructed by a meteorite and as much as knowledge about it has been constructed by scientists over roughly a century, the Dome also constructed living space for Stone and Iron Age settlers. It would probably be too strong an argument to say that it constructed South African history, but I think we have enough evidence to argue that it co-constructed some of the propensities for the South African history to take the trajectory it did. As a counterfactual argument, South African history without rich gold deposits at mineable depths would probably have emerged quite differently. Thus, as much as the materiality of the Vredefort Dome contributed to understanding its origin, it also contributed to historical trajectories in South Africa.

The question now remains: How do we explain the epistemic translational aspect in the co-construction of/by the Vredefort Dome? To this I turn in the next section.

3. Epistemic translation: Opposing perspectives

I explain in the next section how I think scholarly work is a translation process, which means that, for now, I just assume that it is. In this section, I investigate two seemingly opposing ends of the continuum on thinking about epistemic translation. On the one hand, I consider the Kantian postmodernist approach of Douglas Robinson (2017). On the other hand, I explore new materialist work, focussing mainly on Karen Barad (2003, 2007).

Bennett (2023, p. 443) argues that all knowledge is created through a translation process where existing knowledge is "… repackaged and reworked in accordance with new cultural and ideological configurations". This process entails interlingual, intralingual and intersemiotic translation, as well as "inter-epistemic translation" (Bennett 2023, p. 443). I am not convinced by Robinson's (2017) argument that inter-epistemic translation is a fourth kind of translation as it seems to be a sub-category of intersemiotic translation, or if one takes a semiotic definition to translation (Marais, 2019, pp. 61, 120-142), merely a sub-category of translation. That said, inter-epistemic translation is clearly an important domain of translation that requires attention (Bennett, 2007, 2011, 2013, 2015; Robinson, 2017).

Bennet rightly argues that inter-epistemic translation is interested in "… the processes involved in creating and disseminating knowledge at different times and places" (2023, p. 444). As much as the dissemination is important, and as much as Bennett has made insightful arguments in this regard, my focus in this paper is on the translational aspect of knowledge creation. In other words, my argument is that not only translation between existing epistemic systems should be regarded as relevant for translation studies. Rather, the creation of knowledge and knowledge systems themselves entails translational action or work. To make this argument, one first needs a constructivist theory of knowledge creation, for which I turn to the work of Douglas Robinson.

3.1 Neuro-social hermeneutics

Douglas Robinson has bequeathed translation studies with not only a large body of writings but a valuable one at that. His work aims at explaining the hermeneutic process that is (mostly interlingual) translation. He has consistently criticized rationalist, Western-dominant explanations of translation (Robinson, 1991, p. 260), and in its place, he suggested a detailed embodied social-constructivist hermeneutic approach, based in social neuroscience, to translation (Robinson, 2017). This means that Robinson's approach is a rich and detailed epistemology that links insights from neuroscience, translation studies, hermeneutics, sociology/social psychology, and literary theory, among others. His approach has the added benefit of broad yet detailed explanatory power in that it is able to link explanations of social process to explanations of neurological process. This epistemology, Robinson (2017, pp. 118, 133-135) states, is looking for a middle ground between constructivist and objectivist positions, by situating the constructivist agency in the material brain. In this sense, one could therefore describe Robinson's framework as materialist because he studies embodied cognition, as evidenced by his reliance on affect theory and neuroscience. I argue below that Robinson's approach misses one crucial point for epistemic translation, namely the question about the role matter-energy plays in knowledge creation, but his is clearly not a naïve idealism/constructivism. On some occasions, it does indeed seem to be naive, like in the following quote with its strong rhetorical claims concerning 'everything' we know and 'nothing' that is true:

> Everything we know about the brain makes it clear that nothing we believe about our access to "objective" "reality" is true. (Robison, 2017, p. 34)

However, Robinson (2017) concludes his book with a thoughtful consideration that is much closer to the kind of epistemology that I think is needed for epistemic translation – an providing context for the overclaim in the previous quote:

> It is faith in science as explanations that keep changing, because no explanation is ever the objective truth, and our attempts to reach through the conflicting evidence of our senses to "objective truth" invariably fail, to one degree or another, because the material world beyond our periperformative constructions keeps resisting us, keeps pushing back against our cultural grids and maps, thwarting our efforts to synthesize, consolidate, build elegant models of "reality" – but also providing us with our best clues as to what that world is actually like. (ibid., p. 203)

His reference to "the conflicting evidence of our senses" does indeed allow, in this formulation at least, for influence from matter-energy, for pushback against our constructions, but it does not explain in more detail what this would entail. I do not see much debate needed about 'objective' truth, except about what the definition of objective might be. I think we can agree that all knowledge is preliminary and relative to a number of constraining factors. I also think there can be little argument about knowledge as being constructed – and constructed both bodily and socially.

