

Abel, R. R. and R. W. Kulhavy (1986). "Maps, Mode of Text Presentation, and Children's Prose Learning." American Educational Research Journal **23**(2): 263-274.

This study examined the effects of reference maps on what children remember from written and aurally presented discourse. Subjects were presented one of three maps that varied in feature configuration and spatial distribution, and were asked to study these maps before reading or listening to a related story. Results of tests across both prose and maps conflicted with previous research in which learners appeared unable to maintain visual images while reading. We found essentially no differences in recall due to mode of text presentation, but the type of map that was presented profoundly influenced recall from both the text and the map. Maps that had pictorial features logically organized according to passage content greatly increased the learning of text that was related directly to map content. This indicates that maps serve a mnemonic-like function for remembering prose.

Anderson, K. C. and G. Leinhardt (2002). "Maps as Representations: Expert Novice Comparison of Projection Understanding." Cognition and Instruction **20**(3): 283-321.

Anooshian, L. J., V. U. Pascal, et al. (1984). "Problem Mapping before Problem Solving: Young Children's Cognitive Maps and Search Strategies in Large-Scale Environments." Child Development **55**(5): 1820-1834.

2 studies examined both search strategies and spatial representations of preschool children. Results confirmed that only the children who represented routes in cognitive maps were likely to make a logical inference that a missing object might be found somewhere between the last place it was used and the first place it was discovered missing. For both studies, the results indicated that measures of spatial representation were more closely related to age than the length of time children had attended the school where the testing was completed. The results obtained from route-knowledge tasks administered in Study 2 also confirmed the hypothesized order of acquisition-landmark before route-order before route-scaling knowledge. Furthermore, Study 2 indicated that internal representations beyond the level of landmark representation may be necessary for efficient comprehensive searches-that is, searching in locations that had not already been searched, independent of temporal sequence. These results and others suggested that the acquisition of route mapping during the preschool years provides not only a means of organizing spatial information but also the kind of organized internal representations that may be required for successful problem solving in general.

Anooshian, L. J. and D. Young (1981). "Developmental Changes in Cognitive Maps of a Familiar Neighborhood." Child Development **52**(1): 341-348.

Children's performances in pointing a telescope at landmarks surrounding their own neighborhood were assessed for 60 children in 3 age groups: first and second graders, fourth and fifth graders, and seventh and eighth graders. While the greatest improvement in the absolute accuracy of pointings occurred between the young and middle age levels, high relative accuracy scores

suggested that children in all age groups had formed general representations of the relative spatial locations of landmarks. Point consistency scores, reflecting the consistency of pointings to the same landmark from different reference sites, showed consistent improvement across the 3 age groups. Developmental improvement beyond the middle age level was also apparent for pointings from imagined reference sites. Sex differences in both point consistency and in the accuracy of pointings from imagined reference sites were interpreted as reflecting male superiority in the manipulation of spatial representations.

Arathorn, D. W. (2002). Map-seeking circuits in visual cognition : a computational mechanism for biological and machine vision. Stanford, Calif., Stanford University Press.

Axelrod, R. M. (1976). Structure of decision : the cognitive maps of political elites. Princeton, N.J., Princeton University Press.

Bell, W. and R. V. Robinson (1980). "Cognitive Maps of Class and Racial Inequalities in England and the United States." The American Journal of Sociology **86**(2): 320-349.

A 1975 exploratory study is used in this investigation of the cognitive maps of class and racial inequalities held by 113 American and 101 English respondents. An Index of Perceived Inequality is constructed from nine items dealing with inequalities, both among classes and between races, of education, occupation, income, respect, and treatment by the police and courts. The index appears reliable and valid, particularly for the United States. For the United States, factor analyses show that perceptions of class inequalities cannot be separated empirically from perceptions of racial inequalities on the basis of their interrelationships. Thus a single dimension can account for the common variation of the nine items. But in England perceptions of class and racial inequalities tend to separate into two distinct, though correlated, clusters. Additionally, for both countries there is support for grouping the items into those dealing with inequality of opportunity and those dealing with inequality of treatment and condition. Finally, compared with the English, Americans perceived more inequality, were more likely to see a growing economic gap between the rich and the poor, saw a larger number of social classes, and were more likely to say that money is the defining criterion of class.

Bjornson, R. (1981). "Cognitive Mapping and the Understanding of Literature." SubStance **10**(1): 51-62.

Boyle, J. R. (1996). "The Effects of a Cognitive Mapping Strategy on the Literal and Inferential Comprehension of Students with Mild Disabilities." Learning Disability Quarterly **19**(2): 86-98.

This study examined the effects of a cognitive mapping strategy on the literal and inferential reading comprehension of students with mild disabilities - learning disabilities (LD) and educable mental retardation (EMR). Thirty students with mild disabilities who exhibited poor reading comprehension, as evidenced

by low reading comprehension scores on standardized tests, were matched on three variables (disability, grade, and reading achievement) and assigned to either an experimental or a control group. Through a strategy format, students in the experimental group were taught to independently create cognitive maps from reading passages. Students who were taught the cognitive mapping strategy demonstrated substantial gains in both literal and inferential comprehension measures with below-grade level reading passages as well as on-grade level reading passages. The limitations of the research and implications of this strategy for classroom application are discussed.

Brewer, C. A., A. M. MacEachren, et al. (1997). "Mapping Mortality: Evaluating Color Schemes for Choropleth Maps." Annals of the Association of American Geographers **87**(3): 411-438.

