Metaphor, (Metonymy)
and
the ATT-Meta Computational Approach

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Plan of Talk

- Introduction: Metaphor.

- The "ATT-Meta" theoretical approach and implemented system for metaphor processing.

- The Recognizing Textual Entailment (RTE) evaluation framework.

- Relevance of ATT-Meta to some metaphor examples in RTE,
  and our metaphor/RTE strategy.

- Sketch of a deconstruction of metaphor and metonymy into more fundamental dimensions.

- Summary.

Introduction

- **Metaphor:**

  Describing, portraying or thinking about something (the *target*) as if it were something else (the *source*) to which it is perceived, or set forth, as being somehow analogous.

  Some examples:

  - *A small voice inside Mary was insisting that Mick was adorable.*

  - *Within the deepest recesses of our mind, lies a fear that sharks will attack us.*

  - *Dick Lee's a Simon Callow.*

  - *Lyon is the gastronomic capital of France.*

  - *GPS was incubated in the mind of Ivan Getting.*

  - *With pro-American officials in the ascendancy in Tokyo, Japan is turning into the Britain of the Far East.*

  - *Rising food prices are a silent tsunami which knows no borders.*

  - *John gave Mary his cold.*

  - *The new Colleges are grain silos with lots of rats in them and not much grain left.*

Map-Transcendence

We are particularly interested in *map-transcending* metaphor. E.G.:

> *Within the <u>deepest recesses</u> of our mind, <u>lies</u> a fear that sharks will attack us.*

> *GPS was <u>incubated</u> in the mind of Ivan Getting.*

These rest on

    a metaphorical view of the MIND as a PHYSICAL SPACE

and

    a metaphorical view of IDEAS as PHYSICAL OBJECTS.

But they *transcend* the mappings in those views by saying "deepest recesses", "lies" and "incubated."

Inner Persons

"A part of Mary believes that Mick is adorable."
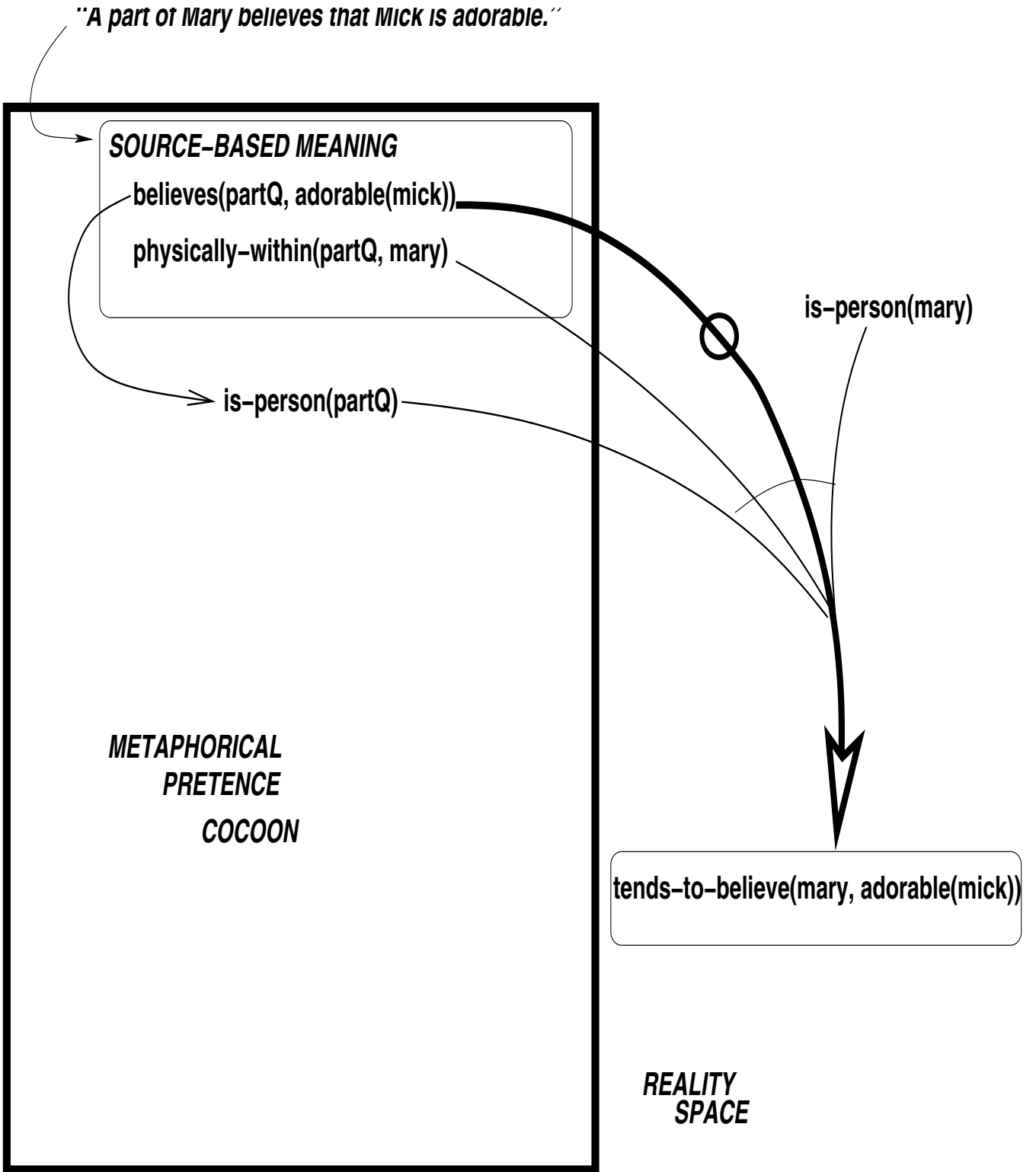
METAPHORICAL VIEW:

