Who decides what a text means?

Graeme Hirst
University of Toronto

Acknowledgements

Stephen Regoczei Jean-Pierre Corriveau

Jane Morris Susan McRoy

Peter Heeman David Traum

Philip Edmonds

Philosophically naïve

Philosophically naïve

– like CL itself

Text-meaning

Text

Text

Any complete utterance

- Spoken or written
- Interactive or not
- Long or short

Text-meaning

Text-meaning

Meaning of whole message, including subtext

Text-meaning

Meaning of whole message, including subtext

- Not just word- or sentence-meaning

Text-meaning

Meaning of whole message, including subtext

- Not just word- or sentence-meaning

- Could be more than, or less than, sum of sentence-meanings

What is the locus of text-meaning?

What is the locus of text-meaning?

1. Meaning is in the text itself

What is the locus of text-meaning?

1. Meaning is in the text itself
2. Meaning is in the writer / speaker

What is the locus of text-meaning?

1. Meaning is in the text itself
2. Meaning is in the writer / speaker
3. Meaning is in the reader / hearer

What is the locus of text-meaning?

1. Meaning is in the text itself
2. Meaning is in the writer / speaker
3. Meaning is in the reader / hearer

Or two of these, or all of these

We can ask the same question of lower-level linguistic elements

Words
Sentences
Semantic roles
Lexical relations
…

The same three answers are possible

The same three answers are possible

But they don't have to be the same answer at each level

Maybe …

Effects of individual writer or reader are apparent only at text-meaning level, not below

Maybe …

Effects of individual writer or reader are apparent only at text-meaning level, not below

Or maybe conversely …

Individual writer or reader's idiosyncrasies are *dampened* at text-meaning level

Maybe …

Effects of individual writer or reader are apparent only at text-meaning level, not below

Or maybe conversely …

Individual writer or reader's idiosyncrasies are *dampened* at text-meaning level

Or maybe …

Three views of text-meaning

Three views of text-meaning

- My view here: Text is always a locus of meaning

Three views of text-meaning

- My view here: Text is always a locus of meaning
- The issue: Reader and/or writer as additional loci?

Three views of text-meaning

Three views of text-meaning

- Dominance of each view in CL varies with era

Three views of text-meaning

- Dominance of each view in CL varies with era
- CL has become *less* sophisticated in its view

