

Rejecting “tofunaise”: On accepting non-self-identity as ground for epistemology

Wolff-Michael Roth, University of Victoria

Because the thinking of metaphysics remains involved in the *difference which as such is unthought*, metaphysics is both ontology and theology in a unified way. . . (Heidegger 1969, p. 71, emphasis added)

Indigenous *science*. For some time now, I have been wondering why some science educators have insisted on using the term to denote the knowledge of certain people—that of American Indians, Canadian First Nations, Maori, Hawaiian—by the same term that also denotes the field that those use who produce substances and plants that are destructive for people and the environment (e.g., Monsanto scientists). Why would anyone want to claim to be part of a category of people, knowledge, or way of dealing with the world that also includes people and groups who produce what environmentally conscious people call “Frankenfood,” food derived from genetically modified organisms? Why would anyone want to have his or her knowledge in the same category as that which has given to humanity the destructive and now banned dichloro-diphenyl-trichloroethane (DDT), agent orange (mixture of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid), thalidomide (2-(2,6-dioxopiperidin-3-yl)-1H-isoindole-1,3(2H)-dione), and other equally and more dangerous substances? Furthermore, why would we use the term *science* to denote a form of knowing that is as different from the discourses that reign in laboratories and scientific journals as the mundane discourses of just plain folks (Jean Lave’s expression) concerning phenomena and areas over which “scientists” have traditionally claimed authority? Why *ought* plain everyday talk about the environment and the “indigenous” forms of knowing developed by fishermen who have fished an area for 40 years be something other than science but the knowledge of a First Nations person fishing salmon in the same area be a form of *science*? Readers will find that Charbel Niño El-Hani and Fábio Pedro de Souza Ferreira Bandeira raise very similar questions in their commentary on an article by Bryan McKinley Jones Brayboy and Angelina E. Castagno that appears in *Cultural Studies of Science Education*.

University-based “scientists” do not always know best even when it comes to their own domains, as I learned while being part of a major research effort that brought together biologists, earth and ocean scientist, philosophers, sociologists, historians, educators, anthropologists, and members of other disciplines to study the phenomenon of single-industry communities on both Canadian coasts. It turned out that locals (fisher-

men, fish culturists) had better and deeper understanding about certain fish, fish culture, fish life cycles, and fish habitat than the university and government scientists who had made it their life purpose to study these and similar fish species. More so, I had repeated occasion to note that the fish culturists I studied had a better understanding of which research designs would work and make sense than the laboratory scientists who came to the hatcheries to conduct experiments (which turned out to be flawed for the reasons that the fish culturists had stated before).

VOICE OVER: Difference as such, Heidegger writes, is unthought. Because it always is thought as difference from the same, difference is unthought as difference, that is, in and for itself.

Tofunaise. Tofurkey. Tofu chicken burger (“looks like chicken burger without the chicken”). I have wondered why products from soy protein attempt to imitate or take the place of dairy and meat products and dishes rather than taking a place in their own right? Tofurkey, also “faux turkey” (technically, a spoonerism on tofurkey because “faux” is pronounced “fo”), is offered in supermarkets with everything required to make it look like turkey. It then may take the place of turkey in the traditional American Thanksgiving meal, with stuffing from grain or sauce-flavored bread to give the eater the impression to eat turkey when one is not really eating turkey. But, as its alternative name suggests, it is not the real thing, it is “faux,” false, imitation. Why *indigenous science*, where “science” is a term not only denoting forms of knowing but also forms of taking a position in the world, methods, epistemologies, which are definitely not taken by those staking claim to certain terrain and territory—what some do in university and commercial laboratories, e.g., at Monsanto—by using the term “science” modified by the adjective “indigenous.” Do those who use the term “indigenous science” also accept the term “mundane science,” “everyday science,” to denote what others in the field of science education term “misconceptions,” “folk beliefs,” “alternative conceptions,” and the like?