PERSON/MIND as CONTAINING PERSONS

Another recent example [from Doris Lessing's autobiography]:

> **"Perhaps a part of my mother's mind she did not know about was making sure she got pregnant then."**

BASIC EFFECT:

When a "part of an agent" believes/intends/... something, the whole real agent has a *tendency* to believe/intend/... it.

"A part of Mary believes that Mick is adorable."

SOURCE-BASED MEANING

believes(partQ, adorable(mick))

physically-within(partQ, mary)

is-person(partQ)

METAPHORICAL
PRETENCE

COCOON

is-person(mary)

tends-to-believe(mary, adorable(mick))

REALITY
SPACE

SKETCH of IMPLEMENTATION
in ATT-META SYSTEM

Explicit Inter-Subject-Matter Mapping Knowledge

Pretended Inner-Person Belief to Real Belief Tendency:

IF P is a person

AND IN THE PRETENCE: Q is a person

AND Q is physically-within P

THEN {presumably}

Q believing X [pretendedly] <u>maps to</u>
P having tendency to believe X [really].

Inheritance of Real Beliefs by Inner Persons

IF P is a person

AND IN THE PRETENCE: Q is a person

AND Q is physically-within P

THEN {presumably}

P believing X [really] <u>maps to</u> Q believing X [pretendedly].

Happening-Transfer Rules:

IF pretend situation X happens and maps to real situation Y
THEN {presumably} Y happens.

IF real situation Y happens and maps to pretend situation X
THEN {presumably} X happens.

Voices in Your Head

"**A small voice inside Mary was insisting that Mick was adorable.**"

