

Sharing and debating Wittgenstein by using an ontology

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Abstract

This contribution discusses some of the challenges involved in building an ontology for research about the philosopher Ludwig Wittgenstein. It pays special attention to different ontological conceptions (event based versus object based). It also discusses how best to model, within the ontology, conflicting views emerging in both Wittgenstein's work and Wittgenstein scholarship. The contribution presents relevant work in progress at the Wittgenstein Archives at the University of Bergen, which has a special focus on Wittgenstein's *Nachlass*, his philosophical estate.

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1 Introduction

Ludwig Wittgenstein's 20,000 pages of manuscripts and typescripts (his *Nachlass*; von Wright, 1982) display his continuous philosophical development and contain revisions, rearrangements, and 'multiple versioning'. It is not least for these reasons that its publication raises a number of challenges for both print and digital editions (Huitfeldt 1994). Since its creation in 1990, the Wittgenstein Archives at the University of Bergen (WAB) has tried to meet these challenges through digital editorial philology and in particular text encoding. In 2000, WAB published *Wittgenstein's Nachlass: The Bergen Electronic Edition* in collaboration with Oxford University Press (Wittgenstein, 2000). In 2009, WAB made 5,000 pages from the *Nachlass* freely available on the Web (Wittgenstein Source, <http://www.wittgensteinsource.org/>, Wittgenstein, 2009; cf. Fig. 1). Samples of WAB's XML TEI (P5) transcriptions (Pichler 2002) of the Wittgenstein *Nachlass* are freely available via links on http://wab.uib.no/wab_hw.page/.

One key aspect of improving and expanding the availability of Wittgenstein's work is to prepare it for the Semantic Web (Pichler and Lanestedt, 2007;

Zöllner-Weber and Pichler, 2007; Pasin and Motta 2008; Pichler 2010; Erbacher 2011). Both the accessibility and efficient use of Wittgenstein's work can be significantly enhanced by Semantic Web technologies, in particular ontologies: the user gains for example advanced search options and better avenues for browsing complementary resources.

A starting point for incorporating an ontology at WAB was inter alia through taxonomies for Wittgenstein's graphics (Biggs 1998) and logical and mathematical notations in the *Bergen Electronic Edition* (Wittgenstein 2000). Within the EU-sponsored Discovery project (Smith 2007; Bartscherer and D'Iorio, 2008), an early version of the ontology was implemented successfully in 2009. Today work on the ontology at WAB is ongoing.

Before continuing, we would like to clarify our use of the term 'ontology' to avoid misunderstandings. Since Aristotle's study of 'categories of being', ontology has been the philosophical study of the nature of being and existence. In this contribution, the definition of ontology standard in Artificial Intelligence is used; it refers to a model that organizes information (Zöllner-Weber 2009). Gruber defined ontology as a 'formal, explicit specification of a shared conceptualisation' (Gruber 1993, p. 199). An ontology typically models information

