research proposal/description for
b0th d1g1tal and n0t

8th December 2016

to the Graduate Studies Committee of UCC

from Anthony Durity
for the Structured PhD Programme
of Digital Arts and Humanities
in tandem with the Philosophy Department

"—the philosopher's better-known words and ideas
are sprayed, skewed, all over the book […]"
both flesh and not (Wallace, 2013)

§

i can't even ...

0.1   research ambit

Past:

Digital technology is transforming the world, not a single discipline has survived its encounter with the realm of the digital intact. Philosophy is no exception. A number of previous investigations into this interaction: (Sloman, 1978),(Bynum and Moor, 1998) and its successor (Moor and Bynum, 2002) are notable, not forgetting (Grim et al., 1998) and (Floridi, 1999) who are equally representative and have focussed the lens of inquiry on the intersection of philosophy and computing. The duo Moor and Bynum label this intersection *cyberphilosophy* and divide the novel and fertile developments into subject matter, models, and methods. (McCarty, 2014) in a work wider in scope also analogously targets discipline, modelling, and the methodological commons. This work pushes back against the overly capacious and unfocussed scope of these surveys.

The more limited boundary of my research stems from the desire to explore the practical impact of only certain sorts of computational methods on the activity of philosophy, to engage in this exploration through both digital practice, and finally to ground that practice in solid theory. To put it another way, the work both does philosophy digitally and asks what it means to do philosophy digitally. To be clear, this work is not an exploration of the impact of the notion of computing/computation on existing subject areas of philosophy. Neither is this work an exploration of the various attempts to formalize by hand existing philosophical arguments and use inference engines to check and refine logical proofs. (A procedure I call *computational philosophy* for reasons that will become clear.) It follows therefore that the scope of this work coincides with the relatively recent upsurge in using machines in a semi-automated way to analyse both the form and content of large collections of text; so-called corpus linguistics (Wynne, 2005). Indeed, thematically, the notions of form and content and their interplay serve in one way to structure my research. See (Stewart, 2013) for more details.

When science is done digitally and when the humanities are done digitally this is called respectively *scientific computing* and *humanities computing*. (By which I wish you to understand as their respective activities augmented by computational methods, computer aided if you will.) I propose an analogous formulation for philosophy, *philosophic computing*.

One key distinction is what ought to be called weak versus strong compuational methods. If during the activity of philosophy the computer is used as a communication toollet us label this weak. The slightly disparaging way this is formulated within the digital humanities is that a mediavalist with a blog is not a digital humanist. In contrast if computational methods are directly involved in a substantial way in the art of philosophy then this may be labeled strong.

The subject area which inquires into the grounds of philosophy, the philosophy of philosophy as (Williamson, 2007) puts it is called meta-philosophy (*metaphilosophy*). In addition to (Williamson, 2007) I rely on (Deleuze and Guattari, 1994). There is a very good argument to be made that the term philosophy already encompasses the notion of metaphilosophy (and as such makes metaphilosophy a redundant term) but as an explicit indicator and disambiguator the term metaphilosophy has merit so long as care is taken not to led into believing that we are engaged in some kind of higher order inquiry that the prefix meta- suggests. As the theoretical implications of engaging in digital research in philosophy and the humanities are worked out it is necessarily the case that philosophy must become more engaged with the question of computational methods as they more increasingly intertwine with qualitative methods and not just quantitative methods. This dissertation aims to do just that and the rest of this document picks out one tentative path towards the distant destination

Future:

Our research indicates that novel computational methods may be brought to bear on the task of philosophy. It suggests a radically different route than that taken by others, that of modelling the formal systems discussed within philosophical works, as exemplified by The Philosophical Computer(Grim, Mar, & St. Denis, 1998). It suggests also that we should take a sustained look beyond the more, if we may say, pedestrian use of computers as educational and communication tool as discussed, for example, in Cyberphilosophy(Moor & Bynum, 2002).

Though some way off from becoming part of the standard philosophical curriculum the investigations we have undertaken indicate further avenues of fruitful research and hint at future novel results once the methods have been refined through third-party experimentation, replication, and feedback.