However, as much as Robinson has made a large and immensely valuable contribution to translation studies, epistemic translation poses a question that his work seems unable to answer. It is the simple question: What is the role of matter-energy in the knowledge we have about matter-energy. This question, to my mind, is crucial when we want to think about epistemic translation. If knowledge is about something, we need to be able to explain the role that this something plays in co-constructing that knowledge, and for that we need more than an anthropocentric, solipsistic, postmodern Kantian idealism/constructivism. If the something that we are to know is a subject in its own right (Deely, 2009) we need a conceptual framework that not only acknowledges its existence but is also able to explain, despite all the legitimate provisos, what the role of that something is in epistemic translation. Eco (1999) makes the point that knowledge creation starts out as a translation process of turning things into the objects of our knowledge, which means that all knowledge entails epistemic translation. Therefore, Robinson's (2017) view, that there is no recourse to brain-external reality in epistemology and that 'truth' is (only) a matter of plausibility as distributed in a society is too simple for epistemic translation purposes:

> An *icosis* or *ecosis* is a socioaffective ecology of value (good and bad, honor and dishonor, glory and shame, approval and disapproval) that turns the somatic exchange into a collective engine of reality-construction/-periperformance (icosis) and morality-construction/-periperformance (ecosis).(Robinson, 2017, p. 186)

For Robinson, truth is a matter of value and seems to have nothing to do with the thing that a truth claim is about. Let me state, before going further, that I am well aware of the intricacies of the idealism-realism debate, and like Robinson, I am looking for a way to reconcile these two epistemological positions in a nuanced synthesis. I also think that Robinson goes a long way in doing so, but as suggested above, I think his framework is still predominantly idealist/constructivist because of his reticence for allowing matter-energy to constrain our experience, or at least for his lack of explaining the role of matter energy, apart from the brain, in knowledge creation. In typical humanist fashion, for Robinson (2017), the human has to be the agent and our knowledge of matter-energy is a mere projection:

> So what is the answer? If we begin not with objectivist theories of causation but at the other end, with Kantian constructivist/periperformativist theories of mimetic projection, it all makes more sense. The empathic connection between author and reader, via the text, is a *projection:* the reader projects it onto the author. It is an empathic construct. (ibid., p. 138)

The Other, whether another human animal, a non-human animal, a text, or some other form of matter-energy, has no constructive power in Robinson's explanation of knowledge creation, a point against which new materialists rally, as I show below. For Robinson, the Other seems to exist in my mind only as projections created by my brain. To be fair, as also argued above, Robinson does seem to have a sense of this problem because one finds

references to the role of matter-energy in epistemology, but they are few and far between, for instance:

> Sense-data move through our sensory apparatus to our central nervous systems, and there are translated not only into a coherent picture of reality but a coherent picture of reality *shared by other members of our culture*. (ibid., p. 182)

As we shall see when discussing new materialism, they call this "sense-data [that] move" the agency of materiality. I am not yet sure how far one needs to take the 'agency' of matter-energy, but I think we have good neuroscience evidence (Juarrero, 2023, pp. 164-166) to argue that at least some of our thoughts are influenced by matter-energy, in whichever form, from outside our bodies.