(from a story in a trashy romance magazine)
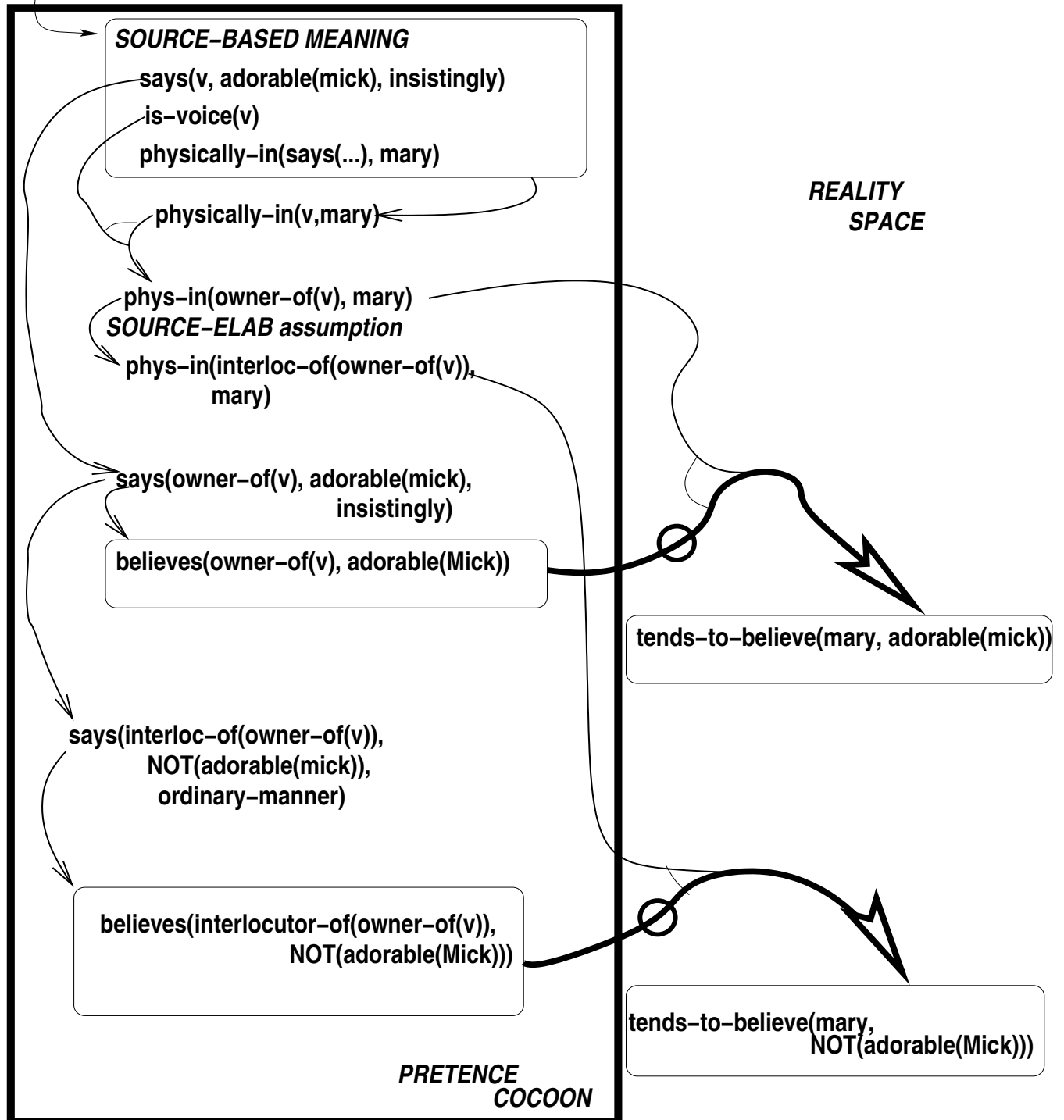
SAME METAPHORICAL VIEW
(more indirectly involved than before)

Main Points about the Reasoning:

- An inner person owning the voice is inferred.

- An interlocutor is inferred.

- The interlocutor is inferred to be an inner person.

- The interlocutor is inferred to have said that Mick is not adorable.

- The two inner persons are inferred to believe that Mick is adorable and Mick is not adorable, respectively.

- So Mary has a tendency to believe that Mick is adorable AND a tendency to believe that he isn't.

"A [small] voice [v] inside Mary insisted that Mick was adorable."