Use of color for representing health data on maps raises many unanswered questions. This research addresses questions about which colors allow accurate map reading and which colors map users prefer. Through the combination of a review of previous color research and an experiment designed to test specific combinations of colors on maps, criteria were established and evaluated for selecting colors for choropleth maps of mortality data. The color-selection criteria provide pairs of hues for diverging schemes that avoid naming and colorblind confusions. We also tested sequential and spectral schemes. Our results show that color is worth the extra effort and expense it adds to map making because it permits greater accuracy in map reading. In addition, people prefer color maps over monochrome maps. Interestingly, scheme preference is affected by levels of clustering within mapped distributions. In this research, people preferred spectral and purple/green hue combinations. Contrary to our expectations, spectral schemes are effective if designed to include diverging lightness steps suited to the logical structure of mapped data. Diverging schemes produce better rate retrievals than both spectral and sequential schemes, however. In addition, diverging schemes place better emphasis on map clusters than sequential schemes. Thus map effectiveness is improved by use of diverging schemes. Our interdisciplinary research connects geographers with epidemiologists through concern about map symbolization and map reading, strengthening a significant area of collaboration. Providing guidelines that improve the design of customized color schemes will assist map makers in all disciplines in gaining insights about their data.

Browne, G. J., S. P. Curley, et al. (1997). "Evoking Information in Probability Assessment: Knowledge Maps and Reasoning-Based Directed Questions." Management Science **43**(1): 1-14.

To assess probabilities in decision analysis, and for decision making in general, decision makers must evoke and apply relevant information. Decision analysts have developed a variety of structuring tools to aid decision makers in these tasks, including influence diagrams and knowledge maps. However, despite their pervasive use in practice, there have been no reported empirical tests of these tools. One goal of the present research was to provide an empirical test of

the evocative knowledge map methodology. Second, a theoretical analysis of probability assessment was used to develop a new prescriptive elicitation technique. This technique uses a theoretically-grounded set of directed questions to help decision makers evoke information for probability assessment. Experimental results showed that both the knowledge map and the new directed questions methodology elicited a higher quantity and quality of information from decision makers engaged in probability assessment tasks than did a control condition. Further, the information elicited by the two techniques was qualitatively different, suggesting that the two methods might profitably be used as complementary elicitation techniques.

Bryson, J. M. (2004). Visible thinking : unlocking causal mapping for practical business results. Chichester, West Sussex, England ; Hoboken, NJ, J. Wiley.

Carley, K. M. (1997). "Extracting Team Mental Models through Textual Analysis." Journal of Organizational Behavior **18**: 533-558.

An approach, called map analysis, for extracting, analyzing and combining representations of individual's mental models as cognitive maps is presented. This textual analysis technique allows the researcher to extract cognitive maps, locate similarities across maps, and combine maps to generate a team map. Using map analysis the researcher can address questions about the nature of team mental models and the extent to which sharing is necessary for effective teamwork. This technique is illustrated using data drawn from a study of software engineering teams. The impact of critical coding choices on the resultant findings is examined. It is shown that various coding choices have systematic effects on the complexity of the coded maps and their similarity. Consequently, a thorough analysis requires analyzing the data several times under different coding choices. For example, re-analysis under different coding scenarios revealed that although members of successful teams tend to have more elaborate, more widely shared maps than members of non-successful teams, this difference is significant only when the data is unfiltered. Thus a better interpretation of this result is that all teams have comparable models, but successful teams are able to describe their models in more ways than are non-successful teams.

Carlson, L. A., E. v. d. Zee, et al. (2005). Functional features in language and space insights from perception, categorization, and development. [Oxford linguistics]. Oxford ; New York, Oxford University Press: xiv, 386 p.

Carlson, W. B. and M. E. Gorman (1992). "Socio-Technical Graphs and Cognitive Maps: A Response to Latour, Mauguin and Teil." Social Studies of Science **22**(1): 81-91.

Cohen, R., L. M. Baldwin, et al. (1978). "Cognitive Maps of a Naturalistic Setting." Child Development **49**(4): 1216-1218.

Distance estimates of locations in a camp setting were obtained from 9- and 10-year-olds and adults. Each subject estimated distance on 2 tasks: magnitude estimation and reconstruction (tile placement onto a featureless board). Data were analyzed for the effects of certain environmental features-buildings, trees, and hills. Subjects at all ages seemed to judge distances on the basis of ease of travel (functional distance). The presence of environmental features which added to the effort necessary to move between locations led to overestimations of distance, while the absence of these features led to underestimations of these relatively less effortful distances. While the effect of hills was consistent, distortions of distance with intervening buildings and/or trees differed between tasks.

Connolly, D. K. (1999). "Imagined Pilgrimage in the Itinerary Maps of Matthew Paris." The Art Bulletin **81**(4): 598-622.

Matthew Paris's itinerary maps preface his *Chronica majora* and have been understood as illustrations for that history. I scrutinize the dynamic designs of one of these maps and argue for its appreciation as a meditational aid in imagined pilgrimage to Jerusalem. Cooperative, interactive strategies in the map encourage the monk to participate in its movements to the Holy City as a fulfillment of his desire to access that sacred site's theological meanings. I describe contexts by which its St. Albans audience learned and understood practices whose manipulations of time and place were similar to the map's dynamic presentation of geography.

Coulson, S. (2006). "Constructing Meaning." Metaphor and Symbol **21**(4): 245 - 266.

This article reviews cognitive neuroscience research on visual and language processing to suggest an analogy between the neural interpolation mechanisms in perceptual processing and the constructive processes that underlie meaning construction in language. Traditional models of language comprehension as a decoding process are argued to involve an overattribution of the import of linguistic information, and an overly narrow view of the role of background and contextual knowledge. A review of a number of event-related brain potential (ERP) studies of language comprehension reveals an early sensitivity in the brain response to global contextual factors. These findings are consistent with a view of linguistic information as prompting meaning construction processes such as the activation of frames, the establishment of mappings, and the integration or blending of information from different domains.

Downs, R. M. and D. Stea (1973). Image and environment : cognitive mapping and spatial behavior. Chicago, Aldine.

Downs, R. M. and D. Stea (1977). Maps in minds : reflections on cognitive mapping. New York, Harper & Row.

Downs, R. M. and D. Stea (2005). Image & environment : cognitive mapping and spatial behavior. New Brunswick, N.J., AldineTransaction Publishers.