1. **objectives and keywords**

    (a) **objectives**
    To better characterise the encounter (this collision of worlds) by creating a useful map of the site designating points of interest and landmarks: schemata; typology; to better ground ...; ...

    (b) **keywords**
    philosophic computing, linguistic corpora, computational linguistics, topic inferecing, domain modelling, computaional metaphysics, type theory, semiotics, typed semiotics

2. **project title / topic**
    The title of the dissertation is *b0th d1g1tal and n0t*. I hereby acknowledge that using l33t speak is totally naff, but hey, what can you do? The corpus is called *PACT.x*(Durity, 2015a) (pronounced 'pact dot x') where PACT is an abbreviation for "philosophical archive of clear texts" and the .x is to signify that snapshots of versions of the evolving corpus are

taken when necessary at key intervals. This versioning enables each self-contained digital investigation, project, or experiment to correspond to one particular version of the corpus for reproducibility and direct comparison purposes in order that like can be compared with like. The first digital project is called *Saffron #1*(Vulcu, 2015)(Durity, 2015c) (pronounced 'Saffron experiment number one') where Saffron(Bordea, 2013) is a computational linguistics tool developed(Bordea et al., 2014) at the Insight Centre for Data Analytics in Galway. The second digital project is called *Wikidata #1* (Durity, 2015d) (pronounced 'Wikidata experiment number one' where Wikidata (how to cite?)[1] is a semantic web triplestore, a structured offshoot of Wikipedia. The third project is called *Philosophical Units #1* (Durity, 2015b) (pronounced 'Philosophical Units experiment number one' where a philosophical unit is the term coined to encompass all the different orders of magnitude of concepts in philosophy from the most fine-grained (individual concepts) to the most coarse-grained (branches of inquiry).

0.2   personalia

Like many who were young when personal computers became household objects I became fascinated by programming. Mostly self-taught I have worked outside the walls of academe in software testing and development with one hiatus to study philosophy and mathematics at the undergraduate level at NUIG (National University of Ireland, Galway). At the onset of the recent economic downturn I returned to education and received a masters in digital culture from Jyväskylä university, Finland. I joined the UCC DAH PhD programmed to work on the Boole digital archive but after a couple of years pivoted to the current project which more aligns directly with my twin passions of philosophy and code.

0.3   research basis

(Peirce, 1932)

0.4   project description in detail

It is proposed that one of the deliverables for this dissertation is a digital assemblage[2]. The work divides naturally along the epistêmê / technê fault line.

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[1]https://www.wikidata.org/wiki/Wikidata:Main_Page

"Wikidata is a free linked database that can be read and edited by both humans and machines."

"Wikidata acts as central storage for the structured data of its Wikimedia sister projects[...]"

Wikidata is a triplestore. A triplestore is a database of semantic web triples, each with the form: subject, predicate, object. It is no coincidence, we suggest, that the ultimate store of structured data that has evolved on the web shares the same form as Peirce's triad of logical terms.

[2]This is now relatively commonplace in the digital humanities. Although there is ongoing debate as to how to assess this new hybrid work of text+code the arts and sciences (inc.

There is a natural schema for where in conceptual space the digital investigation (the technê) is situated.

	formal	material
representation	computational stylistics	topic modelling[3]
reckoning	automated provers	concept checking

All of these methods are strong computational methods. Again the division of form versus content comes into play, this very natural division has been overlooked in philosophical works in the digital humanities. Quality, being the union of the formal and material, arises immediately as a category in Stoic philosophy, Aristotle, Kant, Hegel, Peirce, and others. The division and labeling of representation and reckoning are not as clear and it is even less clear what category subsumes both – one can see it is a division though because of the different clusters of computational methods and tools that have coalesced in each area, with concept checking still on the horizon.

0.4.1 practical scaffolding

knowledge representation   Pawel Garbacz,

> "I assume that the distinction between taxonomies and ontologies has to do with the type of formal structure they contain. A taxonomy will be a structure defined just by the subsumption relation (possibly with the instantiation if the individuals are involved.) (If you are familiar with the Semantic Web jargon, the DL expressivity of a taxonomy will be at most ALC.) A (proper) ontology will have a richer structure built out of other relationships, e.g., parthood. So if your ontology just classifies entities, without specifies any relations there between, it is, in this view, a taxonomy."