In other words, as an epistemology, I think Robinson's proposal holds much value and does indeed move use forward through its innovative use of social neuroscience. However, his version of translation studies lacks an ontology, which is to be expected from a good Kantian as seen in the following formulation:

> Icosis and ecosis are socioecological versions of post-Kantian social constructivism/ periperformativism, based on Kant's "Copernican Hypothesis" that we do not simply "register" the objects around us but actively (if unconsciously) *construct/ periperform reality*. (ibid., p. 182)

In summarising a long chapter on his icotic theory of hermeneutics and translation, Robinson concludes as follows:

> The things that the humanities study, and the orthodox methods they have evolved to study them with, are organized icotically; but the evolution of those methods in each humanistic discipline, subdiscipline, and interdiscipline is also organized icotically. (ibid., p. 119)

The question that the quotation above raises is: What are 'the things that the humanities study'? Robinson does not specify these things, but I would suggest that he means that the humanities studies ideas and society-culture that has been constructed by humans. As much as I would agree, the question is: Is this all that the humanities studies? In a cogent argument, Maran (2020) criticized the Western humanities tradition for assuming that humans live in the symbolosphere, i.e., language and ideas, only. Biosemiotics has not only shown the use of signs in all living organisms but also that the dividing lines between human animals and other organisms are not as clear-cut as they have been assumed. I would therefore argue that, in addition to ideas and society-culture, the humanities (should) study the materialities from which ideas and society-culture emerge and the ways in which human existence is entangled with matter-energy of various shape and form. The question is not only how the embodied and material nature of the brain and the nervous system constrain knowledge creation. As much as we should argue that our knowledge about reality is never objective and always shaped by our bodily experience, for certain types of knowledge, we need to understand the object of our knowledge well enough to be able to

act safely on our knowledge. To put it simply, our knowledge cannot just be construction willy nilly. It has to be construction of something, and because the construction is in relation to the somethings, that something needs to have an influence on the construction because getting it wrong might have disastrous consequences. Knowledge is constructed, for sure, but the 'thing' that we know needs to constrain the construction because of pragmatic consequences if it does not. Knowing fairly accurately, not positivistically and objectively, how much kilowatt you need to keep an aeroplane carrying 500 people in the air is important, at the very least for those 500 people and their families. Robinson might object that building aeroplanes is not what the humanities studies, but the humanities does study the creation of the knowledge that underlies the building of aeroplanes, and the implication is that a theory of translation that reduces onto-epistemology to epistemology will not be able to study epistemic translation.

3.2 New materialism

New materialism is a multi-faceted onto-epistemological framework within which to study social-cultural phenomena, and it mainly responds to the idealism that underlies constructivism by considering the role of matter in the emergence of society-culture. Leading scholars in this approach are Deleuze and Guattari (1987), Latour (2007), though he would probably not have called himself a new materialist, DeLanda (2006, 2013, 2015, 2016) with his assemblage theory, and Barad (2007), who combines physics and feminist theory, as well as feminist scholars like Harroway, Braidotti, and Butler (interviewed and discussed in Dolphijn & Van der Tuin, 2012) for an overview and rich reference list). While showing similarities with Marxist materialism, new materialism also differs significantly from Marx (Cheah, 2010; Choat, 2018; Coole & Frost, 2010; Lettow, 2017). The point that I am trying to make in this section, and for which I harness new materialist thought, is that we might enhance our thinking in and about the humanities if we operate with a conceptual framework that explains how matter-energy constrains our thinking. In the next section, I try to work out the 'how' of this matter in more detail.

Here, I focus briefly on Barad's complex and rich contribution because of her background in physics and the dialogue she stimulates between the natural sciences and the humanities. A first point of interest would be Barad's insistence that, for all scholarly work, one needs both ontology and epistemology, which is why she works with an onto-epistemology (Barad, 2003, 2007; Fox & Alldred, 2018; Gamble, Hanan, & Nail, 2019; Juelskjaer, Plauborg, & Adrian, 2021; Monforte, 2018). As a trained physicist, Barad bases her conceptualisation on Bohr's theoretical insights into the wave-particle problem. Experimental physics has shown that light exists as both particles and waves but that one cannot observe both at the same time. This problem has been described as the uncertainty principle, but, based on Bohr's interpretation, Barad argues (2003, p. 815, 2007, pp. 108-130) that it is a matter of indeterminacy or complementarity (Dolphijn & Van der Tuin, 2012; Gamble, Hanan, & Nail, 2019; Juelskjaer, Plauborg & Adrian, 2021), not primarily uncertainty. In other words, it is not a matter of the observer being uncertain about the

observation but rather a matter that the observed (reality) itself is indeterminate, even when limited or decided through the act of observation. Thus, observer and observed are entangled in a complementarity relationship, and both contribute to the construction of knowledge.