Eubanks, P. (1999). "The Story of Conceptual Metaphor: What Motivates Metaphoric Mappings?" Poetics Today **20**(3): 419-442.

Research into conceptual metaphor has improved our understanding of metaphoric mapping, but because researchers have largely ignored the concrete expressions that constitute metaphoric groupings, little or no heed has been paid to discursive and rhetorical influences that bear upon mapping processes. Because metaphors are always uttered by historically and culturally situated speakers, metaphoric mappings are subordinate to the speakers' political, philosophical, social, and individual commitments. These ideological commitments are often expressed as, and may be constituted as, stories. Presenting evidence from focus groups, this article shows that metaphors and metaphoric mappings are guided by "licensing stories."

Fauconnier, G. (1997). Mappings in Thought and Language. Cambridge, Cambridge university Press.

Frake, C. O. (1985). "Cognitive Maps of Time and Tide Among Medieval Seafarers." Man **20**(2): 254-270.

To predict the treacherous tides and currents of northern Europe, medieval sailors employed a schema for directions, the rose of the mariners' compass, as a cognitive device for correlating lunar with solar time and for memorising the lunar-tidal regimes of each port. It was a stratagem that enabled the medieval sailor to construct in his mind the information which the modern literate sailor must seek written down in his tide and current tables. This study addresses a basic issue in the investigation of human cognitive ability. There is a long, and still flourishing, line of argument claiming that certain socially-defined sets of persons have-as a group-minds of lesser quality than 'we' do-whoever 'we' might be. Like 'primitives', the inhabitants of the Middle Ages have frequently been attributed with lesser cognitive abilities. This study, by examining actual cognitive performances of individual human beings in the course of their daily lives, shows that thinking at the highest level, at Piaget's stage of formal operations, is not, as many have claimed, the hallmark of the modern, literate, scientific mind, but is, rather, the hallmark of the human mind when confronted with a task sufficiently necessary, sufficiently challenging, and sufficiently clear in outcome.

Freeman, M. H. (2002). "Cognitive Mapping in Literary Analysis." Style **36**(3): 466-484. Literary analysis takes many forms, depending on the critical approach adopted. Critical theories vary in the ways they accommodate the three components of literature-the writer, the reader, and the text. At one extreme are those theories that focus almost exclusively on the text itself, such as formalist or structuralist approaches; at the other, those that focus on the writer (biographical, psychoanalytical) or the reader (reader response); and then there are approaches that fall somewhere between, adopting elements of more than one

component (historical, cultural). Each approach has its strengths and weaknesses in illuminating the nature and role of literature in a given society.

A cognitive linguistic approach to literature provides a methodology by which the insights of these literary theories may be reconciled. Because cognitive linguistics is concerned with the conceptual workings of the embodied mind, all aspects of human experience and behavior, whether from the perspective of the writer, from the perspective of the reader, or from the perspective of the text itself, are relevant and are integrated into a cognitive understanding of the literary experience. In addition, cognitive linguistics further contributes to literary studies by revealing the extent to which the imaginative powers that both create and comprehend literary works reflect the general workings of the human mind. (First two paragraphs of the article.)

Furbee, L. and R. A. Benfer (1983). "Cognitive and Geographic Maps: Study of Individual Variation among Tojolabal Mayans." American Anthropologist **85**(2): 305-334. Disease and geography are related domains for Tojolabal-Maya. Using multidimensional methods, we compare two domains: (1) individual cognitive "maps" from disease terms and (2) hand-drawn maps, both with one another and with an official topographic map. Multivariate study of individual informant data demonstrates correspondence of the axes of maps. Least squares fitting of dimensional representations using a method specifically modified for ethnosemantic data allows meaningful comparisons both among and within informants, and with an aggregate from a related survey of 33 informants as well. These multivariate operations help integrate individual data, sampled simultaneously for several domains, tasks, and occasions, with aggregate data. For semantic domains, we achieved rapprochement between psychological and anthropological approaches

Gärbling, T. (1995). Urban cognition. London ; San Diego, Academic Press.

Gattis, M. (2001). Spatial schemas and abstract thought. Cambridge, Mass., MIT Press.

Gillespie, C. A. (2005). The socialization of scale : geographic education and spatial cognition in the Old Order Amish classroom. [San Marcos, Tex., s.n.], Texas State University-San Marcos, 2005.: xii, 157 p.

Glicksohn, J. (1994). "Rotation, Orientation, and Cognitive Mapping." The American Journal of Psychology **107**(1): 39-51.

Tversky (1981) has argued that when a map has a natural orientation that does not correspond to that of its frame of reference, conditions are ideal for invoking the heuristic of rotation in its representation as a cognitive map. In the two studies reported here, such a situation was exploited with respect to judgment of orientation to cities within Israel. In both Experiments 1 and 2, which employed a recall-and-production method, a 15° counter-clockwise rotation was predicted and found in orientation judgments.

Goldin, S. E., P. W. Thorndyke, et al. (1981). An analysis of cognitive mapping skill. Santa Monica, Calif., Rand.

Hamilton, C. A. (2002). "Mapping the Mind and the Body: on W. H. Auden's Personifications." Style 36(3): 408-427.

Despite our traditional view of the body and mind as divided, one figurative way for representing the two in our thought and in our language is the unified method of metaphor. For example, because we have easier access to bodies than to minds, our everyday notion of body language means we "map" from the body to the mind to interpret the behavior of others. As Simon Baron-Cohen has argued, this normal psychological mapping provides us with a "theory of mind" that some autistic children appear to lack for successful social cognition. We may not be fully aware of such mappings, but they conceptually link the body to the mind, making the body indexical of the mind in a way that closely integrates them and nearly negates dualism. Apart from these non-verbal mappings, mappings from the body to the mind in language, according to Eve Sweetser, motivate how physical verbs like grasp take on mental meanings like "know" during a language's evolution. As we would imagine, these connections between mind and body, between the mental and physical, also appear in literature, particularly in bodily descriptions, the language of emotions, and the use of mind or body metaphors. W. H. Auden is one case in point since he was forever writing about the mind and the body in his poems. Usually, Auden depicts body and mind in general via metaphor and personification in particular. What makes Auden's mind and body personifications strange, however, is that they are unlike the imaginary abstractions we often associate with personification. (Introductory paragraph of the article.)

