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**HOW DOES “COLLABORATION” OCCUR AT ALL?  
REMARKS ON EPISTEMOLOGICAL ISSUES RELATED TO  
UNDERSTANDING / WORKING WITH *THE OTHER***

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**Working Together?**

***Collaboration and the Future of Higher Education***

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## Abstract

Collaboration, if to occur successfully at all, needs to be based on careful representation *and communication* of each stakeholder's knowledge. In this paper, we investigate, from a foundational logical and epistemological point of view, how such representation and communication can be accomplished. What we tentatively conclude, based on a careful delineation of the logical technicalities necessarily involved in such representation and communication, is that *a complete representation is not possible*. This inference, if correct, is of course rather discouraging with regard to what we can hope to achieve in the knowledge representations that we bring to our collaborations. We suggest two actions. First, we can strive to make all stakeholders more aware of the incompleteness of their knowledge representations. This awareness should serve to moderate one's confidence in advocating for the "Truth" of her or his knowledge representations. Second, a moderation in one's certainty of "Truth" should increase each stakeholder's humility and respect for 'the other', thereby, promoting both the efficacy of collaborations and the ability to live helpfully in an increasing complex and needful world.

### **Keywords**

Cognition and Perception

Collaboration

Epistemology

Logic and Foundations of Mathematics

Mathematical Logic

Overconfidence

*“The more I think about language,  
the more it amazes me that people understand each other.”*

– Kurt Gödel, from THE VIENNA CIRCLE by Friedrich Stadler (2001, p. 206)

## OVERVIEW

If we wish to improve our understanding of collaboration in higher education, then one of the foundational efforts we could make involves improving our understanding of

*how collaboration occurs at all*

in any group setting whatsoever. In this paper, we attempt to make some progress in a foundational effort toward clarifying our understanding of collaboration. We do this by

- (1) Describing an epistemological perspective, called *Explorationism*, upon which the investigation in this paper will be based;
- (2) Surveying some of the foundational insights and constructed machinery of contemporary logic and model theory, developing the notion of a *framework*; and
- (3) Investigating how these insights and machinery may help us to understand better the dynamics of human knowledge representation and communication, with a view toward improving collaboration.

In the process of this explication, we will uncover a potentially useful insight, which we roughly summarize as follows:

*We seem to operate, possibly necessarily, within highly **incompletely elaborated frameworks**, which include relevant language predicates (which themselves are subject to an unclarity that is well described by Ernst Mach in Section 1 below), logical rules of inference, logical assumptions, and domain-specific assumptions. One possibility, in our striving for "communication for collaboration" with others, would be to complete the elaboration of these frameworks routinely (and share these full elaborations). However, such elaborations may not be (at least presently) possible. Indeed, the best tactic (at present) may be to increase AWARENESS among all collaborators OF THE HIGHLY INCOMPLETELY ELABORATED NATURE OF ALL OF THEIR FRAMEWORKS.*

Increased awareness may help us to be more sensitive to the nature of all narratives, more humble in our assertion of our own narrative, and more respectful of the narratives of others, which in turn, may well lead to collaboration that is more efficacious.

### (1) Explorationism

Explorationism (1999) is an epistemological perspective in which all of our knowledge is (so far) less than certain. Our daily epistemological work regularly involves us in an iterative process of knowledge collection, knowledge representation, knowledge analysis, action decision generation, and action implementation. In this process, each action implementation leads to an altered state of affairs, forming the basis for our ‘next’ knowledge collection. What we are dealing with, in such a process, is *evidence*, confirmatory and refutatory evidence.

Ernst Mach, a spiritual forerunner (along with Albert Einstein, Bertrand Russell and others) of the Vienna Circle, wrote on page 2 of his *THE ANALYSIS OF SENSATIONS* (1897):

*“Colors, sounds, temperatures, and so forth are connected to one another in manifold ways, and with them are associated dispositions of mind, feelings, and volitions. Out of this fabric, that which is relatively more fixed ... stands prominently forth, engraves itself on the memory, and expresses itself in language. Relatively greater permanency is exhibited ... by certain complexes ... which therefore receive names, and are called bodies. Absolutely permanent such complexes are not.”*

From the perspective of Explorationism, these ‘labelings’, as described by Mach, are both helpful and unhelpful.