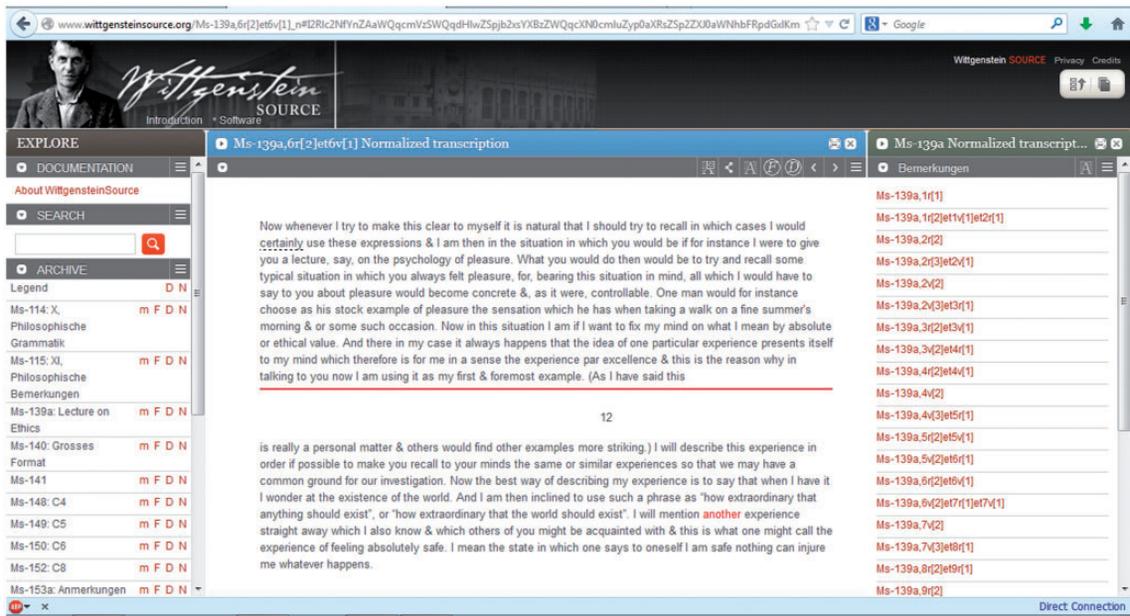


Fig. 1 Screenshot from Wittgenstein Source

in a hierarchy. This model stresses a shared and therefore mostly a commonly accepted conceptualization of information. Using an ontology provides a range of benefits for the user: (1) limitations of free text search are overcome, as semantic labels allow for searching and browsing by concept rather than string-based only; (2) a grouping of these concepts, which relates them to each other and organizes them into classes and subclasses; and (3) drawing inferences and reasoning become possible, as both the human and the machine will be able to extract from the specific position of a concept information about its place in the overall conceptualization. This includes information about what kind it is, to which class(es) it belongs, and in what relation it stands to other instances, like synonymy, part to whole relation, etc.

1.1 Design of the ontology

Since the introduction of Semantic Web technologies and standards, like RDF and OWL (Antoniou and van Harmelen, 2003), ontologies have entered many research fields. Earlier enterprises using ontologies were mostly within life science, e.g. GeneOntology (Stevens *et al.*, 2000). Since then,

these technologies have also been introduced into several projects in the humanities, especially in linguistics, e.g. GOLD (Farrar *et al.*, 2002) and WordNet (Gomez 2004). GOLD has been developed for issues in descriptive linguistics, e.g. syntax, morphology, or linguistic data structures. WordNet is a lexical database of English that is presented as an ontology. In both, descriptions of language are represented formally. Although Wittgenstein presents many considerations about language and its relation to the world, he is not interested in linguistic categories as such, and his scope goes far beyond linguistics. Therefore, though linguistic ontologies such as GOLD and WordNet can make many positive contributions to a Wittgenstein ontology, they are too narrow for modelling Wittgenstein's thought. The FRBR ontology defines concepts of bibliographic cataloguing and indexing (Renear *et al.*, 2006). Bibliographic categories are interesting for the Wittgenstein domain, but cover again only a rather small part. In the project of CIDOC CRM, an ontology has been developed to describe cultural heritage information—it attempts to model events by using categories like temporal entities, places,

physical objects, and actors, and relating them to each other (Ore and Eide, 2009). CIDOC CRM is interesting for WAB's ontology work because it relates cultural objects to each other. However, CIDOC CRM is event based and focuses on events and relations of time and space. In contrast to this, owing to its engagement in digital editing and philosophy, the focus in WAB's ontology should be on objects such as documents, philosophers, and philosophical concepts, as well as the relations within and between object classes.