Hardwick, D. A., C. W. McIntyre, et al. (1976). "The Content and Manipulation of Cognitive Maps in Children and Adults." Monographs of the Society for Research in Child Development 41(3): 1-55.

Harris, C., K. Daniels, et al. (2002). "Using Cognitive Mapping for Psychosocial Risk Assessment." Risk Management 4(3): 7-21.

A cognitive mapping method was used to elicit mental models of psychosocial hazards at work. First, an outline of the theoretical basis of a mental model approach to psychosocial risk assessment is presented. We then demonstrate how a cognitive mapping method was used as an assessment tool for representing mental models of psychosocial hazards at work. Using cognitive maps of individuals (n = 35) from eight organisations and a detailed example of one of the participating organisations, we show how understanding mental models of psychosocial hazards at work can aid the assessment of psychosocial risk and the development and implementation of intervention programmes to reduce psychosocial hazards and harms.



Hart, J. A. (1977). "Cognitive Maps of Three Latin American Policy Makers." World Politics **30**(1): 115-140.

Cognitive maps are representations of the causal beliefs or assertions of a specific individual. Maps of three Latin American policy makers (Carlos Andres Perez, Roberto de Oliveira Campos, and Aurelio de Lyra Tavares) suggest new hypotheses and ways of comparing maps across individuals: (1) individuals with broader political responsibility may have more complicated maps with respect to numbers of goals and policies, but less complicated maps with respect to linkages between policies and goals, than individuals with narrower responsibility; (2) maps of different individuals can and should be compared with respect to the degree to which they make (or fail to make) distinctions among related concepts; and (3) maps can be used to predict the future policies of individuals, and should be used in this way to test the theoretical potential of the approach.

Hernández-Guzmán, L. and R. García Mira (2005). Environmental perception and cognitive maps. Hove, Psychology Press.

Horacek, H. (1996). "On Expressing Metonymic Relations in Multiple Languages." Machine Translation **11**(1/2/3): 109-158.

Recently, the scientific interest in addressing metonymy phenomena from a computational perspective has increased significantly. Considerable effort is invested in this, but issues addressing metonymy in the context of natural language generation have been widely ignored so far, and also comparable multilingual analyses are rather sparse. Motivated by these shortcomings, we investigate methods for representing knowledge required to express metonymic relations in several ways and in multiple languages, and we present techniques for generating these alternative verbalizations. In particular, we demonstrate how mapping schemata that enable lexical expressions on the basis of conceptual specifications to be built are derived from the Qualia Structure of Pustejovsky's Generative Lexicon. Moreover, our enterprise has led to the exposition of interesting cross-language differences, notably the use of prefixed verbs and compound nouns in German, as opposed to widely equivalent expressions entailing implicit metonymic relations, as frequently found in English. A main achievement of our approach lies in bringing computational lexical semantics and natural language generation closer together, so that the linguistic foundations of lexical choice in natural language generation are strengthened.

Jensen-Butler, C. (1979). Critique of Behavioural Geography: an Epistemological Analysis of Cognitive Mapping and of Hagerstrand's Time-Space. Aarhus, Aarhus University Geographical Institute.

Kitchin, R. and S. Freundschuh (2000). Cognitive mapping : past, present, and future. London ; New York, Routledge.

Klein, J. H. and D. F. Cooper (1982). "Cognitive Maps of Decision-Makers in a Complex Game." The Journal of the Operational Research Society **33**(1): 63-71.

This paper illustrates the use of a cognitive mapping technique to examine the behaviour and perceptions of individual decision-makers. A cognitive map is a representation of the subjective decision-making environment of an individual. Seven military officers each played two scenarios in a research wargame. Analysis of their communications in the game showed that individual players were remarkably consistent over the two scenarios, but their perceptions of their common decision-making environment differed noticeably. Differences related to the size and complexity of their cognitive maps, the detailed interpretation of the maps, the players' confidence and anticipation of the future and the way in which the maps were altered as time progressed.

Kulhavy, R. W. and W. A. Stock (1996). "How Cognitive Maps are Learned and Remembered." Annals of the Association of American Geographers **86**(1): 123-145.

This paper draws on research from geography and psychology to explain how people learn and remember both reference and thematic maps. The review describes how prior knowledge about maps interacts with task demands to produce mental representations that satisfy the constraints of the human information processing system. The paper then examines research that has used maps to assist people in answering questions about "What happened there" and concludes with some suggestions on directions for future research.

Lakoff, G. and M. Turner (1989). More than Cool Reason: A Field guide to Poetic Metaphor. Chicago, University of Chicago Press.

Promotional blurbs from the publishers website:

"The authors restore metaphor to our lives by showing us that it's never gone away.

We've merely been taught to talk as if it had: as though weather maps were more 'real' than the breath of autumn; as though, for that matter, Reason was really 'cool.' What we're saying whenever we say is a theme this book illumines for anyone attentive." — Hugh Kenner, Johns Hopkins University

"In this bold and powerful book, Lakoff and Turner continue their use of metaphor to show how our minds get hold of the world. They have achieved nothing less than a postmodern Understanding Poetry, a new way of reading and teaching that makes poetry again important." — Norman Holland, University of Florida

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More on Traditional Views

Langfield-Smith, K. and A. Wirth (1992). "Measuring Differences between Cognitive Maps." The Journal of the Operational Research Society **43**(12): 1135-1150.