SOURCE–BASED MEANING

says(v, adorable(mick), insistingly)

is–voice(v)

physically–in(says(...), mary)

physically–in(v,mary)

phys–in(owner–of(v), mary)

SOURCE–ELAB assumption

phys–in(interloc–of(owner–of(v)), mary)

says(owner–of(v), adorable(mick), insistingly)

believes(owner–of(v), adorable(Mick))

says(interloc–of(owner–of(v)), NOT(adorable(mick)), ordinary–manner)

believes(interlocutor–of(owner–of(v)), NOT(adorable(Mick)))

PRETENCE COCOON

REALITY SPACE

tends–to–believe(mary, adorable(mick))

tends–to–believe(mary, NOT(adorable(Mick)))

MORE on IMPLEMENTATION

Knowledge about Saying, Voices, People, etc.

Example:

IF P is a person
AND P says X in a positive manner
THEN {presumably}

P believes X.

Also:

IF someone **insists** something X
THEN {presumably}

the person's interlocutor has said NOT-X.

Source Elaboration Assumption (Ancillary Assumption)

Enriches the source scenario:

IF P is a person
AND IN THE PRETENCE: Q, R are persons
                                       AND Q is physically-within P
                                       AND Q, R are interlocutors
THEN {presumably}

IN THE PRETENCE: R is physically-within P.

View-Neutral Mapping Adjuncts

VNMA for Negation:

IF [pretend] situation X $\quad$ <u>maps to</u> $\quad$ [real] situation Y
THEN {presumably}

[real] NOT-Y $\quad$ <u>maps to</u> $\quad$ [pretend] NOT-X.

(and similarly with mappings from reality to pretence).

VNMA for Certainty Levels:

Certainty levels in ATT-Meta:

`certainly, presumably, suggestedly, possibly.`

(Part of) VNMA:

IF PRETEND situation X <u>maps to</u> REAL situation Y
THEN {presumably}

X having certainty level $\geq$ C <u>maps to</u> Y having level $\geq$ C.

Concerns of Further VNMAs

The implementation of these as separate mechanisms is in process. Their effect is currently absorbed into view-specific rules.

By default, the following matters (amongst others) correspond across the pretence/reality boundary:

- Degrees (of holding of situations).

- Time relationships between situations.

- Durations of situations.

- Rates of process-like situations.

- Shapes of situations: termination, intermittency, gradualness, etc.

- Change relationships between situations.

- Causation, enablement/prevention, helping, ability, attempting.

- Mental/emotional states and value judgments (both of the understander and of agents within situations).

- Having-function and function-performance.

- Logical structure (not just negation).

- Choice.

- Qualitative set size.

Compounding VNMAs

The VNMAs can be recursively compounded at will:

X causing Y to have ability to degree $\geq D$ to do Z

on one side of the boundary corresponds to

XX causing YY to have ability to degree $\geq D$ to do ZZ

on the other side, if X corresponds to XX, etc.

Power of VNMAs

Many examples can be handled *mostly* by VNMAs as opposed to view-specific mappings:

the latter often just provide a scaffolding for VNMAs to make the important inferences.

Recognizing Textual Entailment
semantic-processing evaluation framework

- **Aim:** help development of systems for serving the semantic-processing (especially inferential) needs of NLP application areas

  such as

  Document Summarization, Question Answering, Information Retrieval/Extraction, Sentiment Analysis, ...

- Based on shared datasets and annual RTE Challenges (starting 2005).

- Task is basically to match human judgments of
  presence or absence of
  (plausible) "textual entailments" from "Texts" to "Hypotheses."

    Text: Lyon is actually the gastronomic capital of France.

    Hyp: Lyon is the capital of France.

    Human Entailment Judgment: NO

- Tasks in above NLP applications are reformulated as a matter of such entailments or lack of them.

- Some metaphor in past datasets, but organizers have generally sought to focus on T/H pairs with crisp judgments, and this has implicitly inhibited inclusion of metaphor.

- Systems tend to do less well on the metaphorical examples than others.

- We have submitted a grant proposal on putting metaphor and RTE together.

- (We have no prior involvement with RTE.)