Barad therefore argues that we do not observe things as they are but neither do we construct the things we observe. Rather, we observe 'phenomena' or 'entanglement or the inseparability of the apparatus and the observed object' (Dolphijn & Van der Tuin, 2012, p. 61). Elsewhere, Barad (2003, p. 814) formulates that we observe "the *phenomenon*—the inseparability of 'observed object' and 'agencies of observation'" and that a phenomenon "consists of relationships, not entities" (Barad, 2007, p. 16) (emphasis original). Observation is therefore neither realist (the thing observes determines the observation) not idealist (the observer determines the observation) but a relationship between observer and observed in which each act as agent with different impact, which is why Barad (2007) calls her approach "agential realism". Observers create phenomena through what Barad (2007, p. 815) calls 'intra-action': "The notion of *intra-action* (in contrast to the usual "interaction," which presumes the prior existence of independent entities/relata) represents a profound conceptual shift."

In my understanding, Barad is trying to argue that observers (as pre-existing things) do not interact with the observed (as pre-existing things). This would mean that, in Barad's (2003, p. 815, 2007, p. 334) view, "relata do not preexist relations; rather, relata-within-phenomena emerge through specific intra-actions." As part of her radical process-philosophical approach, she argues that the intra-actions themselves performs or enacts the observer and observed, i.e., both are becoming through the process of intra-action. In other words, observation is not an interaction "in between" things that are already demarcated but an intra-action "between" things (Dolphijn & Van der Tuin, 2012, p. 14) that become (demarcated) through the action and that can be demarcated differently in different observations. Also, observers are not things of a different category than the observed, i.e., both are material-energy. Rather, the difference between observer and observed is intra-acted through an agential cut that creates observer and observed and separates the two:

> A specific intra-action (involving a specific material configuration of the 'apparatus of observation') enacts an *agential cut* (in contrast to the Cartesian cut—an inherent distinction—between subject and object) effecting a separation between "subject" and "object." (Barad, 2003, p. 815)

Put differently, the act of observation is a process during which subject and object are separated for that observation and that observation only. In another observation, the separation or demarcation can take place differently. This means that neither subject, nor object, nor observation is ever reified. Barad (2003) formulates it in the following ways:

> In my further elaboration of Bohr's insights, apparatuses are not mere static arrangements *in* the world, but rather *apparatuses are dynamic* (*re*)*configurings of the world, specific agential practices/intra-actions/performances through which specific exclusionary boundaries are enacted.* (p. 816) (emphasis original)
> Agential intra-actions are specific causal material enactments that may or may not involve "humans. (p. 817)
> Reality is not composed of things-in-themselves or things- behind-phenomena but "things"-in-phenomena. The world *is* intra-activity in its differential mattering. (p. 817)

Whether one thinks about observation with technological apparatus or with the biological sensory apparatus afforded to living organisms, observation entails the intra-action between two material systems, reconfiguring the world according to the constraints that drive the apparatus. This holds for all living organisms, not only humans. We, as material reality, exist in relation to one another, and our intra-actions leave material marks on one another, and those material marks matter. The material marks, the differences that make a difference *à la* Bateson (2002), are what we relate to when we try to interpret their significance for our entangled existence.

For all its possible warts, e.g., vitalism (Gamble, Hanan, & Nail, 2019), not being critical enough (Cheah, 2010), and espousing agency (Fox & Alldred, 2018), new materialism makes a convincing argument, in my view, that humanities research needs to find a way to include matter-energy in its considerations. In order to take matter seriously, one cannot reduce it to epistemology. When Barad (2007, p. 59) emphasises the agency of matter, she gets very close to a new-vitalist position. As much as I think ascribing life-like or human-like attributes to inanimate nature might just be another form of anthropocentrism and does not help us to investigate the ways in which inanimate matter became animate, sentient life, I think new materialism has a point in arguing that matter is constructive, in the sense that it brings forth new things (Gamble, Hanan, & Nail, 2019, p. 123), or at the very least, allow for new things to come forth. I would probably not use the term 'agency' for inanimate matter, but the point is that it is matter-energy that brought about 'nature' as we know it today, and it is matter-energy that brought about human beings. New materialism emphasises the fact that we, as human beings, are nature, matter-energy – apart from everything else we are.