A distinction must be made between the general notion of category in philosophy (and elsewhere, for instance category theory in mathematics) and the top-level categories of metaphysics. When we refer to the categories of virtue of vice, for instance, it is to the general notion of category to which we refer. When we refer to the ontologies of Aristotle, Kant, Peirce, Whitehead, or whoever, it is to the top-level categories that we refer. Categories of Being, say. Every object/entity there is, without exception, participates in at least one of these top-level categories because these categories designate universal properties. Properties such as: quality, substance, modality, form, and so on. C. S. Peirce arguably took these investigations to their logical conclusion with his triad of logical terms: firstness, secondness, thirdness. John F. Sowa in *Knowledge Representation* (Sowa, 2000) presents a historical whirlwind tour of this philosophical endeavour and its connections with software modelling, I regard this research is a continuation of Sowa's investigations.

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comp. sci.) have set a precedent. There the models are text+compositions (the arts) or text+experiments (the sciences). Because a digital assemblage is a sizeable amount of work the supporting text in the digital humanities is often though not necessarily far shorter that the text of a "traditional" dissertation.

Saffron (Bordea et al., 2014) based on Bordea's domain modelling work (Bordea, 2013) is a research tool that uses novel natural language parsing and taxonomic techniques. Specifically, it performs domain adaptive extraction of topical hierarchies. Saffron was conceived in and is being developed at the Insight Centre for Data Analytics in the National University of Ireland, Galway.

PACT.x (Durity, 2015a) is a purpose-built corpus of philosophical texts, these are stored in plain text with their associated metadata and they reflect 2500 years of mainly Western thought, from Plato's Symposium to Wittgenstein's Tractatus, from Lao-tzu's Tao-te Ching to the essays of Peirce. PACT.x was conceived in and is being developed at the Digital Arts and Humanities program in University College Cork, Ireland.

(Saffron #1) By performing a syntax-based analysis of the PACT.x corpus using Saffron we obtain a resultset α, call it $R\alpha$, which comprises a sequence of terms, $S\alpha$, and related taxonomy, $T\alpha$, of philosophical concepts (Vulcu, 2015).

Here is an illustration of their corresponding visualisation:
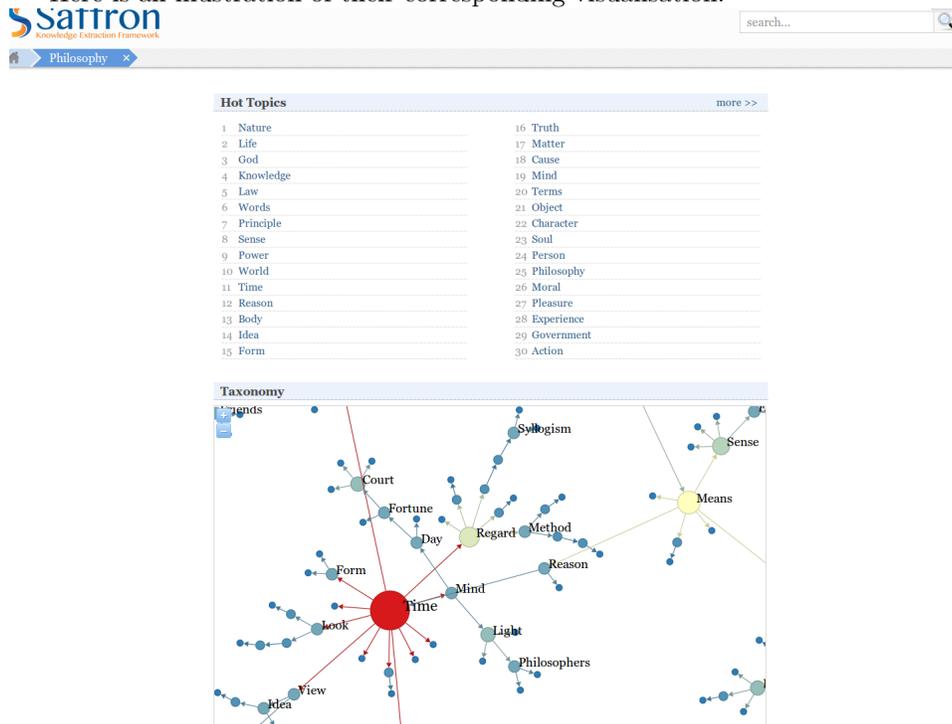