Especially interesting for WAB's ontology project is the ontology of Motta and Pasin, which models Wittgenstein's *Tractatus* and aims at learners' tasks (Pasin and Motta, 2008). This ontology is built on CIDOC CRM and FRBR to provide an event-centered design and bibliographic notions. Its categories are created by the authors or by learners. Like Motta and Pasin, WAB's ontology can include categories contributed by individual scholars, but WAB's aim is expert-controlled modelling to best ensure common ground for scholarly exchange. In addition, as already mentioned, it is important for WAB that the ontology fits smoothly into the WAB world of digital editions and therefore be object oriented rather than event oriented. In summary, none of these ontologies is completely suitable for WAB's needs, while single elements from each may be reusable. Naturally, the Wittgenstein ontology also needs, for example, linguistic and bibliographic categories. Simple Knowledge Organization System (SKOS, <http://www.w3.org/2004/02/skos/>) is a data model for sharing controlled vocabularies, including ontologies, as linked data. It can thus function as a platform to connect WAB's Wittgenstein ontology with other vocabularies and ontologies, including those mentioned here.

WAB's design of the Wittgenstein ontology is based in the Discovery project where a significant amount of European philosophy resources, including antique and early modern philosophy as well as Friedrich Nietzsche and Ludwig Wittgenstein, was made available Open access on digital library platforms within the so-called PhiloSource federation (<http://www.discovery-project.eu/philosource.html>). In this project, collaborative efforts were made to develop an upper-level

ontology that could serve the philosophy resources of the entire consortium. In 2007, groups were organized to establish agreement about the overall structure of the ontology. It was agreed that a primary focus should be on intuitive usability for the targeted user of the specific domain. The resulting top ontology, shared by the project partners, was called 'Scholarship Ontology' (Morbidoni and Nucci, 2010). It included classes for sources (SOURCE, e.g. documents) and subjects (SUBJECT, e.g. concepts and persons). Each partner provided further sub-classes (e.g. primary sources versus secondary sources) and properties for relating the instances of the classes to each other, for example through the relation *hasAuthor*, which would be valid for a document and link the document to a person. From the start, it was crucial for WAB that its ontology should support the use of the *Nachlass* pages being made openly available on Wittgenstein Source through the Discovery project.

To design its SUBJECT class in more detail, WAB analysed different dictionaries and indices of Wittgenstein's work, e.g. for the *Tractatus* (1922) and the *Philosophical Investigations* (1953), as well as the structure of philosophical dictionaries and general works of reference. Wittgenstein dictionaries such as Glock (1996) and Richter (2004) were found especially relevant, as these have a specific focus on the Wittgensteinian domain of philosophy and contain the established terminology, with Richter having a more historical focus and Glock providing the standard taxonomy for talking about Wittgenstein in analytic philosophy contexts. General philosophical works of reference such as the online *Stanford Encyclopedia of Philosophy* (2006) were consulted with a focus on embedding Wittgenstein into larger contexts of philosophical discussion. However, it was soon recognized that WAB needed a bottom-up rather than a top-down approach, as its ontology, including its subject terms, should support the use of specific texts, such as the *Nachlass* published on Wittgenstein Source. Although the dictionaries and works of reference available were of great importance with regard to the question of how the terms selected should be named, the selection of the terms itself needed to be developed with reference to the texts contained

in Wittgenstein Source. Another important aspect of the SUBJECT class design was that the ontology should match and support specific projects which WAB and its partners were involved in, e.g. teaching a class on Wittgenstein's *Tractatus* or joint research on a specific area of Wittgenstein's philosophy. Also here, a bottom-up approach was needed. In the context of such specific projects, the ontology could be tested in both research and learning environments and developed further in cooperation with Wittgenstein experts.

A guiding principle of WAB's ontology work was then and is still today that the ontology should as much as possible mirror the research landscape with which the average Wittgenstein scholar is familiar. This typically includes books containing a table of contents and indices, which facilitate browsing and searching of these texts: a name index including both persons and document titles, and a subject index including a list of the most important concepts (see Krüger 2007). This simple index structure, proven in the Gutenberg era, should also be

migrated to the world of digital ontology so that users can easily find themselves 'at home'. By combining a traditional structure within a digital model, WAB hopes to achieve a broader acceptance for the ontology.