Relevance to Some RTE Dataset Examples

T: Lyon is actually the <u>gastronomic capital</u> of France.
H: Lyon is the capital of France.
Human Judgment: N

T: The technological triumph known as GPS was <u>incubated in the mind</u> of Ivan Getting.
H: Ivan Getting invented the GPS.
Human Judgment: Y

T: Convinced that pro-American officials are in the ascendancy in Tokyo, they talk about turning Japan into <u>the Britain of the Far East</u>.
H: Britain is located in the Far East.
Human Judgment: N

T: Even today, <u>within the deepest recesses of our mind, lies a</u> primordial fear that will not allow us to enter the sea without thinking about the possibility of being attacked by a shark.
H: A shark attacked a human being.
Human Judgment: N

"Convinced that pro-American officials are in the ascendancy in Tokyo, they talk about <u>turning Japan into the Britain of the Far East</u>."

Common style of metaphor, often involving named entities.

Not currently handled by ATT-Meta techniques.

Does not rely on existing metaphorical views.

Needs construction of a fresh analogy on the basis of the specific context.

"Lyon is actually <u>the gastronomic capital of France</u>."

Another common, *productive* style of metaphor:
"<(domain) qualifier> <noun X>"

A lexicon may well include an appropriate general sense for "capital," but some special processing would still needed to pick the correct sense.

But what about cases where no appropriate general sense is available?

Not straightforward to handle by ATT-Meta techniques.

Investigating treatment based on pretending that that *the gastronomic aspects of something Y are a "version" of Y*, and assuming that *a version of something Y inherits Y's properties by default*, including the property of being a country.

"The technological triumph known as GPS was <u>incubated in the mind</u> of Ivan Getting."

A lexicon may well include an appropriate general sense for "incubate."

But, if not, ATT-Meta style processing is appropriate.

"Even today, <u>within the deepest recesses of our mind,</u> <u>lies</u> a primordial fear that will not allow us to enter the sea without thinking about the possibility of being attacked by a shark."

A lexicon may possibly include an appropriate general sense for "recess" or for the phrase "recesses of the mind."

But the word "recesses" can be replaced by an open-ended range of words, and the qualifier ("deepest") if any can be productively varied.

ATT-Meta style processing is appropriate (cf. some previous implemented examples). In essence:

- "Recesses" implies difficulty of physical operation (physical access, inspection, modification, ...).

- The degree of difficulty is amplified by "deepest".

- IDEAS AS PHYSICAL OBJECTS includes a correspondence between physical operation (on an idea cast as a physical object) and conscious mental operation.

- Difficulty and degree are mapped by VNMAs.

- So the high degree of difficulty of the physical operation maps to become the high degree of difficulty of the mental operation.

Shallowing of the ATT-Meta Approach

- ATT-Meta itself is knowledge-intensive.
  Currently uses hand-coded knowledge rules.

- Wish to scale up the work by re-implementing ATT-Meta *principles* in the context of large-scale knowledge resources, lexicons, ontologies, etc.

- Can still have substantial, though coarsened, inference.

- One possibility is *ConceptNet*: a large, 150,000-node network derived from massive web-user input.

  Some relationships, etc. in ConceptNet and other resources (causation, ability, function, event structure, affect, etc.) are just the types of information transferred by some of ATT-Meta's VN-MAs.

  ConceptNet also has (primitve) facilities for analogy-finding.

- Also planning to adapt and extend metaphor-processing algorithms from our e-drama project, using WordNet-based analysis.

Summary

- ATT-Meta approach:
  A particular sort of pretence as the essence of metaphor.
  Emphasis on within-pretence reasoning.

- Some novel aspects of treatment of metaphorical mappings:

  - Source-elaboration assumptions in metaphorical views.
  - View-neutral mapping adjuncts (VNMAs).
  - Mappings themselves can be subject to reasoning.
    Helps with VNMA implementation and control.
  - Focus on uncertainty and degrees.

- Some effects:

  - Power to handle open-ended metaphor ...
  - .. without needing (usually) to create extra mappings, e.g. to deal with "insisting" in the voice-inside-Mary example.
  - VNMAS give simplification of mappings per metaphorical view.