New materialism has brought matter-energy back on the humanities agenda in a challenge to the idealist/constructivist epistemology that currently dominates, as espoused above by Robinson. In my view, these two approaches should not be binary opposites, which is why my aim with the rest of this paper is to try to synthesise these approaches. For now, I suggest that we explore the value a semiotic approach could have for such a synthesis.

4. How knowledge is created through translation: A complexity perspective

In Peircean terms, awareness of something, i.e., registering sensory input, remains at the level of Firstness unless an organism thinks further about what it is that the organism has become aware of. In other words, as much as meaning-making or thinking starts with

awareness, the awareness in itself does not yet mean anything. The awareness has to be related to what Peirce calls an object, i.e., that for which the something that one has become aware of stands. It is only when representamen (the initial something that one became aware of, the something that stands for something else) and object (the something for which the representamen stands or which it represents) are related that an interpretant (what it means – the cognitive import – for the observing organism) can be formed. Peirce calls this process through which a representamen, object, and interpretant are related 'translation'. In other words, it is a process that starts with a representamen and ends at an interpretant, involving the role of the object as mediated by the representamen.

The implication of this line of thought would be that one of the issues in epistemic translation is the determination of the object. Observing (becoming aware of) something for the very first time, means that, semiotically speaking, an observing organism deals with a representamen without an object. Phenomenologically, it would probably be more correct to say that the organism deals with a representamen for which the object is 'unknown', leading to an interpretant such as "I haven't got the foggiest clue as to what this is". The semiotic process could stop there, and the organism can move on without worrying about the unknown anymore. Alternatively, a process to grow an understanding of what the representamen stands for can start. This is why I argue that epistemic translation, or the creation of knowledge, is a process of expanding interpretants by obtaining more information about the object as mediated by the representamen.

There is a sense in which Peirce argues that the object determines the representamen. I would use less deterministic words, suggesting that the object constrains the representamen:

> I define a ***Sign*** as anything which on the one hand is so determined by an Object and on the other hand so determines an idea in a person's mind, that this latter determination, which I term the ***Interpretant*** of the sign, is thereby mediately determined by that Object. (CP 8.343), see also CP 8.335) (emphasis original)

Be that as it may, Peirce seems to suggest that the semiotic process has its origin in the object, which in our case of an unknown thing above, is absent. The goal of creating an interpretant then has to include a process of getting to know more about the object, which is the translation process known as epistemic translation. Hence, epistemic translation is, amongst others, an effort to create pragmatically efficient interpretants of an object.

In his semiotics, Peirce distinguishes between two types of objects, namely, an immediate object and a dynamic object:

> Namely, we have to distinguish the Immediate Object, which is the Object as the Sign itself represents it, and whose Being is thus dependent upon the Representation of it in the Sign, from the Dynamical Object, which is the Reality which by some means contrives to determine the Sign to its Representation. (CP 4.536)

The immediate object thus entails the knowledge/memory that the observing organism has about what the representamen stands for. This means that the immediate object is always internal to the organism, i.e., an idea, a feeling, a memory, etc. This holds irrespective of whether the dynamic object is mind dependent or mind independent. It is the Kantian idea to which Robinson refers and which he explains so well. Peirce is, however, clear that a representamen does not necessarily allow a sign user to infer everything relevant about the object:

> We must distinguish between the Immediate Object, -- i.e. the Object as represented in the sign, -- and the Real (no, because perhaps the Object is altogether fictive, I must choose a different term, therefore), say rather the Dynamical Object, which, from the nature of things, the Sign ***cannot*** express, which it can only ***indicate*** and leave the interpreter to find out by ***collateral experience.*** (CP 8.314) (emphasis original)

Apart from deducing from the representamen, the observer also needs to find 'collateral experience', in other words, the observer has to construct dynamic objects for this representamen that includes more information than the original 'unknown'. This means that the sign process is not solipsistically enclosed in itself but an open system of meaning-making that do, in certain cases, require engaging with 'not-yet semiotised reality'. In other cases, as Robinson makes clear, sign processes engage with existing sign processes. The richness of potential meaning in the representamen is not indicated in the representamen itself, but has to be constructed, sometimes over many years and even millennia. As much as it is difficult to semioticize the dynamical object (CP 4.539), and as much as both Robinson and Barad correctly argues that this semiotization is never absolute or objective, it is one of the ways in which new knowledge is created.

