In future work, we plan to investigate how our formal super-pattern representations can be used in practice to let researchers themselves, who are not necessarily knowledge representation experts, publish their own scientific claims. Furthermore, it will be interesting to investigate how advanced reasoning can be applied, considering that super-pattern formalizations use higher-order logic with its theoretical and practical problems around efficiency and decidability. In any case, any kind of reasoning with partial results or incomplete heuristics would constitute a huge advance compared to what we can currently do in terms of reasoning on scientific knowledge. We can then imagine countless novel applications, such as overarching aggregations, finding supporting or conflicting claims, answering high-level questions, making visualization of scientific knowledge, and much more. In summary, it would allow us to harness computers in a more effective way to increase our understanding of scientific discoveries and thereby amplify their impact.

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REFERENCES

[1] Tim Berners-Lee and James A. Hendler. 2001. Publishing on the semantic web. *Nature* 410 (2001), 1023–1024.
[2] Arthur Brack et al. 2020. Domain-Independent Extraction of Scientific Concepts from Research Articles. In *Advances in Information Retrieval*. https://doi.org/10.1007/978-3-030-45439-5_17
[3] Adrien Coulet et al. 2011. Integration and publication of heterogeneous text-mined relationships on the Semantic Web. *J Biomed Semant* 2 (2011). https://doi.org/10.1186/2041-1480-2-S2-S10
[4] Alexandru Constantin et al. 2016. The Document Components Ontology (DoCO). *Semantic Web* 7, 2 (February 2016), 167–181. https://doi.org/10.3233/SW-150177
[5] Angelo Di Iorio et al. 2014. Semantic Lenses to Bring Digital and Semantic Publishing Together. In *ISWC'14*, Vol. 128. 12–23.
[6] Aldo Gangemi et al. 2014. The Publishing Workflow Ontology (PWO). *Semantic Web* 8 (2014). https://doi.org/10.3233/SW-160230
[7] Cristina-Iulia Bucur et al. 2020. A Unified Nanopublication Model for Effective and User-Friendly Access to the Elements of Scientific Publishing. *EKAW2020* (2020). https://doi.org/10.1007/978-3-030-61244-3_7
[8] David Shotton et al. 2009. Adventures in semantic publishing: Exemplar semantic enhancements of a research article. *PLoS computational biology* 5 (2009). Issue 4.
[9] Emek Demir et al. 2010. The BioPAX community standard for pathway data sharing. *Nat. Biotechnol.* 28 (2010). https://doi.org/10.1038/nbt.1666
[10] Habeeb Ibrahim Abdul Razack et al. 2021. Artificial intelligence-assisted tools for redefining the communication landscape of the scholarly world. *Science Editing* 8 (2021). https://doi.org/10.6087/kcse.244
[11] Jaana Taakis et al. 2015. Crowdsourced semantic annotation of scientific publications and tabular data in PDF. *SEMANTICS'15* (2015).
[12] L. Garcia-Castro et al. 2013. Connections across Scientific Publications based on Semantic Annotations. *SEPublica* (2013). https://doi.org/10.5167/UZH-82214
[13] M.A. Angrosh et al. 2014. Contextual information retrieval in research articles: Semantic publishing tools for the research community. *Semantic Web* 5 (2014), 261–293. Issue 4. https://doi.org/0.5555/2786113.2786115
[14] Marcus C. Chibucos et al. 2014. Standardized description of scientific evidence using the Evidence Ontology (ECO). *Database : the journal of biological databases and curation* (2014). https://doi.org/10.1093/database/bau075
[15] M. Hucka et al. 2003. The systems biology markup language (SBML): a medium for representation and exchange of biochemical network models. *Bioinformatics* 19 (2003). https://doi.org/10.1093/bioinformatics/btg015
[16] Mohamad Yaser Jaradeh et al. 2019. Open Research Knowledge Graph: Next Generation Infrastructure for Semantic Scholarly Knowledge. In *KCAP'19*. https://doi.org/10.1145/3360901.3364435
[17] Paolo Ciccarese et al. 2011. An open annotation ontology for science on web 3.0. *J Biomed Semant* 2 (2011). https://doi.org/10.1186/2041-1480-2-S2-S4
[18] Paolo Ciccarese et al. 2012. Open semantic annotation of scientific publications using DOMEO. *Journal of Biomedical Semantics* 3 (2012). https://doi.org/10.1186/2041-1480-3-S1-S1
[19] Paul Groth et al. 2010. The anatomy of a nanopublication. *Information Services and Use* 30, 1-2 (2010). https://doi.org/10.3233/ISU-2010-0613
[20] Pedro Sernadela et al. 2015. A Semantic Layer for Unifying and Exploring Biomedical Document Curation Results. *WBBIO'2015* (2015). https://doi.org/10.1007/978-3-319-16483-0_2
[21] Sumit Madan et al. 2019. The extraction of complex relationships and their conversion to biological expression language (BEL) overview of the BioCreative VI (2017) BEL track. *Database : the journal of biological databases and curation* (2019). https://doi.org/10.1093/database/baz084
[22] Silvio Peroni et al. 2012. Scholarly publishing and Linked Data: describing roles, statuses, temporal and contextual extents. *i-Semantics 2012* (2012). https://doi.org/10.1145/2362499.2362502
[23] Tobias Kuhn et al. 2013. Broadening the scope of nanopublications. In *Extended Semantic Web Conference*. 487–5017. https://doi.org/10.1007/978-3-642-38288-8_33
[24] Tobias Kuhn et al. 2013. Broadening the Scope of Nanopublications *(ESWC'13, Vol. 7882)*. ESWC: European Semantic Web Conference, Springer, 487–501. https://doi.org/10.1007/978-3-642-38288-8_33
[25] Bryon Jacob and Jonathan Ortiz. 2017. Data.world: A Platform for Global-Scale Semantic Publishing. In *ISWC'17*.