Illustration 1.

Sequence $S\alpha$ is ordered by a weighted combination of frequency and coherence, meaning frequency of occurrence of a word within the corpus coupled with terms that contain a word from the domain model, and terms that appear in the context of a word from the domain model. The structure and relation of the topics in taxonomy $T\alpha$ are drawn from resultset $R\alpha$. The directed edges of the

graph are constructed using the broader/narrower than relation from WordNet[4] and the graph is pruned using the ChuLiu/Edmonds algorithm resulting in a directed acyclic graph.

Again, for legibility, the first 30 terms in sequence α are:

1 Nature	11 Time	21 Object
2 Life	12 Reason	22 Character
3 God	13 Body	23 Soul
4 Knowledge	14 Idea	24 Person
5 Law	15 Form	25 Philosophy
6 Words	16 Truth	26 Moral
7 Principle	17 Matter	27 Pleasure
8 Sense	18 Cause	28 Experience
9 Power	19 Mind	29 Government
10 World	20 Terms	30 Action

Table 1.

(Wikidata #1) We Iterate through each of the terms in resultset α in turn and query the open knowledge graph Wikidata to perform further analysis. By tracing the part-whole relationship properties (instance-of, subclass-of[5]) of each term we infer the compositional structure of these concepts and obtain ultimately another sequence, $S\beta$, and related taxonomy, $T\beta$. The list of topics that is sequence $S\beta$ is more or less identical to sequence $S\alpha$ save for novel topics revealed by Wikidata. Note that taxonomy $T\beta$ differs from taxonomy $T\alpha$ in that it reflects the subsumption relations (and instantiation relations) of Wikidata rather than WordNet.

(Philosophical Units #1) Uses the word vectors of the corpus itself to generate yet another taxonomy, $T\gamma$. Work in progress!

benchmarks

Benchmarking sequences:

We validate the sequences, α and β, against authoritative philosophical reference works such as *The Oxford Dictionary of Philosophy* (Blackburn, 2008), Routledge Encyclopedia of Philosophy (Craig, 1996), and so on. In this way we are able to understand how a distant reading (to use a term that has almost become a genericized coinage) of topics by machine algorithms compares to professional reference works. Is it possible that topics that philosophers have touched on down through the ages, as highlighted by the machine, haven't gotten the attention they deserve? If so, why? Is it possible that there are topics

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[4]https://wordnet.princeton.edu/"WordNet® is a large lexical database of English. Nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms (synsets), each expressing a distinct concept. Synsets are interlinked by means of conceptualsemantic and lexical relations."

[5]not part-of, otherwise we'd generate an ontology

which are considered important enough to gain a reference entry that have been overlooked by the machine? Again, what could be the reason? Because the topics in resultset α are ordered by frequency we now have a rough quantitative measure of the relative usage of different philosophical concepts which perhaps can be used as a proxy for their relative importance; reference works obviously arrange entries in alphabetical order having no other metric.

Benchmarking taxonomies:

We compare the various taxonomies, α and β and γ, with the traditional categories of philosophy to see how the singular vision of individuals ((Aristotle, 1938)/(Kant, 1787), for instance) differs from what may be viewed as a complex adaptive system (WordNet and Wikidata). To clarify, the idea here is to contrast the semi-isolated contemplation of individuals from different eras with the distillation of the organic collective behaviour of billions of wiki edits and collegiate collaboration.

tentative conclusions 15% match, very low. iteration. doesn't catch technical terms. towards smarter reference works who terms can be ordered according to various criteria.