Such ‘fuzzy labelings’ are helpful in that they are certainly very useful for the ‘rough and ready’ ways in which we collect partial and fuzzy data, quickly make our decisions, and take our actions. Indeed, often in the unfolding of our daily lives, such data collection and action implementation is appropriate since more complete knowledge, even if indeed possible in the allotted time frame, is “not required for the triggering of appropriate action” (2000, p. 479).

On the other hand, such ‘fuzzy labelings’ are unhelpful in that they far too often give us an unjustified assurance as to the precision / clarity of our knowledge. Vagueness of our knowledge, if not heeded sufficiently, often leads to overconfidence regarding our knowledge (Puncochar & Fox, 2004). We would highly recommend, in this regard, Bertrand Russell’s wonderful essay “Vagueness” (Russell, 1923).

Explorationism, then, seeks to draw our attention to aspects of knowledge representation and highlight the partial, tentative, *and* evidential nature of this knowledge. This non-absoluteness of our knowledge, as seen through the perspective of Explorationism, makes it clear that Classical Logic, with its purely absolutist view of assertion, cannot be used as a base logic for Explorationism. Hence, for a base logic for Explorationism, we must turn to an evidential logic that goes beyond the absoluteness of Classical Logic. We now turn to such logics.

## (2) Logics for the Representation and Processing of Uncertain Knowledge

We seek increased clarity about the nature of our knowledge, expecting to strive toward improved collaboration, which leads us to a need to use new logics for the representation and processing of uncertainty. One such logic is Evidence Logic (EL), as described by Faust in (2000). In that paper, the reader will find full details of its construction along with theorems and proofs providing an exact analysis of the structure of the logic. Here, where our goal is to develop the notion of a *framework* and see how it might help us better understand collaboration, we turn now to an explication of just those aspects of EL needed to clarify this notion of *framework*.

In any (current) language, there are unary predicates  $Px$  (for example “ $x$  is a chair”), binary predicates  $Pxy$  (for example “ $x$  is longer than  $y$ ”), ternary predicates  $Pxyz$  (for example “ $x$  and  $y$  are parents of  $z$ ), and so on. Let us here refer to any such predications simply by  $P$ , and let us think of evidence levels  $e$  as ranging over all the numbers between  $e = 0$  and  $e = 1$  inclusive, with 0 indicating ‘no evidence at all’ and 1 indicating ‘absolute evidence’, while  $e < e'$  indicates that  $e'$  is a greater evidence value than  $e$ . Finally, let a subscript ‘ $c$ ’ denote that the evidence asserted is confirmatory while a subscript ‘ $r$ ’ denotes that the evidence asserted is refutatory. So, using a convention of annotating a predication with an evidence level currently associated with the predication,  $P_c: .7$  asserts confirmatory evidence for  $P$  at the .7 level, while  $P_r: .5$  asserts refutatory evidence for  $P$  at the .5 level; and since  $.5 < .7$ , the confirmatory evidence for  $P$  is greater than (by .2) the refutatory evidence for  $P$ .

While referring the reader to Faust (2000) for precise details, we make a few remarks to help motivate this logic EL for the reader. Clearly, the two predications above, if both are asserted, indicate some level of conflict: that is, the conjunction  $P_c: .7$  AND  $P_r: .5$  asserts evidential conflict (with some possibly asserting, as we do momentarily, that this is a conflict at the .5 level!). For an analysis of the nature of conflicting evidence in EL, see Faust (2007), wherein (as the reader might like to contemplate)

$P_c: e$  AND  $P_r: e$  asserts an *evidential glut* at evidence level  $e$

while

(NOT  $P_c: e$ ) AND (NOT  $P_r: e$ ) asserts an *evidential gap* at evidence level  $e$ .

