



LECTURE SERIES

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Relationship Web: Spinning the Semantic Web from Trailblazing to Complex Hypothesis Evaluation

Dr. Vannevar Bush outlined his vision for Memex in a 1945 *Atlantic Monthly* article [B45]. Describing how the human brain navigates an information space in what he called trailblazing, Dr. Bush said, "It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain." Now that we can label content with associated meaning (semantics), using the techniques of information extraction, we can develop an interactive, human-directed, semantic browsing environment in which analysts can explore heterogeneous content from disparate sources in a kind of stream-of-consciousness, identifying one item of interest and then following contextually relevant links to another [SR07]. A complementary form of analysis that is now possible is to specify a complex hypothesis, break it down into different pieces, and look for evidence to match parts of the hypothesis.

In current Semantic Web research, longstanding work in IR, information extraction, NLP, statistical NLP, graph and query processing, among other techniques, is paired with knowledge representation and populated ontologies (schemas and associated fact/knowledge base) for the following activities that process all varieties of data: structured, semi-structured, and unstructured/text:

- Extraction of entities and relationships (which form the semantic annotation or labeling of data—a key characteristic of Semantic Web) and their representation in RDF, which models named relationships (predicated in triples of the form <subject, predicate, object>);
- Subgraph extraction, path computations (semantic associations discovery), similarity, causality and other pattern discovery;
- Support for higher-order activities including semantic search and querying, semantic browsing, reasoning, analysis,

hypothesis evaluation, discovery, explanation, question-answering and visualization

In this talk we will discuss some of these capabilities in the context of evolving a Relationship. What metadata, annotation, and labeling are to the Semantic Web, relationships of all forms (implicit, explicit, and formal) are to the Relationship Web. The Relationship Web organizes Web resources for analysis that goes beyond better search and data integration to trailblazing, discovery of complex relationships and hypothesis evaluation, leading to deeper insights and better decision making. We will also discuss several from the domains for biomedical research and health care that have been developed or are being developed in collaboration with the scientists and users.

[Amit P. Sheth](#) is the LexisNexis Ohio Eminent Scholar and director of the Knowledge Enabled Information and Services (Kno.e.sis) Center (<http://knoesis.wright.edu>) at Wright State University. Earlier he founded and directed the LSDIS lab at University of Georgia, and worked at Bellcore, Unisys and Honeywell. His research interests include the Semantic Web, services science, and information integration and analysis. His research has resulted in several commercial products, many deployed applications, and he founded two companies in the area of workflow management and Semantic Web. Sheth is a fellow of the IEEE. He is also the Editor in Chief (EIC) of International Journal on Semantic Web and Information Systems (<http://ijswis.org>), a co-EIC of Distributed and Parallel Databases Journal, and an editor of IEEE Internet Computing and other journals.

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