computer linguistics to his credit. It is therefore a most fortunate circumstance that the author is one of the library directors who possess profound knowledge of scientific information theory as well. Thus, all prerequisites are fulfilled for the coming into being of a scientifically reliable work, whose practical usefulness now only depends on the structuring of the subject matter and the clearness of its presentation.

DIETZE deals in a very able manner with the 3 developmental series - those of language, of computer analysis and of information - that must be related to each other on various levels. The linguistic problems of course come first, here briefly summarized as phonetics, morphology, lexics, syntax and semantics; they are linked up step by step with information functions, whereupon the automatic analysis (parsing) methods are considered which must be interpolated between linguistically formulated text and retrieval knowledge on this text. As the investigation continues, the linguistic questions develop quite logically into text theory, the computer questions into production systems and the questions of information activities into representation of knowledge.

The book is intended for linguists desirous of becoming familiar with problems of information science. Linguistic, or rather: philosophical knowledge is therefore required on the part of the reader. However, this knowledge is - summarily - but nevertheless completely - set forth in the book itself, with due reference to the aspect it is to serve. It is clearly oriented to its application to problems of information using the instruments of informatics. The book also derives its importance, however, from the fact that DIETZE succeeded in making his book useful for two categories of well-informed readers: an expert in the fields of information or informatics will profit from it if he or she has sufficient basic linguistic knowledge, and any philologist wishing or needing to occupy him- or herself with automatic language processing will value this book as a most useful aid.

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SOWA, John.F (Ed.): **Principles of semantic networks - Explorations in the representation of knowledge**. San Mateo, California: Morgan Kaufmann Publ. 1991, 582p., ISBN 1-55860-088-4

The book, a collection of 19 chapters by different authors, is intended to bring together the most important results in the theory and applications of semantic networks, hitherto scattered throughout the literature on Artificial Intelligence (AI). The authors - mostly professors of computer science - tried to organize the material as they would like to present it to their students.

The result is highly interesting but hardly readable for novices to computer science and AI. The scope of interest cannot be sharply delineated: As convincingly explained by Lenhard K.SCHUBERT (Chapter 2), "semantic nets are in the eye of the beholder". In other words, it is misleading to talk about semantic networks as an exactly defined *knowledge representation* (KR) scheme distinct from the alternatives based on logic, frames, rules etc. Virtually all state-of-the-art systems can be viewed as *graphs* consisting of *labelled nodes* (concepts, individuals, etc.) and *labelled arcs* (relations, roles etc.). - A comprehensive book on semantic network theory would probably tend to be a general book on all kinds of KR.

The book is divided into three parts: Part I *Issues in knowledge representation* provides the theoretical background, Part II *Formal analyses* discusses mathematical and computer science aspects of research in KR and reasoning, and Part III *Systems for knowledge representations* deals with a number of implemented systems and projects. There is no necessity to read the parts (and chapters) in any particular sequence. The first 43 pages ("Issues in knowledge representation" and "Panel discussion with all participants (of the workshop at Catalina)"), however, can be recommended as a *brief introduction to the basic problems and terminology.*

The applications of AI have shown the necessity to concentrate on the intensional (as opposed to extensional) properties of concepts. To analyze concepts, several representation methods are proposed: *SOWA's conceptual graphs* (based on graph notations of *C.S.Peirce* - Chapter 5: *Toward the expressive power of natural language*), BRACHMAN's *KL-One* language and its derivatives (cf. Chapter 14, *Living with CLASSIC: When and how to use a KL-ONE-like language*), WOODS' *conceptual descriptions* (Chapter_1) and some others. Generally speaking, the notations try to make the semantic structure of the concepts explicit and formally analyzable.

One of the fundamental concepts of knowledge organization in libraries and documentation is *concept hierarchy.* In this book, the terms 'subsumption' (defined in terms of the particular method of concept representation) and 'taxonomy' are used to deal with the problem.

Chapter 1 by W.A. WOODS (*Understanding subsumption and taxonomy*) is typical. All concepts are described in terms of composite conceptual descriptions (p. 50-51) as

$c_1, \ldots c_k / (r_1:v_1),\ldots(r_n,v_n):\{p_1,\ldots p_t\}$

where

c_i - primary conceptual descriptions (in a simplified case: a conjunction of properties),

$(r_i:v_i)$ - relational modifiers (relation : value pairs) to describe relations to other concepts

p_i - general conditions

This is a very general framework with great expressive power. If all relational modifiers and general conditions were dropped and the list of primary conceptual descriptions were interpreted as a conjunction of properties we would get a taxonomy, the familiar lattice-like traditional monohierarchical scheme based primarily on the is-a relation and its extensional interpretation.