0.4.2 theoretical framework

typed semiotics The name I am giving to the theoretical framework is *typed semiotics*. I have written elsewhere that the scholar, intrepid and cautious to the last, should approach semiotics askance and infrequently. It is seductive, it is what I term a *golden herring* – this is a deliberately chosen rubric, designed to be slightly silly yet arresting. A golden herring is theory as talisman. Though all that glitters is not gold let us pocket it this time because here it pays its way.

Somehow we must mediate between the world of philosophical things and stuff, all that there is; the contents of our minds, all that they contain, the operations of our minds, every manner of conduct; the mess of words upon our pages, in every language; and the structured data and code of our digital machines.

A tall order.

No wonder every time I get to this point I hesistate. The task is immense and daunting.

Nevertheless I propose that there is a formalism that can get us a good deal of the way there. Before I continue I want to say something about the word *formalism*. As I have pointed out many times now I am concerned with both form *and* content, the formal *and* the material. When I use the word formalism I do not want you to imagine I am only referring to the formal side of an entity. I use formalism to refer to the capturing of both the formal and material properties of an entity. I wish there were another word. It is because of, I suggest, the tyranny of logic, and logic's hold over form that when we pluck *le mot juste* from the air we find only formalism to hand.

When we ask of a thing, "what is it?" we mean exactly "what type of thing is it?" or "what is that individual called?", by which we mean how it is conceived in all its qualities; this concept, what are its attributes and what are its relations. Thus we need a theory of types. Furthermore we need to ask how this thing, this something, stands to someone for something else in some respect or capacity. Here I am deliberately glossing Peirce. Thus we need a theory of signs. I call the fusion of both theories typed semiotics. This union has been gnawing away at me for a couple of years.

type theory What is type theory? Most people who are familiar with the story of mathematics and logic in modern times can recite a tale that arcs from Cantor and his transfinities to Gödel and his incompletenesses. So familiar is the trajectory that it barely needs signposting now. I have an account of this journey in comic book format (Doxiadis and Papadimitriou, 2009) on my bookshelf if that is any indication of how trafficed this path is. More standard treatments are (Alexander, 2015) and (Wallace, 2003). Only problem is that we have been telling and retelling the wrong story. The story we should have been telling is the story of type theory and fortunately others (Ladyman & Presnell) are beginning to recognise this. A very quick precis because here is not the appropriate venue to go into depth.

Frege is chipping away at his *Begriffscrift*, Russell spots a paradox and communicates said paradox to Frege causing him to abandon his project (this event is woven into the standard narrative) whereby Gödel drops his incompleteness theorems on the world and wraps things up. But this is not our concern. We do not care about the *limits* of what can be said within a certain framework, we care about what can be said *at all*. In an appendix to the Principia Russell outlines a tentative theory of types to engineer around the paradox by stratifying the universe of discourse into a hierarchy of incommensurate types rather than homogeneous sets. In some way I think the mental instabilities and eccentricities of the main characters (Cantor, Frege, Russell, Gödel) knits the narrative together. Alonso Church, where the story of type theory goes was a character unplagued in this way. Quine struggled along this route and ultimately gave up and because of Quine's standing this is another set-back for the story of type theory.

The main point I am trying to make here is that sometimes (frequently?) narratives shape research, that even logic (of all things) is not immune to the vagaries of the human imagination.

What logic when? (Susan Haack, *Philosophy of Logics*)

Type theories are term rewriting systems where terms inhabit types. Therefore, depending on which way the rewriting of terms is done, a type theory can be as much a model of computation as the turing machine is. In fact, one important result from the birth of computing is the Church-Turing thesis which states that,

> "Whatever can be calculated by a machine (working on finite data in accordance with a finite program of instructions) is Turing-machine-

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computable." (Copeland, 2015)

Computer scientists use Church's model (Church, 1973, 1974), not Turing's model when investigating theoretical problems in computer science. Church's model, the lambda calculus is a term rewriting system, originally untyped, which consists of constants, variables, function abstraction, and function application. When typed we get the simply typed lambda calculus and it is these systems that are studied. As Wadler says,