A causal cognitive map is a directed network representation of an individual's beliefs concerning a particular domain at a point of time. The nodes and the arcs joining them indicate causal beliefs. There have been few attempts to develop quantitative measures for such maps. The measures could be used to compare the maps of different individuals and also to track the changes in the beliefs of a single individual over time. They would assist in providing a more objective basis for qualitative analysis. In this paper we review current cognitive mapping research and then propose some measures for computing the difference between two maps, illustrating this work with a managerial example.

Laszlo, E. (1993). The Evolution of cognitive maps : new paradigms for the twenty-first century. Yverdon, Switzerland ; Langhorne, Pa., Gordon and Breach.

Laszlo, E. (1996). Changing visions : human cognitive maps : past, present, and future. Westport, Conn., Praeger.

Laukkanen, M. (1994). "Comparative Cause Mapping of Organizational Cognitions." Organization Science **5**(3): 322-343.

Increasingly, thoughtful managers recognize the role of knowledge and learning in corporate action and performance. Concurrently, a new field, management and organization cognition (MOC), has emerged producing useful insights and findings. Thus far, empirical studies have largely focused on single cases or actors, using often archival data and sometimes ambiguous methods. To advance the field will require pragmatic tools for eliciting data on thinking in real organizations and for conducting rigorous and more comparative studies of management and organization cognitions. This paper describes a method for comparatively studying real-life managerial thinking, defined here as the respective manager's beliefs about key phenomena and their efficacy links in their strategic and operative situation. The applicability of such a definition will depend on the requirements of research at hand. The payoff is that, thus defined, key elements in managerial and organizational cognitions can be usefully captured by cognitive mapping, an established approach in MOC research. The approach contains, first, a method for eliciting comparison-enabling interview data of several subjects. Then, using researcher-based, interpretive standardization of the individual natural discourses, databases of standard concepts and causal links, constituting the cause map elements, are distilled. This facilitates a text-oriented description of the thinking patterns of single actors like managers or organizational groups, which can be used in traditional-type mapping studies, which typically assume unitary or quasi-unitary actors. However, the method is intended for comparative analyses, e.g., for pinpointing the cognitive differences or similarities across organizational actors or for constructing and comparing groups, assumed cognitively homogenous. Also, it is applicable for longitudinal studies or

aggregated, e.g., industry-level, descriptions of MOC. A PC application is available for the technique, although many of the processing tasks are amenable to general-purpose relational database software. The paper presents a study case comparing the cognitive structures of managers in two interrelated industries in terms of their concept bases and causal beliefs. The objective was to understand the substance of management thinking, as well as the formative logic behind how managers come to think in the shared ways. It is shown that patterns of industry-typical core causal thinking, manifestations of a dominant logic or recipe, can be located, operationalized and comparatively analyzed with this method. Substantively, the contents of management thinking are typically products of complex long-term mechanisms. These consist, first, of organizational problem-solving, recurrently facing a specific, adequately stable constellation of strategic tasks and environment elements, similar within industries and systematically different across them, and, second, of various social processes, which directly transfer and influence management thinking. The paper concludes with discussing the cause mapping method and suggests some options for further studies.

Liben, L. S. and C. A. Yekel (1996). "Preschoolers' Understanding of Plan and Oblique Maps: The Role of Geometric and Representational Correspondence." Child Development **67**(6): 2780-2796.

To study conditions that affect preschoolers' understanding of maps, we asked 4- and 5-year-olds to place stickers on classroom maps to show locations of objects currently in view. Varied were vantage point (eye level vs. raised oblique), map form (plan vs. oblique), and item type (floor vs. furniture locations). Even though they were working with maps of a familiar referent space, preschoolers evidenced difficulty. While an oblique vantage point did not enhance performance, using the oblique map first aided subsequent performance on the plan map. As predicted, performance on floor locations was worse than on furniture locations. Findings are discussed in relation to performance by adults given the mapping task and preschoolers given a nonreferential sticker placement task. Data suggest the importance of (a) iconicity and (b) studying geometric as well as representational correspondences in map research.

Lloyd, R. (1989). "Cognitive Maps: Encoding and Decoding Information." Annals of the Association of American Geographers **79**(1): 101-124.

The experiences of learning a city by direct experience or navigating through it and studying a map of it provide people with different types of spatial information. Navigation is thought to provide procedural knowledge, which is stored as verbal coding, and map reading is thought to provide survey knowledge, which is stored as imagery coding. Subjects who learned a city primarily through years of navigation and subjects who learned a city by studying a cartographic map for several minutes were asked to perform the simple experimental task of locating familiar landmarks relative to reference points. Distortions in the cognitive maps of subjects were analyzed to determine

significant differences in patterns of distance and direction errors. Patterns of absolute distortion are explained by theories related to the use of alignment and rotation heuristics for encoding information and an implicit scaling process for decoding information. Subjects who learned the city from studying a cartographic map were significantly more accurate and faster at performing the experimental task than subjects who learned the city through direct experience or navigation. Both groups were significantly more accurate when making their judgments with centrally located reference points than with peripherally located reference points. These results provide knowledge of processes used in cognitive mapping and the distortions caused by these processes. Ultimately such studies lead to an understanding of spatial decision-making and behavior.

Lloyd, R. and C. Heivly (1987). "Systematic Distortions in Urban Cognitive Maps." Annals of the Association of American Geographers **77**(2): 191-207.

Aggregate cognitive maps of urban areas differ from cartographic maps for reasons other than differences in the mobility and idiosyncratic experiences of individuals. Systematic distortions in aggregate urban cognitive maps may be caused by the cognitive processes used to code spatial information into memory or to retrieve it from memory and by the way these processes relate to a particular urban area. A purpose of this study was to determine the extent to which systematic distortions are present in aggregate urban cognitive maps and to investigate the causes of such distortions. Subjects from three neighborhoods were asked to provide estimates of distances and directions between 105 pairs of landmarks. We analyzed differences between these estimates and true distances and directions to determine if the patterns of distortions were significantly different among the three neighborhoods. Differences for the three samples appeared to be related to the scale and orientation of the aggregate cognitive maps. Regressions with aggregate data for the three neighborhoods using cognitive distance as the dependent variable and actual distance as the independent variable indicated a tendency to overestimate shorter distances more than longer distances. Using multidimensional scaling and Euclidean regression, we mapped subjects' cognitive locations for landmarks and the actual locations in the same space. The aggregate cognitive maps appeared to be rotated to align major transportation axes with canonical direction axes. We argue that systematic distortions are related to a rotation heuristic and to key reference points used by the subjects to code and access spatial information.