Thinking about the drivers for scientific literacy

In an article entitled “Time to Change Drivers for Scientific Literacy,” Peter Fensham (2002) argues that we need to rethink who and what drives the agenda for thinking and designing science education in schools. He

proposes to rethink science education from a more encompassing societal perspective. Thought from such a perspective, as but one of many forms of knowing and human endeavors, science is given its due place within a greater effort in producing and reproducing society. Thinking in such a way then would allow us to recognize what happens and is produced in (university, industrial) research laboratories as but the enactment of one form of knowledge-producing method and knowledge product among many other forms of knowing that we appreciate in our culture today, including philosophy, the fine arts, literature, ethics, politics, social sciences, and so forth. It also would allow us to acknowledge the many forms of everyday knowing that characterizes the ways in which we think, talk, and act toward and about natural phenomena.

In my immediate (Roth 2002) and delayed responses (Roth and Barton 2004) I suggested that we needed to go much further than Fensham did by beginning with a different epistemology that acknowledges a non-hierarchical relationship between different ways of knowing, which all have different merits and which are taken into account as needed in specific, always local issues. Rather than focusing on specific disciplines and ways of knowing to organize school curriculum, we could take a problem-based approach and appreciate the different contributions different ways of knowing make to the specific issue. This knowledge then might come from the local ecological knowledge that white European residents have evolved over decades of living in a particular area, which, as I observed in one particular contentious community issue concerning water supply, by far exceeded the spotty knowledge scientists and engineers brought to and built while working on the case (Roth et al. 2004). In the same way, local fishermen turn out to have developed a tremendous amount of local ecological knowledge concerning particular fish and other marine species that by far outstrips what university and federal fisheries scientists have developed during their relatively brief engagement with the relevant ecosystem.

I know of at least one effort that attempts to combine very different forms of knowledge. At the University of British Columbia, fisheries scientists attempt to reconstruct the Strait of Georgia ecosystem (the ocean between the North American continent and Vancouver Island) by entering (qualitative) indigenous knowledge side-by-side with (quantitative) scientific knowledge into a database to reconstruct what the Strait may have looked like 100 and 500 years ago. The purpose of the reconstruction is to develop policy choices for the future of fisheries in the Strait (Pauly et al. 1998), an approach that takes its name from the method: *Back to the Future*. This back-to-the-future method takes into account all stakeholders and their different forms of knowledge—scientific, qualitative, historical, anecdote-

tal—when it evaluates local benefits that may be extracted from alternative ecosystems, designs practical management instruments, and monitors of the recovery of ecosystems and compliance. Because of this comprehensive method, the approach garners powerful support and consent among “an unprecedented broad range of stakeholders” (p. 1).

Central to the approach of the *Back to the Future* project is the recognition that traditional ecological knowledge and ecological science are not structured in the same way. It is on the basis of difference that it considers similarities between the two, here denoted by the name of the scientific modeling program *Ecopath* and the acronym for traditional ecological knowledge (TEK):

Both Ecopath and TEK are concerned with the relationships, ratios and connection within the ecosystem than with achieving an absolute understanding of individual elements. *In their own way* both TEK and Ecopath are comprehensive, just as local fishers consider an entire constellation of factors along with the target species, prey, associates species, weather, current, tide, phase of the moon, to name but a few. (Haggan et al 1998, p. 10)

As a result of its approach, “The *Back to the Future* methodology supplies a practical direct use for the knowledge of maritime historians, archaeologists, ecological economists, fisheries ecologists, and the TEK of indigenous peoples” (p. 2). In fact, traditional ecological knowledge rather than being denied a voice is “strengthened in the BTF [back-to-the-future] process by a cross-validation with ecological science, and may thus be endowed with a real and valuable role in shaping future fisheries policy” (p. 2).

Does tofunaise become more acceptable and “better” because its suffix “aise” relates it (and makes it similar) to mayonnaise? Some people do not like tofunaise because of its taste of tofu, and all the “naise” does is make it a “niaiserie” (chiefly literary word, derived from French, denoting foolishness). Or does tofu not become a *malaise*, a discomfort, an uneasiness of and for mind and spirit by the addition of the suffix “-aise” (linked by the insertion of -n-)?