1.2 Implementation of the ontology

The Wittgenstein ontology currently has three top classes, SOURCE, PERSON, and SUBJECT (see Fig. 2), which respond respectively to the Wittgenstein researcher's primary focus on documents, persons, and concepts (and the relations between them). The SOURCE class houses primary sources (e.g. the sources available on Wittgenstein Source) and secondary sources relevant for Wittgenstein research (e.g. the collection of conference papers on <http://wab.uib.no/agora-alws/>); the subclass PRIMARY SOURCE divides further into Wittgenstein sources (e.g. the *Tractatus*) and external sources (e.g. Augustine's *Confessiones*). The lowest subclass of Wittgenstein primary sources is BEMERKUNG and denotes, roughly speaking, a

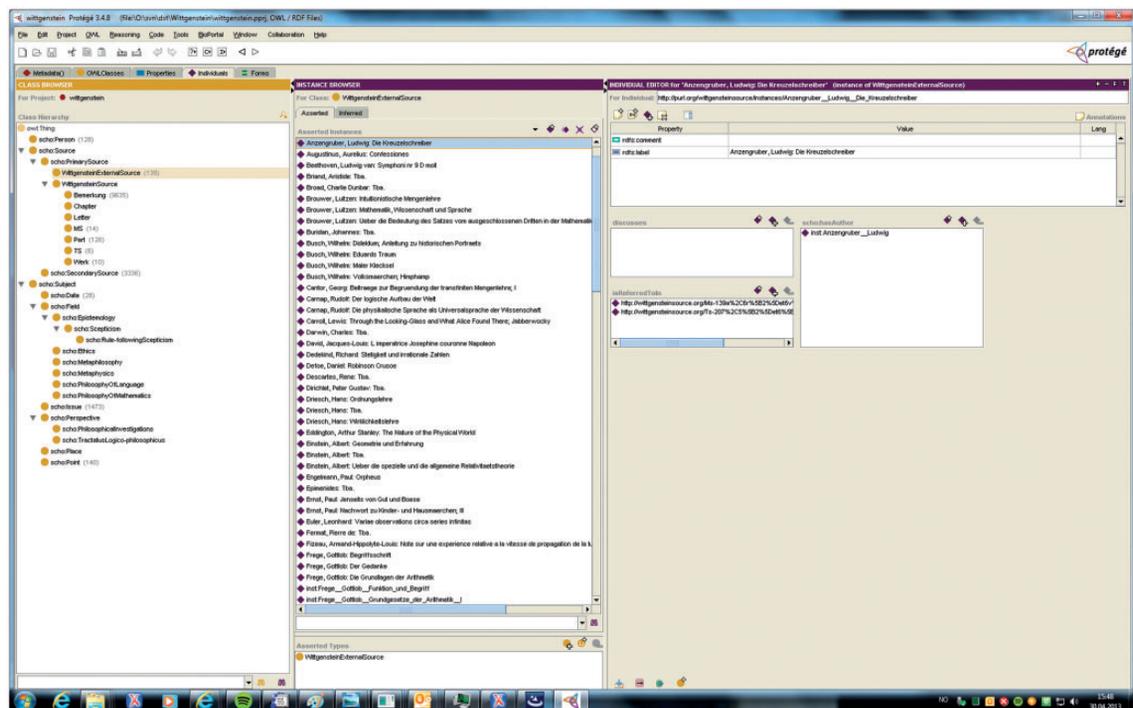


Fig. 2 The structure of the Wittgenstein ontology (screenshot from Protégé)