- Development of idea of embedding metaphor in RTE, to the benefit of both NLP applications and metaphor research.

- ((Deconstruction of metaphor and metonymy into underlying dimensions: on other slides not shown.))

Deconstruction of Metaphor and Metonymy
into
More Fundamental Dimensions

(THUMBNAIL TASTER)

- Major new development over last two years.
  Radical addition to recent debates concerning the distinction between metaphor and "metonymy."

- Has led to a thick draft journal paper.
  (Ask me for a copy if you dare!)

- Examples of metonymy (probably):

  Mike played <u>Bach</u>.

  In many contexts, "Bach" would refer *directly* to the famous composer J.S. Bach, but *indirectly* to that person's music.

  There's <u>a snake</u> in the middle of Johnny's painting.

  She has a good <u>head</u> [meaning brain/mind].

  We will shoot all <u>palefaces</u> [meaning white people] we see.

  $\underline{x} + 3$ *[in a computer program]*

Various Attempted (Partial) Differentiators

Domain (Non-)Crossing

<u>CLAIM</u>:

Metaphor crosses between "domains."
Metonymy stays within a domain.

<u>PROBLEM</u>:

Metaphor can relate two things that are arbitrarily close together, conceptually.

Link Survival into the Message

<u>CLAIM</u>:

In metonymy the source/target link survives into the message.
In metaphor it is annihilated.

<u>PROBLEM</u>:

The link is actually part of the message in some metaphor as well.

Similarity versus Contiguity

<u>CLAIM</u>:

    Metaphor is a matter of **similarity** (often **analogy**).
    Metonymy is a matter of **contiguity**—not a type of similarity.

<u>PROBLEMS</u>:

- The notions of similarity and contiguity are even more slippery than previously realized.

- Similarity can be used as one type of contiguity.

- **Some common, claimed types of contiguity are also forms of similarity (or rest on forms of similarity).**

Various Other . . .

<u>CLAIMS</u>

    HAVE

<u>PROBLEMS</u>.

Some Contiguities are or involve Similarities!!

- There are REPRESENTATIONAL metonymies, e.g. using visual representation:

  "There's a snake in the middle of Johnny's painting."

  The image would normally have some similarity to a snake, and that similarity is important for the representation link.

  The type of similarity is close to or identical the use of similarity in some metaphor. ("The road snakes across the landscape;" "The snake's bumping into that other cloud.")

- A commonly discussed type of metonymy links WHOLES and their PARTS, in either direction:

  She has a good head [*meaning brain/mind*].

  We will shoot all palefaces [*meaning white people*] *we see.*

- But:

  - Any part P of a whole W is *automatically* similar to W: they both consist at least partially of P!

  - The similarity is the more pronounced and intuitive the "bigger" that P is relative to W and the more it is similar to the rest of W.

- And:

  - The part in a metonymy is often also *relevantly* whole-similar, not just automatically so:

  - Pale faces are similar to white people in respect of a salient feature of APPEARANCE. Indeed, a pale face is in large part responsible for a white person's appearance.

  - A head is similar to a brain in a salient feature of FUNCTION. Indeed, a brain is in large part responsible for the cognitive abilities of a head.

Some Conclusions on Metaphor/Metonymy

Metaphor and metonymy overlap in many types of representational and part/whole metonymy.

The phenomena of real interest are not metaphor and metonymy as such,

but rather the underlying dimensions such as:

- *Degree of conceptual closeness of source and target.*

- *Extent of linkage survival.*

- *Extent and types of similarity between source and target.*

- *Extent and types of non-similarity relationship between source and target.*

These dimensions are at least semi-independent.

I (provisionally) claim that

- the essential feature of metaphor is merely
  counterfactual identification/categorization

  (within the understander's mind, not necessarily explicitly in the utterance),

- where that identification/categorization is
  put to work in a particular way.

Other people have based metaphor on counterfactual identification, but not so purely.