Matthews, M. H. (1984). "Cognitive Maps: A Comparison of Graphic and Iconic Techniques." Area **16**(1): 33-40.

The way in which young children are able to externalise about place and space using free-recall sketching, large-scale plans and aerial photographs is examined. The choice of technique is shown to have a considerable bearing upon children's imagery, suggesting that explanation is not independent of the initial stimuli.

Mattingly, C. (1998). Healing dramas and clinical plots : the narrative structure of experience. Cambridge, UK ; New York, NY, USA, Cambridge University Press.

Mennecke, B. E., M. D. Crossland, et al. (2000). "Is a Map More than a Picture? The Role of SDSS Technology, Subject Characteristics, and Problem Complexity on Map Reading and Problem Solving." MIS Quarterly **24**(4): 601-629.

Poole, F. J. P. (1986). "Metaphors and Maps: Towards Comparison in the Anthropology of Religion." Journal of the American Academy of Religion **54**(3): 411-457.

Conversations between anthropology and other academic studies of religion have been marked historically by considerable ambivalence and avoidance. In the post-Malinowskian era of fieldwork-centered ethnography, the remarkable subtleties of newly emerging and unexpected orders of data have challenged the adequacy of traditional academic perspectives on religion, many of which seemed bound-implicitly or explicitly-to the epistemological conventions and cognitive lenses of Western religions. From an anthropological perspective, the restricted emphasis on the written, enshrined texts of literate traditions and the curious assumption that religion could be studied almost in vacuo became untenable in the midst of a newfound functionalist concern to see religious phenomena intricately suspended in broader webs of cultural significance and subtly embedded in wider arrays of social institutions.

Reitinger, F. (1999). "Mapping Relationships: Allegory, Gender and the Cartographical Image in Eighteenth-Century France and England." Imago Mundi **51**: 106-130.

Among the allegorical maps of early modern times, those relating to romantic attachments, sexual relationships and marriage have long excited curiosity among students of literature and the history of cartography. These maps describe states of married and non-married life, irrespective of social acceptability, and chart the course for the prospective matrimonial traveller. Profoundly allegorical, closely tied to contemporary social and literary trends, and full of word play, the maps are not always easy to understand. The aim in this paper is to provide a comprehensive overview of the genre of 'sentimental' allegorical maps and an analysis of the literary and political situations which gave rise to them. Their key role in gender issues and in the promotion of new ideals of femininity in France and England from the seventeenth to the nineteenth century is examined.

Richardson, G. D. (1981). "Comparing Two Cognitive Mapping Methodologies." Area **13**(4): 325-331.

Two methodologies for extracting and representing cognitive spatial information are examined. A map model and a paired comparison/nonmetric multidimensional scaling method were used to elicit cue-location information. The configuration of cues obtained from each method were found to be quite similar when compared using bi-dimensional correlation and a matrix matching procedure.

Ron, W. (1989). "Cognitive Mapping and the Origin of Language and Mind." Current Anthropology **30**(4): 518-526.

Saintsbury, G. (1897). The Flourishing of Romance and the Rise of Allegory. London, William Blackwood & Sons.

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Sanders, R. A. and P. W. Porter (1974). "Shape in Revealed Mental Maps." Annals of the Association of American Geographers 64(2): 258-267.

Shape is an integral part of the spatial information contained in mental maps. A central problem in isolating shape representations in revealed mental maps is to expunge the measurement effects we incorporate into the data during analysis. Using two independent data sets derived from portrayed shapes of Africa, factor analytic tests indicate that we can separate measurement error from systematic misrepresentations of the African shape. Independently derived factor structures reflect the tendency for subjects to represent the shape of Africa as a regular geometric form.

Sanjek, R. (1977). "Cognitive Maps of the Ethnic Domain in Urban Ghana: Reflections on Variability and Change." American Ethnologist 4(4): 603-622.

Recent work on cognitive domains has stressed the themes of intracultural variability, "larger cultural informational systems," the relationships between cognition and behavioral performance, and diachronic change in cognitive organization. These themes are taken up in an analysis of the domain of ethnic identities ("tribes") among an urban Ghanaian population. It is shown that individual outlooks vary considerably; that few of the many ethnic terms have high salience; that alternative hierarchical and nonhierarchical modes of organization of the domain coexist; that a widely shared implicit structure of language groupings underlies surface diversity; that the domain "tribes" embraces a world-wide array of ethnic identities; that cognitive salience and structure correspond closely, but not perfectly, with behavioral experience; and that change in cognitive organization may arise both "on the ground" through

changing patterns of interethnic relations, and "from above" in state-sponsored modes of organization of the ethnic domain. Twelve dimensions of cognitive variability that arise in the analysis are recapitulated in conclusion.

Shortridge, J. R. (1985). "The Vernacular Middle West." Annals of the Association of American Geographers **75**(1): 48-57.

Contrary to the writings of academicians and journalists, college students from most sections of the country perceive the Middle West to have its core in Nebraska and Kansas. In a 1980 survey, Indiana, Michigan, and Ohio seldom were seen as part of the region except by their own residents. Business and organization names using the term Middle West also are at their greatest relative frequency in the plains states, matching the collegiate perceptions. Regional images provide an explanation for the cognitive map patterns. Americans view the Middle West overwhelmingly in rural, small town terms. Even residents of the industrialized states of the Old Northwest hold this view. Pastoralism apparently has been so much a part of the regional and national identity that people find the idea difficult to abandon. Rather than changing the regional image to fit urban-industrial reality, the public has shifted the regional core westward to the Great Plains where rural society is more dominant.