single Wittgensteinian remark. The terminology of the ontology is in English, but WAB has, in this case, decided to use Wittgenstein's own expression 'Bemerkung'; it denotes a specific text unit that does not always coincide with what one usually would call a 'remark'. The PERSON class contains instances of persons, be they fictive and semi-historical (e.g. Hamlet) or historical (e.g. Gottlob Frege). The SUBJECT class contains, among others, the subclasses ISSUE, PERSPECTIVE, POINT, and FIELD. ISSUE refers to topics dealt with by Wittgenstein himself or in Wittgenstein research, e.g. 'elementary proposition', 'logical independence', 'picture', 'state of affairs', 'philosophy', 'logical analysis', and 'essence'. The nature and position of philosophical topics is almost by definition *contested* and loaded with many issues; therefore, it seemed appropriate to call the philosophical topics 'issues'. The instances of BEMERKUNG can be interlinked with instances of ISSUE via the property *discusses*. POINT refers to the point made or discussed by an individual Wittgensteinian 'Bemerkung' and typically contains an entire statement such as 'The elementary proposition is a picture of a state of affairs'. Instances of BEMERKUNG can be linked with instances of POINT, again via the property *discusses*.

It is WAB's goal to enable users as much as possible to browse and access the Wittgenstein ontology in their preferred language. Translations are particularly important for instances of ISSUE and POINT, as expressions for these instances deviate far more from language to language than do e.g. expressions for instances of PERSON. Here WAB's intention is that each instance of ISSUE is, via *rdfs:label*, eventually available in at least English and German versions. At the moment, only English language is implemented throughout the ontology. But a great number of the ISSUE instances are already prepared for German, and some also for Danish, though not yet implemented. A multilingual implementation of the ontology is naturally dependent on adequate resources and, last but not least, international cooperation.

In Wittgenstein's work, definitions are often altered and categories are not always as clear and precise as necessary for building an ontology. We already noted this challenge when we, as a first step

in the ontology development, tried to model parts of Wittgenstein's *Tractatus* (Zöllner-Weber and Pichler, 2007). We were soon confronted with problems of categorization and consequently experienced difficulties constructing a hierarchy of Wittgenstein's terms. How can ontologies deal with differences and conflicting views emerging both in Wittgenstein's work and in Wittgenstein scholarship?

WAB believes that the solution to this challenge can neither consist in trying to harmonize or disregard the disagreements, nor giving prevalence to one of several competing models. Rather, the Wittgenstein ontology should be capable of housing and presenting the entire range of different views and approaches possible. In WAB's view, it is indeed one of the assets of an ontology that it can provide a framework for documenting and explicating these differences: it is through an ontology that disagreement and alternative proposals can be made visible, sharable, and debatable.

One example of a divergence in Wittgenstein's work is as follows: For the *Tractatus*, philosophy heavily involves logical analysis, while this view is later opposed in the *Philosophical Investigations*. In response to such situations, WAB introduced the class PERSPECTIVE. PERSPECTIVE provides the possibility that an instance of ISSUE or POINT can have different and partly conflicting relations, whether in Wittgenstein or in Wittgenstein scholarship. In a seminar on the *Tractatus*, the teacher will draw positive attention to the concept of logical analysis (the *Tractatus* perspective), while a seminar on the *Investigations* may not even have this concept in its list of important subjects (the *Investigations* perspective). Or, the seminar on the *Investigations* may use as one of its key ingredients the ontology statement 'logicalAnalysis isNotCentralTo philosophy', while the seminar on the *Tractatus* would have 'logicalAnalysis isCentralTo philosophy'. These are statements which contradict each other. It is important to make such contradictions visible through the ontology, while at the same time ensuring that the ontology remains valid. This is achieved through the PERSPECTIVE class which, while permitting contradictory statements to remain as they are, 'disarms' the contradiction by confining the statements to specific perspectives. Naturally, the PERSPECTIVE class

is no less relevant where Wittgenstein scholars fundamentally disagree about the interpretation of a work by Wittgenstein. Users may want to enter the ontology specifically at places where there are such disagreements in modelling of Wittgensteinian subjects, as such places record and express points of argument that may be crucial for Wittgenstein research and philosophy in general. But especially when users are not yet familiar with Wittgenstein's works and philosophy, they may want to start at one of the subclasses of FIELD that organize the instances of ISSUE and POINT into general fields of philosophy (e.g. 'epistemology').¹

Properties are key for WAB's ontology. Eventually, each instance of BEMERKUNG will be connected to at least one instance of ISSUE through *discusses*. In this way an instance of BEMERKUNG will guide scholars to specific instances of ISSUE, and vice versa, thereby semantically enriching a scholar's search experience. Properties provide the navigation links between sources within each group (primary or secondary sources). In addition,

properties establish links between primary sources and secondary sources (see Fig. 3). Thus, the ontology is as much a tool for navigating within the very dense terrain of the Wittgenstein *Nachlass* as a tool for retrieving semantic information.