However, the full apparatus of semantic networks can accommodate much more: polyhierarchy (in the sense used in documentation), the differences between the structural (i.e. permanent) vs. assertional (i.e. temporary, situational) links, defaults, quantifications, exceptions

from a more general concept can be overruled, "defeated" in the case of an exception), etc.
As far as the concept of subsumption is concerned a considerable generalization of the traditional approach is achieved . If any instance of the subsumed concept must necessarily be an instance of the subsuming concept in a model-theoretic sense (any *cow* is necessarily an *animal*), we obtain the traditional *extensional subsumption* (and taxonomy).
In addition to this, there are several alternative subsumption variants (see p. 68 - 69): *structural, recorded, axiomatic,* and *deduced.*- In Chapter 11 by B. NEBEL (*Terminological cycles: Semantics and Computational Properties*) a further approach to subsumption based the mapping of concepts onto their (semantic) models is demonstrated.
Even though natural language modelling issues are mentioned superficially in most of the chapters, we would like to point out Chapter 18 by Paul S. JACOBS on *Integrating Language and Meaning in Structured Inheritance Networks* as an example of fine analysis of conceptual roles of the indirect object in English in terms of labelled graphs.
It is an interesting advanced-level book with bias for computer science and AI issues. Otto Sechser

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TUFTE, Edward R.: **Envisioning Information.** Cheshire, CT: Graphics Press)Box 430, Cheshire, CT 06410) 1990.
"The world is complex, dynamic, multidimensional; paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?" (p.9). Edward Tufte, a teacher of statistics, graphic design and political economy at Yale University, seeks to answer this question by describing the structures of the 'flatland'.
In the six chapters 'Escaping Flatland', 'Micro/Macro Readings', 'Layering and Separation', 'Small Multiples', 'Color and Information', and 'Normatives of Space and Time' he develops the perspectives under which 'two-dimensional' representations - mainly in books - can be systematized. On 126 pages he unfolds a host of examples of graphic representation techniques which the reader will vainly seek elsewhere in such abundance and such excellence of printing: maps of countries and cities according to a wide variety of projection techniques, sectional drawings of spaces and bodies, micro- and macroscopic models and photographs, construction plans and design drawings, timmetables, calendars, calculating tables, computer diagrams, etc. He discusses the legends of maps and schemes, the grammar of the art of dancing and other notational systems such as e.g. flag and sign language. It is in this collection and systematic listing of the representation possibilities that the strength of the book lies. What makes it particularly valuable is the host of examples from various historical epochs and practically all cultures of the world. Itr reflects pinnacles of collectioner's diligence well worth of finding acceptance into relevant standard works, e.g. the rounding-up of ten attempts at deciphering the engravings on Dighton Writing Rock near the Taunto river in Southeastern Massachusetts (p.72/73): depending on their different theoretical preconceptions, the viewers from the 17th, 18th and 19th centuries construe the most varied inscriptions, thus also proving indirectly, among other things, how difficult it is to infer a mental representation from any given structure found in our environment.
Such epistemological questions are as far removed, however, from Tufte's interests as the formulation of clear rules of graphic representation. While showing himself convinced that the principles of information design are universal - like mathematics - and are not tied to unique features of a particular language or culture (p.10), he does not spell out these formulae for us. Nor does he as much as use them for the arrangement of his book into chapters. No, for the ordering and understanding of the material the reader remains dependent on such knowledge as he or she already has. While reference is made to an adequate body of relevant semiotic and psychological literature, Tufte does not rely on what this literature has to offer. Perception psychology, for example, has reformulated Tufte's aforecited initial question and asks it in the form: 'How does the human brain process the information it receives concerning shape, color, space and motion?' Margaret S.Livingstone and David H.Hubbel - to mention only one approach -. reply 'that visual signals are not processed within a single hierarchical system in the brain, but rather simultaneously in at least three mutually independent systems' (Spektrum der Wissenschaft, March 1988, p.114 seqq), with one of them being in charge of the perception of form, a second one of that of color and a third one of that of motion and spatial structures. Starting out from these neurological findings they then try to decide why some graphic representations are more clearly identified inter-subjectively than others - and how such representatins can be optimized. That is a possible path for a systematic approach to Tufte's questions.
Personally I already mistrust the very form in which the problem is presented: I do not believe that it is the transformation of 'multidimensional worlds' into 'two-dimensional' ones which is at issue. We can read Tufte's book only because it is *not* a two-dimensional medium. We see the letters and pictures because ink or color was *deposited* there - by whatever technological procedure. Maybe we regret the disappearance of intaglio printing precisely for the reason that the 'three-dimensionality' of the printed matter has thereby been so greatly reduced that our fingers can no longer feel the letters. And of course we love the painting of the old masters precisely because of the many layers of paint they successively spread onto the canvas, e.g. to produce an illusion of depth. No, although there certainly are differences between the 'territory' and the 'map' - as G.Bateson expressed it, whom Tufte briefly invoked when presenting his definition of 'information' (p.65) - they assuredly do not consist in the former being wide, long and high and the latter only wide and long. Information is tied to material