Siegel, A. W., J. F. Herman, et al. (1979). "The Development of Cognitive Maps of Large- and Small-Scale Spaces." Child Development **50**(2): 582-585.

Kindergartners, second, and fifth graders made repeated trips through a large- or small-scale model town, and then constructed from memory the layout of buildings in either a large- or small-scale space. Accuracy of construction increased as a function of developmental level and repeated trips through the town. Children's constructions were most accurate when they were tested in the same-scale environment as that in which they developed their spatial knowledge; accuracy was impaired significantly only when children were exposed to a small space and then reconstructed in a large space. Results were interpreted in terms of a "competence-load trade-off."

Sinding, M. (2002). "Assembling Spaces: The Conceptual Structure of Allegory." Style **36**(3): 503-524.

Allegory is a Mount Everest for critics. It drives some to renounce theory and descend to particulars, while inspiring others to new heights. Northrop Frye's work on allegory "obstinately adhered to a much larger theoretical structure" (vii), and so became *Anatomy of Criticism*. Allegory was the paradigmatic figure for the semiological theory of rhetoric Paul de Man envisioned for deconstruction. I suggest we can assess aspiring frameworks by how they meet the challenge of allegory, and that cognitive rhetoric fares better than most.

Mark Turner calls *Death is the Mother of Beauty* a "modern rhetoric which makes use of insights from contemporary cognitive science and linguistics" to analyze the whole mind of the audience—"conceptual systems, social practices, commonplace knowledge, discourse genres, and every aspect of a common

language, including syntax, semantics, morphology, and phonology" (3-4). Like Frye and de Man, he seeks to extend new discoveries about language, and trace out far-reaching ramifications for the understanding of the mind. Allegory has been a shaping force in the growth of blending theory, too. A typical allegorical scene runs against the expectations of the conceptual theory of metaphor that was Turner's springboard in two related ways: abstract sources structure concrete targets, and many source-domains structure single scenes. (First two paragraphs of the article.)

Smith, J. M. (1996). "Geographical Rhetoric: Modes and Tropes of Appeal." Annals of the Association of American Geographers **86**(1): 1-20.

Geographers are frequently enjoined to identify and satisfy the interests of their audience, as performance of this service is the ultimate justification for the field's continued existence. There is, however, little agreement on how best to render this service, largely because there has been little thought about the nature of the audience, or about its role in shaping geographical discourse. Geographers must recognize the existence of multiple audiences, and understand that these audiences are not identical to existing institutional and epistemological categories. Audiences are constituted by rhetorical prejudices and preferences. To satisfy an audience, and earn its trust, the writer must confirm their prejudices and respect their preferences. I present two alternative maps of geographical audiences, using selected examples from twentieth-century Anglophone geography. First, I describe prejudices about the nature of action, which a writer must confirm if he or she is to be regarded as "good," and consequently re-map geographical discourse in terms of Northrop Frye's fictional modes (romance, tragedy, comedy, and irony). Second, I describe preferences for types of representation, which a writer must respect if he or she is to be regarded as "speaking well," and consequently re-map geographical discourse in terms of Kenneth Burke's master tropes (metaphor, metonymy, synecdoche, and irony). I conclude that geographical rhetoric is primarily shaped by the need to win the trust of an audience. The rhetorical cultivation of trust does not preclude the pursuit of truth as a goal of geographical writing, but it must be regarded as primary.

Spencer, C. and M. Weetman (1981). "The Microgenesis of Cognitive Maps: A Longitudinal Study of New Residents of an Urban Area." Transactions of the Institute of British Geographers **6**(3): 375-384.

As thirty new residents of an urban area developed their cognitive maps over a period of three months, there was little evidence to support the Shemyakin, Appleyard, Moore hypothesis that the spatial city image develops out of a series of interrelated sequential maps, nor for Lynch's related hypothesis that paths and districts are the elements which predominate in the earlier maps, giving way later to local landmarks. Instead, it was found that neighbourhood maps were, from the first few days, drawn in spatial fashion, the journey to work as a sequential map, and that overall city maps might be drawn from the first few days as either spatial or sequential according to the individual's preferred style

(as indicated in subjects' cognitive maps of their previous home area). Female subjects tended to use the sequential style, and males the spatial style in drawing city and home area maps.

Spencer, D. (1973). An Evaluation of Cognitive Mapping in Neighbourhood Perception. Birmingham, Centre for Urban and Regional Studies, University of Birmingham.

Tuan, Y.-F. (1975). "Images and Mental Maps." Annals of the Association of American Geographers **65**(2): 205-213.

"Image" and "mental map" appear frequently in the literature of environmental perception, often in an abstract or metaphorical sense. As psychological phenomena mental images do not play any essential role in spatial behavior, nor in abstract thinking. To account for spatial ability we need to postulate "schemata," rather than images and mental maps. The mental map, a special kind of image, does have its functions: for example, it is a mnemonic device; it allows mental practice which promotes assurance in subsequent physical performance; it is, like the real map, a way to organize data; it is an imaginary world, complex and attractive enough to tempt people out of their habitual rounds. To generate images focal attention seems necessary. In an inattentive state, skillful behavior in space is still possible under the guidance of somatic intelligence or schemata.

Vasanthakandasamy, W. B. and F. Smarandache (2003). Fuzzy cognitive maps and neutrosophic cognitive maps. Phoenix, Xiquan.