1.3 Outlook

In developing the Wittgenstein ontology, on the one hand, WAB has to balance between using existing ontologies, taxonomies, and models. This means WAB is embedded in global and unifying initiatives and directly supports interchangeability and standardization. On the other hand, WAB tries to serve the needs of the primary user directly. WAB aims at presenting the user a domain ontology that is immediately intuitive and ready for use. Bringing both aims together, conflicts may occur. Adhering to the upper Discovery 'Scholarship Ontology', exchange and merging capacity are achieved at least on the levels of the PhiloSource federation. A key challenge in developing the ontology is to reflect Wittgenstein's dynamic and multi-faceted

The screenshot displays the Philospace application interface. On the left, a browser window shows the 'Wittgenstein SOURCE' website with a search bar and a list of documents. The main content area displays a 'Normalized transcription' of a text passage. On the right, a 'Contextual Graph' shows a network of relations involving the document 'Ms-139a,6r[2]et6v[1]'. The graph includes nodes for 'WLE', 'isPartOf', 'hasDate', 'Ethics', 'discusses', 'referTo', 'refersTo', 'has author', 'PhilosophyOfLanguage', 'Anzengruber_Ludwig...', 'Anzengruber_Ludwig', and 'Wittgenstein Ludwig'. The bottom right panel shows a list of ontologies and bookmarks.

Fig. 3 Interlinked browsing of ontology and Wittgenstein source (screenshot from Philospace / SwickyNotes)

work, and the fact that different interpretations of and approaches to this work exist. This is addressed by the class PERSPECTIVE, which makes it possible to represent competing models in and about Wittgenstein's work in a single ontology. The SUBJECT branch is related by properties to the SOURCE branch, which enables fast and easy study of the contents of both Wittgenstein primary and secondary sources.

WAB's Wittgenstein ontology is in parts still in its infancy, especially with regard to the SUBJECT branch. In this area, many terms (especially instances of ISSUE) still await inclusion and linking to SOURCE instances. A special investment will be needed to make the ISSUE taxonomy available not only in English, but also in other languages. Particularly for this task, but also more generally, international cooperation is required. While the first version of the ontology and its overall structure were developed in the course of the Discovery project by WAB staff, consequently, the project has been strengthened by international cooperation since 2010 (see http://wab.uib.no/wab_philospace.page). In the JNU VWAB project, sub-domain taxonomies were built for Wittgenstein's philosophy of mathematics and psychology (http://wab.uib.no/wab_user_projects.page#SB) and rendered in English, German, and Danish. Through the ongoing Agora (<http://www.project-agera.org/>) and DM2E (<http://dm2e.eu/>) projects, it became possible to add a large number of ISSUE instances derived from secondary literature and audio-visual materials, and to enrich the ontology with data for text genetic relations within the Wittgenstein primary sources.