> "Untyped lambda calculus or typed lambda calculus with a construct for general recursion (sometimes called a fixpoint operator) permits the definition of any effectively computable function, but have a Halting Problem that is unsolvable. Typed lambda calculi without a construct for general recursion have a Halting Problem that is trivial—every program halts!—but cannot define some effectively computable functions. Both kinds of calculus have their uses, depending on the intended application." (Wadler, 2015)

Again we have the case where in culture, including the world of philosophy, Turing's machine has reached the level of popular consciousness and Church's machine is relatively unknown.

From the simply typed lambda calculus we have a multitude of extensions[6] that exhibit various computational properties with corresponding type systems. So long as the type systems are not ad hoc and are wired up in a principled fashion we have certain types that stand out in the landscape like structural landmarks. These are the zero type: what could be called ideal-nothing, the unit type, what could be called pure being, the universal type, and so on. There is a certain sense in which Hegel and Peirce could be called proto-type theorists.

semiotics The development of the study of signs is, like so many other things, divided by the Atlantic. In the so-called New World there is Charles Sanders Peirce and his triadic formulation – in Europe the dyadic formulation of Ferdinand de Saussure. Why do they differ when, surely, their subject matter does not? A sign for Peirce is confusingly divided into sign (or representamen), object (or semeiotic object), and interpretant. For de Saussure into signifier and signified.

Let us call the Peirce's sign qua representamen the sign-vehicle. This corresponds to De Saussure's signifier. It is the label or handle or unique identifier or outwardly aspect used to call and recall the sign. Peirce's object corresponds to de Saussure's signified.

De Saussure has nothing that corresponds to Peirce's interpretant. Peirce calls this the quasi-mind in which sign-vehicle and object are brought together in understanding. De Saussure presents a static picture of knowledge representation, Peirce a dynamic one. Peirce's picture allows for reckoning, computing,

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[6]intuitionistic type theory, System F, dependent type theory, Martin-Löf type theory, calculus of constructions, homotopy type theory, ... (Harper, 2016; Pierce, 2002)

calculating, inferring, deducing, and so on. I am more or less wholly unconcerned in this work with this part of the picture. In the best work to date that I have read on the subject matter Sowa calls this picture knowledge representation. I have to disagree, to follow Peirce one would have to call this knowledge representation and reckoning. I am unconcerned with the reckoning part, what concerns me is how concepts and their relationships are represented prior to reckoning. To put it another way, I am more or less unconcerned at this juncture with intelligence or cognition taken as the ability to reason (artificial or otherwise) and more concerned with the formation of judgements or recognition. (There is the caveat at this point in that I am unsure to what degree and to what extent these two positions are separable.)

You might think then that I would ascribe to a dyadic conception of sign-making, that is to say, the de Saussurean model. This is not the case. I see Peirce's quasi-mind as a prefiguring of Deleuze and Guattari's conceptual persona. It is the context in which systems of knowledge are grounded – think how it is necessary to distinguish between "it is said (or known, or judged, or believed)" versus "I say (or know, or judge, or believe). If you are uncomfortable with the talk of personae and minds then feel free to substitute in the phrase knowledge-context, or simply context. Usefully, this is in accord with type theory as will be seen further on.

To understand Peirce's theory of signs one needs to realise that his system is architectonic, the various parts interlock. From one to three to a triad of trichotomies to ten classifications to sixty-six (Sanders, 1970).

typed semiotics redux   What you get when you stick the two parts together? (Though it sounds completely gross when I put it like this.) What work the complex of parts is doing?

For instance, is the Theory of Types is really the proper theory of the first trichotomy? And though Peirce spoke of mark and token and type and spoke about the ground he overlooked the background, that is to say the medium, and he overlooked the totality of signification, that is to say the message.

And so to the second trichotomy. What is the proper theory of icon and index and symbol? Perhaps this is knowledge representation.

Then what of the third trichotomy, the part of the edifice most in need of renovation in light of type theoretic advances. The divisions of unsaturated predicate and proposition and argument do not stand up to scrunity.