For all the praise I have attributed to the *back-to-the-future* method, in my way of thinking it does not yet go far enough, because cross-validation of two domains is possible only when they are considered on some ground that allows validation of one by another. But that ground has to be independent of the two others, providing it a space to be compared. What might such an epistemically disinterested ground be? Inherently it is impossible. Instead, I propose to consider different ways of knowing as inherently, that is radically differ-

ent. It is so different that the two forms of knowledge are not only different from every other way of knowing but also different from themselves: each form of knowing is non-self-identical because it allows translations within itself. The only way that two forms of knowing are the same is that they are different from every other form. That is, I am arguing to think epistemology from an ontology of difference.

Toward an epistemology grounded in an ontology of difference

We can only say “the same” if we think difference. . . . The same banishes all zeal always to level what is different into the equal or identical. The same gathers what is distinct into an original being-at-one. The equal, on the contrary, disperses them into the dull unity of mere uniformity. (Deleuze 1968/1994, p. 66)

In the quote opening this editorial, Martin Heidegger notes that difference had not been thought in and for itself. Grounded in prior work of German idealist philosophy, he appears to have been the first scholar to call for a thinking of difference in and for itself. His statement has become programmatic for a substantive amount of philosophical work conducted particularly in France. It includes the writings of the philosophers Jean-François Lyotard, Jacques Derrida, Giles Deleuze, and Jean-Luc Nancy and of belletristic writers such as Hélène Cixous, a poststructuralist feminist theorist known for her *écriture féminine*, who is intellectually close to Derrida. (Cixous plays with the phonemic properties of language, thereby drawing additional layers of meaning that escape strict lexical analysis; she might have enjoyed combination of pairs of words employed here, such as tofurkey and faux turkey.) Underlying this work is a wariness with forms of thought that reduce the diversity inherent and constitutive of the world to the sameness underlying representation and its effects in the unifying concepts and theories at our hands.

Attempting to adjoin indigenous ways of knowing to science, by means of modifying adjectives “aboriginal science,” “indigenous science,” and so on under the guise of equality disperses, as Deleuze notes in the quote opening this section, what is inherently distinct “into the dull unity of mere uniformity.” Changing aboriginal ways of knowing so that they can be cross-validated with ecological (industrial, university) science, though a tremendous step forward to overcome the hegemony of *modern* science, really means bringing it into a dull unity of mere conformity and uniformity.

The road toward thinking difference in and for itself is not easy, as the origin of this difficulty, at least

within Western cultures of the Greco-Roman-Christian lineage, lies in language:

Our Western languages are languages of metaphysical thinking, each in its own way. It must remain an open question whether the nature of Western languages is in itself marked with the exclusive brand of metaphysics, and thus marked permanently by onto-theo-logic, or whether these languages offer other possibilities of utterance—and that means at the same time of a telling silence. (Heidegger 1969, p. 73)

Despite subsequent critiques of his work on difference, Heidegger led the way for proposing a way of thinking difference as such—*singulare tantum* (p. 36), a singular term that denotes a plurality or multiplicity, that is, a *singular plural* (Nancy 2000). The following two examples are offered to concretize this idea difficult to understand within the ontology that underlies current Western (scientific) thought, which, in modern philosophical writings, frequently comes to be qualified by the adjectives *logocentrist* or *phallogocentrist*.

The first example of a singular plural is a language, which, being “a” language, is thought as a singular, though everyday experiences show that it is in fact a plural simultaneously. Take for example the following situation where one of my graduate research assistants (Carolyn) asks the sixth-grader Jennifer about what she meant by using the expression “more force.”

- 01 C: It is interesting that you’d use the word force. But I wasn’t sure exactly how you meant it. I wasn’t sure you said, one would take more force than the other, does that mean . . . ?
- 02 J: More strength.
- 03 C: More energy or strength? Okay.