[26] Tobias Kuhn. 2018. Using the AIDA Language to Formally Organize Scientific Claims. *CNL 2018* (2018). https://doi.org/10.3233/978-1-61499-904-1-52
[27] Tobias Kuhn and Michel Dumontier. 2017. Genuine semantic publishing. *Data Science* 1 (2017), 139–154. Issue 1/2. https://doi.org/10.3233/DS-170010
[28] Esther Landhuis. 2016. Scientific literature: Information overload. *Nature* 535 (2016), 457–458. https://doi.org/10.1038/nj7612-457a
[29] Silvia Mirri et al. 2017. Towards accessible graphs in HTML-based scientific articles. In *4th IEEE Annual Consumer Communications & Networking Conference (CCNC)*. 1067–1072. https://doi.org/10.1109/CCNC.2017.7983287
[30] Silvio Peroni. 2012. *Semantic Publishing: issues, solutions and new trends in scholarly publishing within the Semantic Web era*. PhD Thesis. Universita di Bologna. http://speroni.web.cs.unibo.it/publications/peroni-2012-semantic-publishing-issues.pdf
[31] Silvio Peroni. 2014. The Digital Publishing Revolution. In *Semantic Web Technologies and Legal Scholarly Publishing*, Pompeu Casanovas and Giovanni Sartor (Eds.). Law, Governance and Technology Series, Vol. 15. Springer International Publishing, Switzerland, Chapter 2, 7–43. https://doi.org/10.1007/978-3-319-04777-5_2
[32] Silvio Peroni. 2017. Automating semantic publishing. *Data Science* 1 (2017), 155–173. Issue 1/2. https://doi.org/10.3233/DS-170012
[33] Silvio Peroni et al. 2017. Research Articles in Simplified HTML: a Web-first format for HTML-based scholarly articles. *PeerJ Computer Science* 3 (2017). Issue e132. https://doi.org/10.7717/peerj-cs.132
[34] Silvio Peroni and David Schotton. 2008. The SPAR Ontologies. *ISWC 2018 Proceedings* (2008). https://doi.org/10.1007/978-3-030-00668-6_8
[35] Silvio Peroni and David Shotton. 2012. FaBiO and CiTO: ontologies for describing bibliographic resources and citations. *Web Semantics: Science, Services and Agents on the World Wide Web* 17 (December 2012), 33–43. https://doi.org/10.1016/j.websem.2012.08.001
[36] Peter Gordon Roetzel. 2019. Information overload in the information age: a review of the literature from business administration, business psychology, and related disciplines with a bibliometric approach and framework development. *Business Research volume* 12 (2019). https://doi.org/10.1007/s40685-018-0069-z
[37] Idafen Santana-Perez and María Poveda-Villalon. 2018. *FAIR* Reviews Ontology (FR)*. Retrieved September 14, 2021 from http://purl.org/spar/fr
[38] Bahar Sateli and René Witte. 2016. From Papers to Triples: An Open Source Workflow for Semantic Publishing Experiments. In *Semantics, Analytics, Visualization. Enhancing Scholarly Data*. Springer, 39–44. https://doi.org/10.1007/978-3-319-53637-8_5
[39] Pedro Sernadela and Jose Luis Oliveira. 2017. A semantic-based workflow for biomedical literature annotation. *Database (Oxford)* (2017). https://doi.org/10.1093/database/bax088
[40] David Shotton. 2009. Semantic publishing: the coming revolution in scientific journal publishing. *Learn. Publ.* 22 (2009), 85–94. Issue 2. https://doi.org/10.1087/2009202
[41] Leslie F. Sikos. 2017. *Knowledge Representation with Semantic Web Standards*. Springer International Publishing, Cham, 11–49. https://doi.org/10.1007/978-3-319-54066-5_2
[42] Ted Slater. 2014. Recent advances in modeling languages for pathway maps and computable biological networks. *Drug Discovery Today* 19 (2014). https://doi.org/10.1016/j.drudis.2013.12.011
[43] Ted Slater and Diane H. Song. 2012. Saved by the BEL: ringing in a common language for the life sciences. *Fall* (2012).
[44] Bodo M. Stern and Erin K. O'Shea. 2019. A proposal for the future of scientific publishing in the life sciences. *PLoS Biol* 17, 2 (2019), 683–684. https://doi.org/10.1371/journal.pbio.3000116