It is clear, to me at least, that Peirce's semiotics cannot survive unchanged in the face of a century of type theoretic advances and insights. It is equally clear to me that type theory in order to realise its true promise of handling all the objects of cognition needs to take into account the ideas from semiotics. Perhaps the investigation of that union can be called typed semiotics.

In order to convince ourselves that typed semiotics is a thing a number of routes will be unthreaded, each supporting the others.

route 1 − internal reflection   I reject Kripke's term possible worlds in favour of Gardenfors's conceptual space, this better gels with Deleuze & Guattari and with natural language. When I reflect subjectively on the mental operations within I see (with my mind's eye as it were) that everything I can possibly conceive of should be termed most naturally a concept.

Each concept has both a signifier and a signified. The act of assigning a signifier to a signified and the act of recalling this assignation is always context dependent. In use this signification we call meaning making, this naming designating. Hence what is needed is a theory of signs or semiotics.

Each concept, at least every philosophical concept that I can conceive of has a type. I find it impossible to separate the type of a thing from the thing itself. I had previously thought of the type as the unity of form and content I reliase now that: quality is the unity of form and content; value is the measure of quality relative to some standard; types are agreed upon standards. Hence what is needed is a theory of types or type theory.

I realise that in drawing this picture I am assuming that how I see the world of ideas is how the world of ideas is for everyone, I also realise that I am drawing on concepts given to me to do so. But there it is.

route 2 − in literature   Are there suggestions in the literature of typed semiotics? Yes, I believe so.

(a) A telling quote:

> "Judgement in general is the faculty of thinking the particular as contained under the universal. If the universal (the rule, principle, or law) is given, then the judgement which subsumes the particular under it is determinant. This is so even where such a judgement is transcendental and, as such, provides the conditions a priori in conformity with which alone subsumption under that universal can be effected. If, however, only the particular is given and the universal has to be found for it, then the judgement is simply reflective."
> (Introduction to Part IV, Kant, 1892)

Translated into the framework I'm building: particulars are values, universals are types.

(b) There is a much stronger hint of it in Eco in (Eco, 2000), basically what he calls cognitive types. There is a whole chapter with this title. Eco never once considers there may be a *bona fide* theory of types. I shall not go into detail here, I will only say that there are surprisingly few works which cite this text of Eco and none connect his types with type theory. The question of course is, is this permissible? Which is something I asked,

(c) Linda Wetzel who in the very recent (Wetzel, 2009) argues for the pervasiveness of types and tokens and again her types are roughly the Peircean ones and not the types of type theory. I emailed her and asked her if she thought there was a connection and she said that I was the second person to ask her this question this summer! She said she did not know. I suggest, of course, that they are.

(d) Returning to one of the sources, returning to Peirce. It was in the context of semiotics he asserted that only legisigns (Peirce, 1906) are typed as far as the literature goes, whereas I think I am saying that all signs are. There's the question, which Peirce never answered (in truth, he never even *asked* the question) which is, "if signs have a type, where is the type?"

(e) Another telling quote:

> "Constructive type theory avoids separating form and meaning (content) by explaining semantically each form of judgement and each rule of inference at the same time as they are introduced (and this in a direct, intuitive and not in a recursive, set-theoretical way)." (Sommaruga, 2000)

That type theory unifies the formal and material (we are speaking figuratively here) is a compelling idea. It means that we can say that in the concrete world there are *physical constants*, in the formal world *logical constants*, and innovatively in the material world what may be termed *material constants*. Metaphysics is the philosophical study of material constants I claim.