In this interview, Jennifer responds to the question by providing an alternative expression, “more strength.” Carolyn then pronounces yet another alternative expression, “more energy.” Here then, there are two clearly different, alternative ways offered into which the expression “more force” is translated. However, translation—etymologically derived from the past participle of the Latin *transferre*, to carry, bring (*ferre*) across (*trans*)—occurs when something from one field, area, or domain is moved *across* some boundary and into *another* field, area, or domain. Carolyn, in continuing, exhibits satisfaction with the translation, which thereby is accomplished as meaning that the question has been resolved. By saying differently, Jennifer now has allowed Carolyn to understand or to eliminate her uncertainty about what she really meant. The first expression was not understood, but the second, different one was

understood, and was understood to mean the same. It is a “translation [that] translates itself in an internal . . . translation by playing with the non-identity with itself of all language” (Derrida 1998, p. 65). Language, therefore, exhibits itself as inherently different, requiring and affording translations within itself so that there *cannot be* something such as *a* language. Not only can there be not *a* language, but there cannot be anything like *a* culture or *a* (pure) identity because “every culture is in itself ‘multicultural,’ not only because there is a prior acculturation or because there is no pure and simple provenance, but more importantly because the gesture of culture is itself a gesture of *melee*: of confrontation, transformation, deviation, development, recomposition, combination, cobbling together” (Nancy 2000, p. 283). Attempting to conceive language, culture, or identity in any other way constitutes an intellectual effort that reduces the term to a *One* where there really is a multiplicity; and such effort constitutes an “hegemony of the homogeneous,” which is a form of colonial power that “remains at work in the culture, effacing the folds and flattening the text” (Derrida 1998, p. 40). These authors therefore would be very wary with any science educator who attempts to subject different forms of knowing to the hegemony of the homogeneous, a validation and cross-validation of different forms of knowledge by reducing them to the One.

A second example of multiplicity comes from a re-conceptualization of conceptions in mathematics and science. It concerns the process of participation in experience and the evolution of conceptions for the learner. For example, in one study we showed how twelfth-grade Australian students through their embodied experiences with objects rolling down an inclined plane learned about the effects of a number of variables such as mass, radius, and degree of hollowness on the downhill rolling motion of objects (Roth et al. 1997). The students made a number of observations (e.g., ball rolls, ball accelerates) and used a variety of words that came to be connected to the observation (e.g., “accelerates,” “inclined plane,” “goes faster,” “velocity”). Today I understand a conception to be a network of individual experiences that come to be connected up with one another (Figure 1).

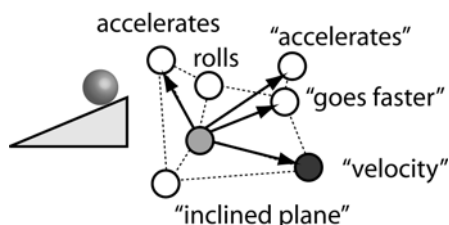


Figure 1. A conception can be understood as a singular plural (singulare tantum), whereby each experience is constitutive of the whole, but the whole organizes (presupposes) the individual experiences.

The result of the network is not that the experiences are merely summed up, but that, because of the interdependence of the connections, each additional experience mediates the effects of all other experiences on each other. That is, the “value” of the whole network depends on the value of each individual node (experience), but the value of each node depends on the value of the net as a whole. Ideas therefore “are multiplicities: every idea is a multiplicity or a variety” (Deleuze 1968/1994, p. 182). Importantly, “multiplicity must not designate a combination of the many and the one, but rather an organisation belonging to the many as such, which has no need whatsoever of unity in order to form a system” (p. 182). We cannot therefore understand the whole independently of its parts, nor can we understand an individual apart from the whole. The “individual” experiences the twelfth-grade students had with rolling objects therefore are not “elements” from which the conception is (can be) built up. Lev Semenovitch Vygotsky (1986) therefore proposed “unit analysis” to replace the psychological analysis in terms of elements, where in the present case the unit would be the conception as a whole. Such a conception—in contrast to how it would appear in traditional (constructivist) theories—is not just mental; rather, it subsumes all forms of experiences, including emotions (Roth and Thom in press). Each “conception” is a multiplicity that cannot be reduced to any of the ways in which it expresses itself. There is no “one” conception that a singular person “has,” but a continuously changing, non-self-identical multiplicity that is different from the continuously changing non-self-identical multiplicity of any other singular person.