In a world of chaotic alignments, traditional logic with its strict boundaries of truth and falsity has not imbued itself with the capability of reflecting the reality. Despite various attempts to reorient logic, there has remained an essential need for an alternative system that could infuse into itself a representation of the real world. Out of this need arose the system of Neutrosophy, and its connected logic, Neutrosophic Logic. Neutrosophy is a new branch of philosophy that studies the origin, nature and scope of neutralities, as well as their interactions with different ideational spectra. This was introduced by one of the authors, Florentin Smarandache. A few of the mentionable characteristics of this mode of thinking are [90-94]: It proposes new philosophical theses, principles, laws, methods, formulas and movements; it reveals that the world is full of indeterminacy; it interprets the uninterpretable; regards, from many different angles, old concepts, systems and proves that an idea which is true in a given referential system, may be false in another, and vice versa; attempts to make peace in the war of ideas, and to make war in the peaceful ideas! The main principle of neutrosophy is: Between an idea <A> and its opposite <Anti-A>, there is a continuum-power spectrum of Neutralities. This philosophy forms the basis of Neutrosophic logic. (From the preface.)

Vervaeke, J. and J. M. Kennedy (2004). "Conceptual Metaphor and Abstract Thought." Metaphor and Symbol **19**(3): 213 - 231.

David Ritchie (2003b) defended Lakoff and Johnson's (1980) theory of conceptual metaphor against criticism made by Vervaeke and Kennedy (1996).

Though Ritchie modified theory of conceptual metaphor, he held fast to the idea that much of abstract thought depends on metaphorical projection from embodied experience. We argue therein lie reductionism's dangers, seriously misrepresenting abstract thought, and a straightjacket—an inability to account for significant cognitive phenomena that are often presupposed by the theory of conceptual metaphor. As an alternative to explanations relying on embodied experience, we propose a more cognitive account of pervasive mappings, e.g., of spatial relations onto other domains. We show our account fits well with procedural knowledge and procedural similarity, factors that Ritchie addressed. Finally, we suggest that conceptual blending theory, a theoretical foundation Ritchie favored for conceptual metaphor theory, cannot do the work he has hoped for.

Viano, M. (1999). "'Life Is Beautiful': Reception, Allegory, and Holocaust Laughter." Jewish Social Studies 5(3): 47-66.

In a 1987 essay entitled "Holocaust Laughter," Terrence Des Pres notes that "one of the surprising characteristics of the film Shoah is how often Claude Lanzmann and some of his witnesses take up a sardonic tone, a kind of mocking irony that on occasion comes close to laughter." Observing that Lanzmann "seems deliberate about it," Des Pres concludes that "if Shoah is a sign of the times, we may suppose that artistic representation of the Holocaust is changing--that it is trying a more flexible mode of response." 1 Eleven years later, two films would prove his uncanny intuition right: Roberto Benigni's *Life Is Beautiful* and Radu Mihaileanu's *Train of Life*. Whereas the latter has not thus far raised much controversy, *Life Is Beautiful* has been and is the focus of unbridled media attention, enormous popular success, and critical venom. This article aims to prove that *Life Is Beautiful* is an important film that, judging from the way it was received by several critics, might unfortunately be overlooked by scholars. In the first section, I shall discuss the film's reception; in the second, I shall map out a textual analysis through eyes searching for "the pleasure of the text." (The first paragraph of the article.)

Vitouch, P. and H. J. Tinchon (1996). Cognitive Maps und Medien : Formen mentaler Repräsentation bei der Medienwahrnehmung. Frankfurt am Main ; New York, P. Lang.

Wallace, R. (1989). "Cognitive Mapping and the Origin of Language and Mind." Current Anthropology 30: 518-526.

Spatial memory is essential for any mobile animal (Tolman 1948). A species must remember the locations of hazards, foods, mates, offspring, and shelters and how these change through time. Neurological models of space, known as "cognitive maps," probably characterize all mammalian species. The human cognitive map appears to be unique, however, in being closely related to communication. The primary structure involved is the hippocampus, a component of the limbic system.

Mental representations of features in our environment are encoded in our maps by "place" and "misplace" special nerve cells. This makes it possible to remember an object's location ("place") and, if it is no longer there, to remember where it used to be ("misplace"). Changes of scale are possible through an "enlarger-reducer" process, which amounts to a nested system of maps within maps within maps. I emphasize these features of spatial cognition, undoubtedly a few of many, because of their similarity to language-production features. Specifically, the place-misplace process seems a probable analog of "trace" movements in the deep structure, which essentially encode shifted linguistic elements and their former locations. The enlarger-reducer process appears similar to embedding, in which one sentence is included within or a constituent of another. I will argue that these similarities are not coincidental but reflect a set of conditions in early hominid evolution. (First paragraph of article.)

Yonemoto, M. (1999). "Maps and Metaphors of the "Small Eastern Sea" in Tokugawa Japan (1603-1868)." Geographical Review **89**(2): 169-187.

This article examines the ways in which oceans were depicted in Japanese geographical writings and maps from the Tokugawa period. It uses these texts to understand how early modern Japanese visions of the Pacific and of maritime Asian waters constructed epistemological frameworks through which the Japanese saw their place in an increasingly complex web of regional and global connections. In the absence of actual adventure on the "high seas," Japanese writers, artists, and mapmakers used the inventive power of the imagination to fill in the cognitive blank of ocean space. I argue that the definition of early modern oceanic space was profoundly ambiguous, a legacy that, it can be argued, left its mark on Japan's modern relationship with the Asian Pacific region.

Young, M. D. (1996). "Cognitive Mapping Meets Semantic Networks." The Journal of Conflict Resolution **40**(3): 395-414.

Cognitive mapping has been a valuable tool in understanding how individuals view their external environment. It has been used successfully to investigate crisis decision making, juror decision making, and international negotiation, and may find further use as a support tool in negotiation and mediation. This article presents a method for enhanced cognitive mapping--WorldView, which uses the symbol-based formalism of semantic networks. WorldView provides important advantages over more traditional cognitive mapping and assists in the systematic study of belief system content and decision process. WorldView eliminates constraints on represented relationships and captures more information than previous content analysis systems for belief structures,

provides aggregation over texts or subject responses, provides a synonym facility for collapsing similar concepts, incorporates structural and comparative measures for analysis, and constructs manipulable cognitive maps that provide a basis for process models of belief change and decision making.