(f) Urs Schreiber, personal communication, dated 22nd Sept. 2016. More on this later.

route 3 – "curious parallels"   The correspondence has various names, it has been called propositions-as-types, computational trinitarianism, Curry-Howard correspondence. Here is a quote from computer scientist Robert Harper:

> "The doctrine of computational trinitarianism holds that computation manifests itself in three forms: proofs of propositions, programs of a type, and mappings between structures. These three aspects give rise to three sects of worship: Logic, which gives primacy to proofs and propositions; Languages, which gives primacy to programs and types; Categories, which gives primacy to mappings and structures." (Harper, 2011)

Wadler – propositions-as-types (Wadler, 2015)

Sørensen & Urzyczyn – Curry-Howard isomorphism (Sørensen and Urzyczyn, 2007)

nLab – propositions-as-types

Harper/Wadler – Brouwer-Heyting-Kolmogorov (BHK) interpretation

Baez – Physics, Topology, Logic and Computation: A Rosetta Stone (Baez and Stay, 2009)

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types >= logics: propositions-as-types

logics + signs: logic-as-semiotics *or* logical semiotics

types + signs: typed semiotics

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Using the inference: If foo bar is a thing and foo eq. baz then baz bar is a thing.

Specifically we have the inference: If logical semiotics is a thing and logic eq. types then typed semiotics is a thing. Is logical semiotics a thing? R. M. *Martin in Logical Semiotics and Mereology* Martin (1992) seems to believe so. Note, I discovered this text by working backwards!

route 4 – logic-as-semeiotic Towards the end of his life Peirce saw Logic and Semiotics as blending into one another:

> "Logic, in its general sense, is, I believe I have shown, only another name for semiotic …, the quasi-necessary, or formal, doctrine of signs. By describing the doctrine as 'quasi-necessary', or formal, I mean that we observe the characters of such signs as we know, and from such an observation, by a process that I will not object to naming Abstraction, we are led to statements, eminently fallible, and therefore by no means necessary, as to what must be the characters of all signs used by a 'scientific' intelligence, that is to say, by an intelligence capable of learning by experience."

Peirce, _Collected Papers_ 2.227, (c. 1897)

0.4.3 applied ontology

from taxonomies to ontologies The difference between philosophical ontologies and (applied) ontologies for the domain of philosophy.

Grenon & Smith assert:

"Ontologies as information artifacts are constructed nowadays in very many disciplines [Watson n.d.], and methodologies differ as to the sources used and the role of hu man intervention. We have referred already to the distinction, amongst ont ologies in information science, between those that are handcrafted , and those generated via natural 5 language processing techniques. The latter are in prac tice created semi- automatically, since the process of ontology extraction requires the validation by human editors if it is to yield usable content. The most successful approach to the building of ontologies seems however still to be one which relies entirely on human input" (Grenon and Smith, 2011)

Garbacz has analysed their attempt and other attempts in "Challenges for Ontological Engineering in the Humanities–A Case Study of Philosophy" (Garbacz, 2015) and suggests an ontology of his own from the lessons learnt.

applied ontology done type theoretically Taking a typed semiotics approach suggests that we ought to inform these with type theory and semiotics. And so we have (Dapoigny and Barlatier, 2013)

computational linguistics done type theoretically Furthermore computational linguistics ought to be informed likewise. And so we have a general syntax Ranta (1994). Relating to literary form, in this case metaphor Genabith (2001) – reason dictates that all varieties of literary devices could get the typed

semiotic treatment or could be considered type theoretically: metonymy, irony, synechdoche, and so on.

questions and hypotheses

1. **questions**
   Regarding the corpus, an immediate question is what makes a text initially worthy for inclusion. Questions of canonicity, technology, tradition, collaboration, standardisation, …

2. **hypotheses**
   That the activity of philosophy (investigative/creative part) is compatible with the crafting of certain computational methods. Ugh.

0.5   methodology

Philosophy (the instructional part) teaches us how not to think. Philosophy (the active part) is said to be an armchair discipline, and while you will get as many answers to the question *what is philosophy?* as there are philosophers there is, in fact, broad agreement once the individual's personal impression is subtracted. The method of philosophy is conceptual analysis where analysis here is used in the broad sense not the narrow. It could be argued that reasoning about philosophy as I am in part doing here does not necessarily have to be a philosophical pursuit. How can this be so? Because philosophy viewed as a thing under inquiry, viewed as a discipline, is a rather more concrete object than regular philosophical notions such a *freedom*, *justice*, *virtue*, *truth*, and so on.

§

what they said ...

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