These two examples now allow us to think of culture, language, knowing, and identity as multiplicities that cannot be reduced to individual elements and components. They are therefore inherently different, not merely from other cultures, languages, forms of knowing, and identities but also different from themselves; they are non-self-identical. What any “one” culture, language, form of knowing, or identity has in common with any other culture, language, form of knowing, or identity is this: it differs. This, then, has as a consequence that we need to recognize all “indigenous” forms of knowing, including that of just plain folks of White Western cultural heritage. Their everyday ways of knowing have suffered from the same kind of hegemonic onslaught and colonialism of laboratory “science” as the ways of knowing of other sections of society including women, people of color, aboriginals, and immigrants.

In the process of coming into contact with other cultures, languages, forms of knowing, and identities, blood already and inherently mixed becomes even further mixed, creolized, mingled, commingled, blended,

merged, coalesced, amalgamated, and fused. These processes are continuous; they traverse our lives. The resulting mixture is more than simply rich with diversity: it ceaselessly eschews and escapes the diversity it mixes. As a result, cultures do not add up (Nancy 2003). “They encounter one another, mix with one another, alter one another, reconfigure one another. All cultures cultivate one another: they clear one another’s ground, irrigate or drain one another, plough one another, or graft themselves onto one another” (p. 282). Brad, the indigenous participant in a study conducted by Michiel van Eijck and collaborators (featured in an upcoming issue of *Cultural Studies of Science Education*), no longer is the same Brad after coming through the experience in the water laboratory. What has happened to him and what he made happen is not a simple uptake of aspects of science into his aboriginal point of view. Both transformed and were transformed by each other, resulting in concomitant changes in Brad, his language (discourses), identity, and culture.

Coda

In this editorial, I suggest to think various ways of knowing (epistemology) on the basis of an ontology of difference. In such an ontology, we think entities not only as different from other entities but also as different within and with respect to themselves: each entity is thought as a singular plural, non-self-identical phenomenon. We then begin by recognizing difference for itself and capitalize on the affordances that derive from bringing difference to the table. We no longer need to construct the similitude of a tofu-based condiment with another one using egg yolk. In the old way of approaching the two condiments, tofunaise always remains the substitute, impostor, always in the quest of seeking recognition in the face of the other, legitimate “-aise.” Rather than the malaise of tofunaise, let us celebrate this condiment in its own right, which would begin by designing a new name for a different product (thing). In the same way, rather than using the term “indigenous science,” let us recognize in the various knowledges—aboriginal, mundane, local, feminine, and so on—as actually *legitimate* ways of knowing in their own right. These ways, rather than coherent and monolithic, are thought to be non-self-identical and useful in different ways in different local contexts. Brad, the indigenous participant in the forthcoming van Eijck et al. study, exhibits a reflexive stance, where he takes from science what is useful in his activities without abandoning his specific and special culturally mediated form of knowing. Let us accept the various forms of indigenous knowing (including Western common sense, mundane knowing) and appreciate them for the contributions they (can) make to render this a better and more livable world.

Tofunaise. But there is another way of looking at the issue. It is an expression of the *métissage* that continuously occurs in culture and language. Rather than looking for a semblance of purity in separating mayonnaise from other condiments on the basis of tofu, tofunaise simply is the expression and product of a mixing of words and things. Equivalent mixing of indigenous knowing and traditional science may therefore bring about new forms of knowing that have advantages over the forms of knowing that exist today. Tofunaise is something special, unlike and irreducible to mayonnaise, with its own taste and use that may bear a family resemblance with the tastes and uses of mayonnaise from which it differs radically, ontically.

I empathize a lot with efforts to legitimize indigenous ways of knowing and allow them to be part of school science. This is Moyra Keane’s approach and question whether there is a place for indigenous knowledge in the science curriculum. But perhaps we should go further and, rather than trying to legitimize ways of knowing until they find a place in the science curriculum, ask whether there are different ways of organizing schooling and the curriculum. In this reorganization laboratory-science-inspired school science would be but one component of a more encompassing course framework that is concerned with epistemology and the real and possible contributions different ways of knowing can make to the pressing issues of the day. Whether we want to produce—and subsequently eat—transgenic salmon that grows 400 to 600% faster is not a question that can be resolved *within* the domain over which Monsanto and like-minded scientists claim authority. This is precisely the domain that produces these foods and applies for permits to market them—it was Monsanto that produced the now outlawed agent orange, PCBs, and bovine growth hormone.

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