Finally, consider how this logic EL allows clear distinction between, speaking roughly, ‘absence of evidence’ and ‘evidence of absence’: for example, while it is the case that  $\text{NOT } P_c$ : .4 asserts absence of confirmatory evidence for P, in contrast  $P_r$ : .4 asserts presence of refutatory evidence for P. This distinction is not possible in Classical Logic due to its rather thin explication of the concept of negation. Indeed, this example of a stronger knowledge representation available in EL is due in part to EL’s richer explication of the concept of negation, provided by the gradational confirmatory and refutatory evidence machinery built into EL.

Consequently, we are pleased to have EL available to use in our representation of uncertain knowledge. In addition, we are even more pleased that EL has all the salient features found in our ‘old and familiar’ Classical Logic. Indeed, EL is a proper extension of Classical Logic in the technical mathematical logic sense that Classical Logic is properly embeddable into EL. Let us mention just two of these salient features, possibly the most important ones. These two characteristics, indeed converses of each other, provide the fundamentally important connection between the syntax and semantics of any EL language. As is usual, letting B be any set of sentences in any EL language, the syntax involves the notion of ‘provable from B’, while the semantics involves the notion of ‘true in every model of B’. First, the Soundness Theorem roughly says, “provable implies true”: more precisely, it asserts, “if a sentence S is provable from B, then S is true in all models of B”. Second, the Completeness Theorem roughly says, “true implies provable”: more precisely, it asserts, “if a sentence S is true in all models of B, then S is provable from B”. The fundamental importance of these two theorems is clear. The Soundness Theorem asserts our proof system is not too strong (since it never proves (from B) any sentence that fails to be true in all models of B!); while the Completeness Theorem asserts our proof system is strong enough (since it always proves (from B) any sentence that is true in all models of B!). Taken together, these two theorems tell us that the proof system of EL is “just right” in its relation to the notion of truth in EL.

Particularly relevant to our considerations here is that we note an important aspect of the notion of truth as defined in formal logic settings. In such settings, there are no ‘universal truths’! It is always with respect to a particular model that a sentence S is true (is the case) or is not true (is false, is not the case). With this perspective, one cannot escape frameworks and get to some sense of ‘universal truths’. **The best we can do is to say that a sentence S is B-true (for a set of sentences B) with a defined meaning that S is true in all models of B.**

With our logic EL, for representing and processing evidence, now available, we are able to give a rough description of the knowledge domains within which, we conjecture, collaboration occurs. Namely, a *framework* is any theory in any stipulated EL language. This precise encapsulation of our knowledge domains within our EL languages for representing and processing of our evidential knowledge, however formally beautiful, in fact seems to point to the largely unelaborated character of our knowledge. Let us now try to see both why this largely incomplete elaboration is so and how this understanding of largely unelaborated frameworks might help us improve collaboration.

### (3) Improving Collaboration

Those individuals or groups who wish to collaborate each ‘bring to the table’ their frameworks. Each framework, while complete in itself in accordance with the development in (2) above, is carried (and expressed!) by each individual and group in an only incompletely elaborated form. The completeness of the framework is embodied in the stipulation of the EL language to be used, the logical axioms and rules of inference to be used, and the other more specific axioms to be used. In contrast to this completed framework, the individual or group brings to the table only a meagre ‘incompletely elaborated’ form of the framework – indeed, incompletely expressing the language they are using, the logical axioms and rules of inference they are using, the other more specific axioms they are using, and the theorems that they are by inference asserting to be true.

A more preferable tactic would be to have each collaborator bring to the table a full framework. This, however, does not seem, in view of our considerations in (1) and (2) above, to be possible.