In Peircean thought, one therefore also has the dynamical object, which for Peirce is the brute existence in nature that, in his words, determines the representamen – in my words, constrain the representamen:

> As to the Object, that may mean the Object as cognized in the Sign and therefore an Idea, or it may be the Object as it is regardless of any particular aspect of it, the Object in such relations as unlimited and final study would show it to be. The former I call the ***Immediate*** Object, the latter the ***Dynamical*** Object. For the latter is the Object that Dynamical Science (or what at this day would be called "Objective" science,) can investigate. Take for example, the sentence "the Sun is blue." Its Objects are "the Sun" and "blueness." If by "blueness" be meant the Immediate Object, which is the quality of the sensation, it can only be known by Feeling. But if it means that "Real," existential condition, which causes the emitted light to have short mean wave-length, Langley has already proved that the proposition is true. So the "Sun" may mean the occasion of sundry sensations, and so is Immediate Object, or it may mean our usual interpretation of such sensations in terms of place, of mass, etc., when it is the Dynamical Object. (CP 8.183, see also CP 5.473; 8.314; 8.343) (emphasis original)

I am aware that there are Kantian interpretations of Peirce's dynamic object, Robinson for instance, but I base my argument here in Deely's (2001, 2009, 2014) semiotic realist interpretation of the dynamic object. In his magnus opus, Deely (2001) goes back to the

Scholastic distinction between mind-dependent and mind-independent reality.[6] There are things that exist in the world irrespective of whether they are known or not. These are called mind-independent reality or '*ens reale*', in the Latin of the Scholastics. Other things, such as unicorns, are created by minds and exist only in the mind. As much as they are based on or derived from either inanimate or animate things, and therefore related to matter-energy, they do not themselves exist materially but only as the creation of the mind of a living organism. They only exist in a mind-dependent way, i.e., they depend on a mind for their existence. Deely expands this difference further in his distinction between things and objects. Things are mind-independent existents, or '*ens rationis'* for the Latins. Objects of thought can be both mind-independent and mind-dependent existents. This means that things become objects through a semiotization process, which I here call epistemic translation. In Deely's terms, everything we know are objects. Some of these are only objects, i.e., they exist mind-dependently only, but some objects of our knowledge are also things, i.e., apart from their existence in our minds, they also exist mind-independent. Put differently, some things exist as either *ens reale* or *ens rationis* only, but some things have a double existence, partaking in both the matter-energy world and the semiotic world. For Deely, things exist subjectively, according to their own being, but they are known objectively as objects of our thought.

Deely's unorthodox use of the terms subjective and objective does not overlap with its common use in epistemology. For Deely, things exist as subjects in their own right, hence they exist subjectively. When we know them, we know them only as objects of our thought, hence we know them objectively. This is contrary to the common use of subjective and objective that takes the human knower as point of reference.

As much as the immediate object is always of the nature of '*ens rationis'*, the dynamic object could be either of the nature of '*ens rationis'* or '*ens reale'*, i.e., either mind dependent or mind independent, either pure object or thing-turned-object (Deely, 2009, 2014). Now, the relation between dynamic object, immediate object, and interpretant is really complex. If all of them are of the nature of '*ens rationis'*, e.g., I am thinking about a unicorn, they are clearly all of an ideational and mind-dependent nature, and they are all clearly constructed by me as the constructing semiotic agent. However, if I observe a mind-independent thing, the thing itself, its subjectivity in Deely's terms, constraints the semiotic process through which I turn it into an object of my thought. The object of thought is constructed, no debate about that, but it is constructed relationally by allowing the subjectivity of the thing to constrain my construction. Things-turn-objects thus participate in a complex onto-epistemology. They are both mind-independent things (subjectivities) and mind-dependent objects (objectivities) that are woven together, creating the fabric of experience, according to Deely (2009).

[6]I acknowledge Piotr Blumczynski for pointing out that Deely's distinction might be too binary. As much as I agree that one might need to revisit Deely through a complexity lens, I do not have the space to do that here, but it is a point that needs clarification.