Furthermore, WAB's Wittgenstein ontology can create new possibilities for achieving deeper insights into his philosophy and the intertextual relations within and between his works and the secondary literature. Already the current ontology is used for collaborative research in the 'Wittgenstein Incubator' project (<http://dm2e.eu/newsletter-march-2013/>). Here, an international group of scholars uses PUNDIT software (<http://thepund.it/>) to annotate the texts of Wittgenstein Source. As discussed above, the ontology can also be used for teaching, e.g. in a class on the *Tractatus*, by drawing attention to the concepts and arguments that are relevant. Collaborative work between students in

any seminar dealing with Wittgenstein is also an attractive possibility when driven by PUNDIT. WAB hopes that the ontology can contribute to the process of turning ontologies into a more integral part of research and learning within the humanities and probably beyond this field.²

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References

- Antoniou, G. and van Harmelen, F.** (2003). Web Ontology Language: OWL. In Staab, S. and Studer, R. (eds), *Handbook on Ontologies*. Berlin: Springer, pp. 67–92.
- Bartscherer, T. and D'Iorio, P.** (2008). Philosophy in an Evolving Web: Necessary Conditions, Web Technologies, and the Discovery Project. In Hrachovec, H. and Pichler, A. (eds), *Philosophy of the Information Society*. Heusenstamm: ontos, pp. 261–74.
- Biggs, M.** (1998). Ludwig Wittgenstein: a visual concordance to the published works. *Minerva - An Internet Journal of Philosophy* 2. <http://www.minerva.mic.ul.ie/vol2/index.html> (accessed 1 May 2013).
- Erbacher, C.** (2011). Unser Denken bleibt gefragt: Web 3.0 und Wittgensteins Nachlass. In Windholz, S. and Feigl, W. (eds), *Wissenschaftstheorie, Sprachkritik und Wittgenstein*. Heusenstamm: Ontos, pp. 135–46.
- Farrar, S., Lewis, W. D., and Langendoen, D. T.** (2002). An Ontology for Linguistic Annotation. *Semantic Web Meets Language Resources: Papers from the AAAI Workshop, Technical Report WS-02-16*. Menlo Park, CA: AAAI Press, pp. 11–19.
- Glock, H.** (1996). *A Wittgenstein Dictionary*. Oxford: Blackwell.
- Gomez, F.** (2004). Grounding the Ontology on the Semantic Interpretation Algorithm. *Proceedings of the Second Global WordNet Conference Brno, Czech Republic, January 20–23, 2004*. Brno: Masaryk University, pp. 124–29.
- Grenon, P. and Smith, B.** (2011). Foundations of an ontology of philosophy. *Synthese*, 182(2): 185–204.
- Gruber, T. R.** (1993). A translation approach to portable ontology specifications. *Knowledge Acquisition*, 5(2): 199–221.