There is a path forward, though, in our attempt to improve collaboration in this regard. Namely, we can strive to broaden understanding, by ALL collaborators, that it is only partial elaborations of their frameworks that these collaborators carry with them and expresses to others. Included in ways collaboration, thereby, may be improved are the following:

- (a) the humility of each collaborator will be increased; and
- (b) the respect and tolerance of each collaborator toward all others will be increased.

Further, due to the realization of each collaborator that ‘their truth’ is just ‘truth within their framework’ and not ‘universal truth’:

- (c) each collaborator will understand that NO collaborator is allowed to assert positions that are claimed to be OBVIOUSLY TRUE for all collaborators.

Hence, any collaborator who is found to be asserting a position as OBVIOUSLY TRUE FOR ALL OF US should be questioned immediately and not allowed to make such an assertion.

The last mentioned possible improvement in collaboration may well be the most important. For one of the most dangerous ways in which collaboration breaks down is when individuals or groups of collaborators think that ‘their truth’ is ‘universal truth’ and further think that they have the right to impose (even through violent means) their truth upon others. We hope that a greater awareness of the framework dependence emphasized in this paper may lead to better collaborations built on less overreaching.

## CONCLUDING SUMMARY AND OBSERVATIONS

To provide an overview of these considerations, we paraphrase from Faust and Puncochar (2013) the following:

Explorationism (see 1999) is a perspective wherein all of our knowledge is (so far) less than certain, and naturally would come equipped with a *base logic* entailing machinery for representing and processing evidential knowledge. One such *base logic* is Evidence Logic (see 2000), which strives to deal with the phenomenon of the gradational presence of both confirmatory and refutatory evidence.

From this perspective, we have addressed questions surrounding sociological problem areas involved with strivings for efficacious collaboration, which we see as deeply infused with substantial epistemological factors. By defining a *framework* as any theory, in the technical sense this term is used in logic, in Evidence Logic, we attempted to see each sociological milieu as a complex web of largely unelaborated frameworks. This dearth of elaboration leads to both a lack of awareness of presuppositions and implications inherent within each framework and an overconfidence regarding the veracity and applicability of each framework. For example, some sociological milieux involve Belief Systems (see 2008), below which lurk poorly elaborated frameworks. This lack of elaboration allows believers to sometimes assert that their beliefs should apply to ‘the other’ as well as themselves. We considered the possibility that, even when further elaboration of a framework seems infeasible, increasing the awareness of the framework and the highly unelaborated versions of the framework, which we routinely use, will help to improve processes of collaboration.

While we have intentionally avoided the use of ‘belief’ in the main body of the paper, our reference to it above was intentional due to its wide use in highly unelaborated forms. To emphasize the importance of not using ‘belief’ in argumentation, let us consider how to avoid ‘belief talk’. Let us define a belief as follows: agent A believes a sentence S if and only if A asserts S is true even though A does not know that S is true. We have given argumentation (of course to some extent inconclusive) elsewhere (2008) that “all belief systems are unnecessary”. In that paper Faust argues that commitment is always sufficient, where commitment is defined as follows: agent A is committed to a sentence S if and only if A agrees to actions inferable from S. Indeed, important aspects of collaboration depend on whether the collaborators bring beliefs or bring commitments to the table, and we would suggest that interested readers might look to (2008) for more ideas in this regard. Hence we would encourage this distinction between ‘belief’ and ‘commitment’ be proffered to collaborators, emphasizing the advantages of minimizing beliefs and maximizing commitments in any collaboration process.

We conclude with a quote from Bertrand Russell's essay "Vagueness" read before the Jowett Society, Oxford (1923, p. 84):

*"The influence of symbolism on philosophy is mainly unconscious; if it were conscious, it would do less harm. By studying the principles of symbolism, we can learn not to be unconsciously influenced by language, and in this way can escape a host of erroneous notions."*

Russell clearly points to a need, as we discussed here, to be as mindful as possible in our collaborations within all of our 'villages' (viz. our neighborhoods, universities, countries, and even the Global Village itself), of the incompletely elaborated character of our frameworks and to help others to understand this incompleteness as well.

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