This conceptualisation means that, as much as the construction of the Vredefort Dome in geology is a creation, an immediate object, the materiality of the Dome itself had an effect on this construction. When the materiality of the dome clashed with the construction, e.g., that it was of volcanic origin, the construction had to be adapted, which is probably why it is called science and not fiction. Now Robinson is also correct in arguing that the line between fiction and reality is blurred, but that does not logically necessitate deleting the line. Living with a blurred line is the complexity response to the complexity of reality. Trying to enforce or delete the line is the reductionist response to the complexity of reality. Deely agrees that it is impossible to stipulate where reality ends and construction starts, and in cases like literary creations it is not really relevant. However, in many cases in the world, it is relevant. Is there a deadly poison in the cup of tea handed to me by my mortal enemy? Will the design of this aeroplane hold 500 people in the air between Johannesburg and Zurich? Will this medication cure my cancer? In all of these cases, the materiality of the thing under discussion is crucial for my survival, which means that the immediate objects that are related to them somehow need to account for, or allow themselves to be constrained by, the materiality of the things themselves. In other words, if the materiality of the Vredefort Dome did not matter, if knowledge about it is as fictional as any Mills and Boons, why do sciences exist and why did it take scientists about 100 years to construct their 'fiction' of the Vredefort Dome? Why did they not just agree on the first fiction? Both explanations, i.e., internal and externa upheaval, are plausible in Robinson's terms, but the plausibility did not settle the matter, the matter-energy constraints did.

In the history of epistemology, various terms have been used to explain what is meant by 'needs to take them into account' in the previous paragraph. It was claimed that signs should 'represent' reality, signs should be 'true' to reality, signs should 'reflect' reality, signs should 'copy' reality, signs should 'resemble' reality, signs should 'be in accordance' with reality, signs should 'correlate' with reality, and many more. These terms have rightly been criticized for assuming a one-to-one relation between semiosis and reality. However, the criticism has, to my mind, been overstretching its logic by trying to erase any relationship between semiosis and reality. At this point, my best effort at a non-positivist/objectivist, non-constructivist/idealist, non-reductionist conceptualisation would be that scientific semiosis needs to relate to both mind-dependent and mind-independent reality in a pragmatically relevant way. In this process, scientific semiosis needs to allow mind-independent reality to constrain its epistemological constructions. In other words, there would be cases where as close to absolute equivalence between immediate and dynamical object is required, e.g., the aeroplane. There might be cases in which as little equivalence is required, e.g., a fairytale, and there would be many cases in between. The point is, if we want to understand the subjectivity of things, the way they are, we can never do that in an absolute way. However, if we try to understand it as best we can for the pragmatically determined intent that we are trying to understand it, we have to reckon with the materiality of the thing.

Linking back to new materialism, I would argue that living organisms, including humans, live in a state of entanglement with other living organisms, e.g., ecologies, societies or cultures, and non-living matter. However, they also live in states of entanglement with inanimate matter-energy, e.g., sunlight, rain, oxygen. Non-living matter and living matter are both matter, organised differently, but still matter. A semiotic materialism or semiotic realism in Deely's terms provide us with a way of explaining this entanglement rather than reducing it to either matter or mind. Semiosis is the process through which mind and matter relates, entangles.

Apart from an epistemological motivation, there is also an ethical motivation for reckoning with the 'thing'. The thing is, ethically speaking, and Other. Constructivism, even social constructivism, runs the risk of placing so much emphasis on construction that the other tends to become 'my construction'. In my view, this is not an ethical approach. Whether the other is mind-dependent or mind-independent, I need to show respect, ethically speaking, to the Other. In my view, it is exactly the solipsistic tendencies in Kantian thought that is, among many other things, responsible for the inability for people to listen to each other and for people to listen to nature, hence the ecological crisis.

5. Conclusion

To conclude, if one assumes that epistemic systems exist and that one does not need to explain how they came to be, explaining inter-epistemic translation is enough and will be able to account for what needs to be accounted. However, if one does not assume the existence of epistemic systems but thinks that their existence needs explanation, you need a conceptual framework within which to explain epistemic translation. In other words, if epistemic translation is to contribute to more than a solipsistic circulation and recreation and adaptation of existing knowledge systems, it needs a theory of open systems. I hold the latter position and therefore suggests, in an adaptation of my earlier conceptualisation of translation (Marais, 2019) that epistemic translation is a subcategory of translation, defined as a semiotic process, that entails the negentropic semiotic work performed under a complex of constraints, including matter-energy constraints where needed. Part of this translational process entails turning sensory data into knowledge, turning things into objects of thought, semioticising matter-energy.

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