- Huitfeldt, C.** (1994). Toward a machine-readable version of Wittgenstein's nachlaß. *Beihefte zu Edition*, 6: 37–43.
- Krüger, H. W.** (2007). Wittgenstein Registrieren. In Hrachovec, H., Pichler, A., and Wang, J. (eds), *Papers of the 30th International Ludwig Wittgenstein-Symposium*. Kirchberg a.W.: ALWS, pp. 119–21.
- Morbidoni, C. and Nucci, M.** (2010). SwickyNotes User Guide. <http://www.swickynotes.org/docs/SWickyNotesStartingGuide.pdf> (accessed 1 May 2013).
- Ore, C.-E. and Eide, Ø.** (2009). TEI and cultural heritage ontologies: exchange of information? *Literary and Linguistic Computing*, 24(2): 161–72.
- Pasin, M. and Motta, E.** (2008). PhiloSURFical: Browse Wittgenstein's World with the Semantic Web. In Pichler, A. and Hrachovec, H. (eds), *Wittgenstein and the Philosophy of Information*. Heusenstamm: Ontos, pp. 319–34.
- Pichler, A.** (2002). Encoding Wittgenstein. Some remarks on Wittgenstein's Nachlass, the Bergen Electronic Edition, and future electronic publishing and networking. *TRANS. Internet-Zeitschrift für Kulturwissenschaften* 10. <http://www.inst.at/trans/10Nr/pichler10.htm> (accessed 1 May 2013).
- Pichler, A.** (2010). Towards the New Bergen Electronic Edition. In Venturinha, N. (ed.), *Wittgenstein After His Nachlass*. Houndmills: Palgrave Macmillan, pp. 157–72.
- Pichler, A. and Lanestedt, G.** (2007). Humanistisk forskning og publisering i en digital kontekst: Europeiske filosofimiljøer trekker veksler på semantisk metadata-tagging. *Human IT* 9.2: 29–51. <http://www.hb.se/bhs/ith/2-9/apgl.pdf> (accessed 1 May 2013).
- Renear, A. H., Yunseon, C., Jin Ha, L., and Schmidt, S.** (2006). *Axiomatizing FRBR: An Exercise in the Formal Ontology of Cultural Objects, Proceedings of Digital Humanities 2006*. Paris: Sorbonne, pp. 164–70.
- Richter, D.** (2004). *Historical Dictionary of Wittgenstein's Philosophy*. Lanham, Maryland: Scarecrow Press.
- Smith, D. C. P.** (2007). Re-Discovering Wittgenstein. In Hrachovec, H., Pichler, A., and Wang, J. (eds), *Papers of the 30th International Ludwig Wittgenstein-Symposium*. Kirchberg a.W.: ALWS, pp. 208–10.
- The Stanford Encyclopedia of Philosophy* (2006). In Zalta, E. N. (ed.). <http://plato.stanford.edu/> (accessed 1 May 2013).
- Stevens, R., Goble, C. A., and Bechhofer, S.** (2000). Ontology-based knowledge representation for bioinformatics. *Briefings in Bioinformatics*, 1: 398–414.
- von Wright, G. H.** (1982). The Wittgenstein papers. In von Wright, G. H. (ed.), *Wittgenstein*. Oxford: Basil Blackwell, pp. 35–62.
- Wittgenstein, L.** (1922). *Tractatus Logico-Philosophicus*. In Ogden, C. K. and Ramsey, F. P. (eds), (Transl.). London: Kegan Paul.
- Wittgenstein, L.** (1953). *Philosophical Investigations*. In Anscombe, G. E. M. and Rhees, R. (eds), (Transl. Anscombe G.E.M.). Oxford: Blackwell.
- Wittgenstein, L.** (2000). *Wittgenstein's Nachlass. The Bergen Electronic Edition*. In Huitfeldt, C. (ed.), Wittgenstein Archives at the University of Bergen under the direction of C. Huitfeldt. Oxford: Oxford University Press.
- Wittgenstein, L.** (2009). *Wittgenstein Source: Bergen Text and Facsimile Edition*. In Pichler, A., collaboration with Krüger, H. W., Lindebjerg, A., Smith, D. C. P., Bruvik, T. M., and Olstad, V. (eds). Bergen: Wittgenstein Archives at the University of Bergen. <http://www.wittgenstein-source.org/> (accessed 1 May 2013).
- Zöllner-Weber, A. and Pichler, A.** (2007). Utilizing OWL for Wittgenstein's Tractatus. In Hrachovec, H., Pichler, A., and Wang, J. (eds), *Papers of the 30th International Ludwig Wittgenstein-Symposium*. Kirchberg a.W.: ALWS, pp. 248–50.
- Zöllner-Weber, A.** (2009). Ontologies and Logic Reasoning as Tools in Humanities? *Digital Humanities Quarterly*, 3(4): <http://67.207.129.15:8080/dhq/vol/3/4/000068/000068.html#> (accessed 1 May 2013).

Notes

- 1 The FIELD class is suggested by Grenon and Smith (2011). Grenon and Smith present a comprehensive model for a philosophical upper ontology, which is directly relevant for our topic here. However, WAB's Wittgenstein ontology differs from the Grenon and Smith model in several respects, for example, by its primary focus on documents; however, the differences cannot be discussed in detail here. We are grateful to James Matthew Fielding for drawing our attention to Grenon and Smith (2011).
- 2 The ontology can be viewed and downloaded at http://wab.uib.no/wab_philospace.page/wittgenstein.owl under the Creative Commons General Public License Attribution, Non-Commercial, Share-Alike version 3 (CCPL BY-NC-SA).