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Knowledge Capture through the Millennia: From Cuneiform to the Semantic Web

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ABSTRACT
As we celebrate twenty-five years of knowledge capture research we can view it from a short-term perspective as a substantial component of the sixty-year development of digital computing technologies, or from a long-term perspective as part of the most recent segment of the hundred millennia evolution of recorded knowledge processes that have shaped our civilization.

We can trace the development of knowledge capture processes similar to those we now study: from the Neolithic origins of our civilization; through the Babylonian development of mathematics and writing; Greek innovations in logic, ontology and science, and their medieval elaboration; the development of formal logics, metaphysical systems and sciences stemming from the scientific revolution; to the computational implementation of knowledge representation, capture, inference and their ubiquitous application in our current information age.

This presentation outlines major events in the trajectory of knowledge capture processes over the millennia, focusing on those relevant to where we are now and where we may be going. It encompasses: the evolution of civilization from archeological, economic, socio-cultural and systemic perspectives; highlights in the formalization of knowledge capture processes through the ages; trajectories of the development of knowledge technologies supporting its representation, capture and use; to projections of expected major issues and advances in the next quarter century.

Categories and Subject Descriptors
I.2.6 Learning – *knowledge acquisition.*

General Terms: Human Factors

Keywords
History of knowledge acquisition, expert systems & artificial intelligence; role in evolution and civilizations; place in infrastructure of information technology; future projections.

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KNOWLEDGE ACQUISITION RESEARCH
A quarter century ago the first Knowledge Acquisition Workshop (KAW) took place in Banff in a wave of enthusiasm—120 papers submitted, 500 applications to attend from 30 countries. After intensive refereeing, 42 papers were accepted and 60 researchers invited to attend. The trigger for the workshop was the explosion of industrial and academic interest in the potential of expert systems as evidenced by the attendance of over 7,000 at the previous year's joint IJCAI/AAAI Conference at UCLA.

The three largest tracks were: *Learning and Acquisition* with 31 papers; *Expert Systems* with 28; *Natural Language* with 28. Some 36% of the 245 papers presented were on these themes that came to dominate the KAW meetings worldwide, but the unexpectedness of this is illustrated by the conference planning where none of the 4 keynotes and only one of the 12 panels addressed these themes.

Evolution of Artificial Intelligence Research
The significance of this growth of interest in expert systems may be seen in terms of the history of artificial intelligence research which took off in the late 1950s with the *Dartmouth Summer Project* [1] in the USA and the *Mechanization of Thought Processes Symposium* [2] in the UK. These occurred as computers came into their second generation, before the advent of computer science as an academic discipline, and when the artificial intelligence metaphor might well have become the core of such a discipline. There was a crisis in the 1970s as computers came into their fourth generation and embryonic computer science departments had to vie with nascent artificial intelligent departments in their requests for major funding to purchase the next generation of computers such as the DEC PDP10.

In Britain the conflict led the Science Research Council to commission a distinguished applied mathematician not associated with the contending applicants to report on the state of the art and future potential of artificial intelligence research. The infamous *Lighthill Report* [3] damned both in sarcastic terms, and undermined the funding of AI research in the UK and USA for seven years—the first so-called *AI winter* [4].

It is ironic that the report only briefly mentions the recognized achievements of DENDRAL [5], overlapped Winograd's [6] doctoral thesis on SHRDLU which marked a major advance in natural language understanding, and was shortly followed by Shortliffe's [7] doctoral thesis on MYCIN that provided the foundations for expert systems

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