The history of the philosophy of text-meaning in computational linguistics

1970–2009

1970–1985

1970–1985

1970–1985

- Simple utterances

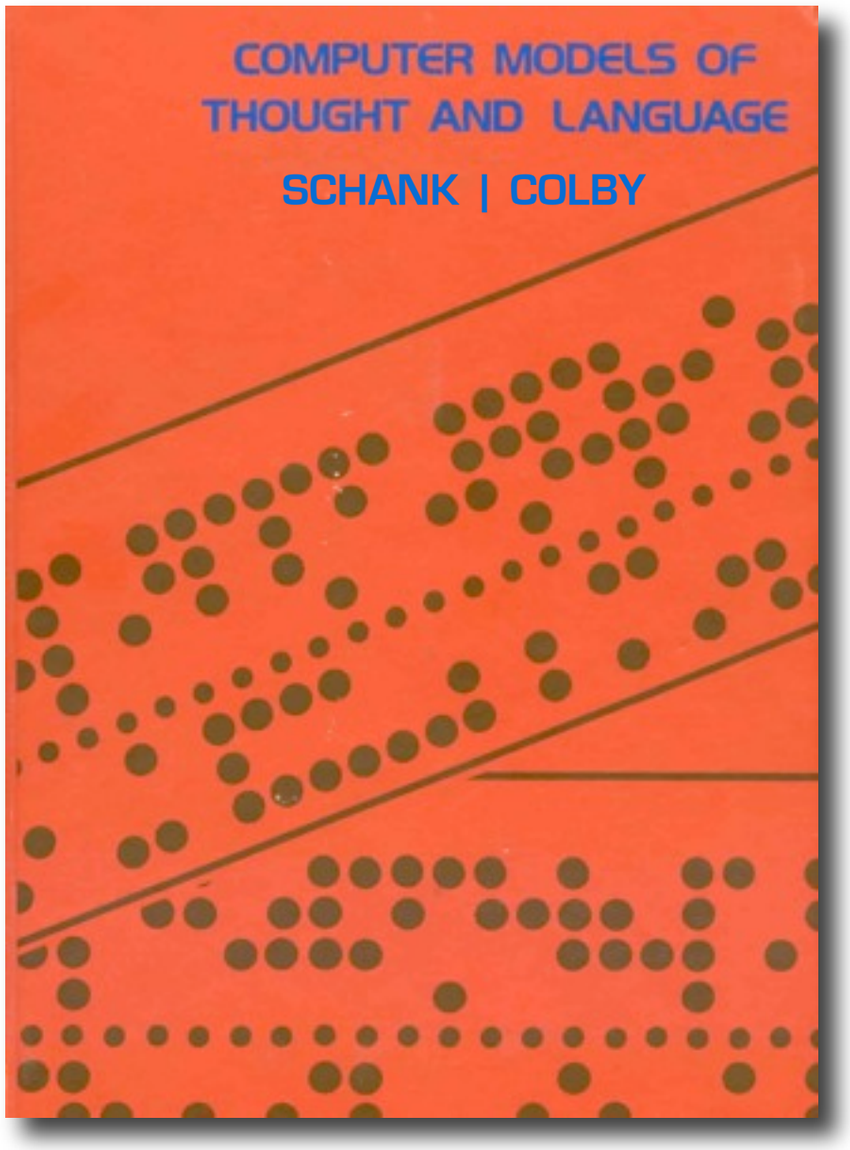
1970–1985

- Simple utterances
- All texts are massively ambiguous; all texts are enthymematic

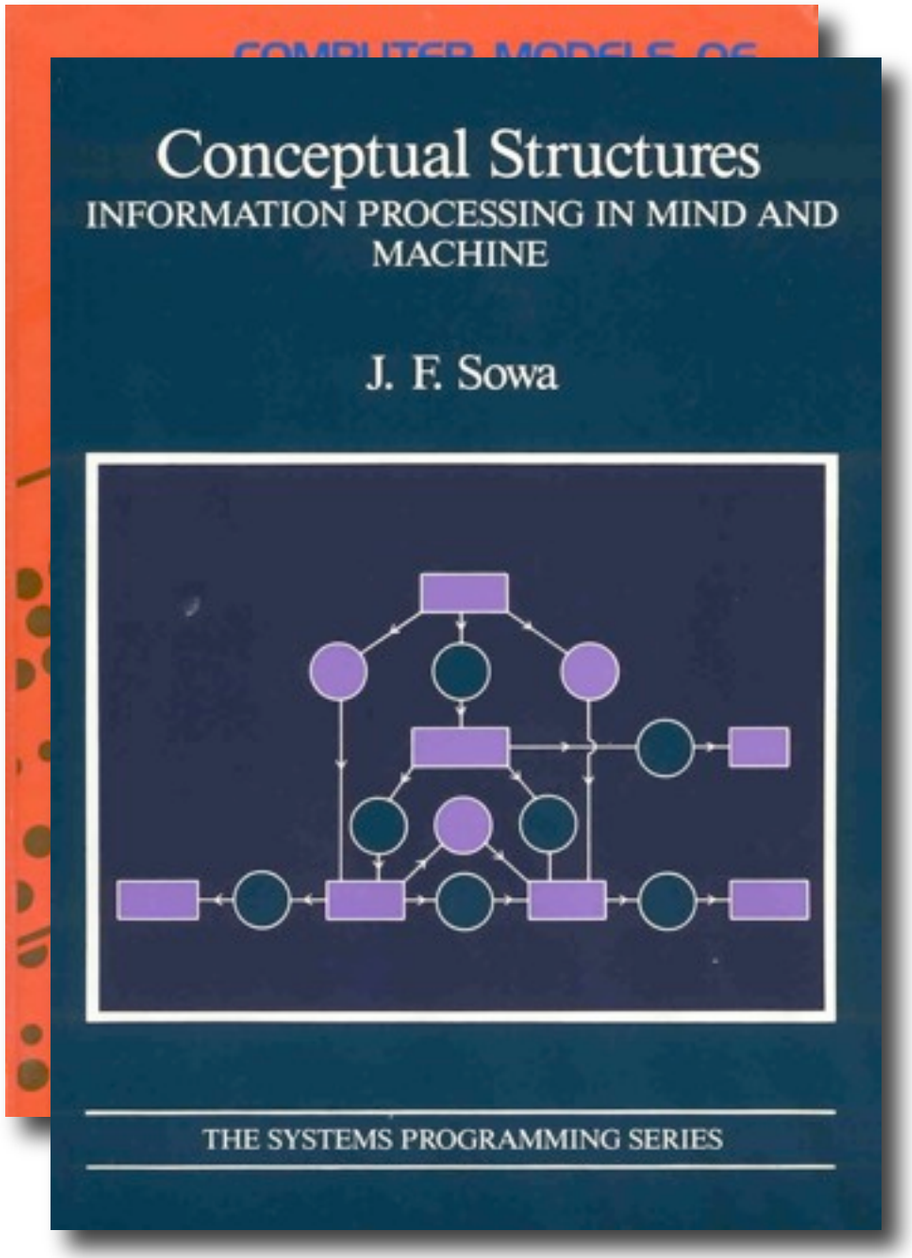
1970–1985

- Simple utterances
- All texts are massively ambiguous; all texts are enthymematic
- Use knowledge of world and beliefs to interpret

1970–1985



1970–1985


Conceptual Structures
INFORMATION PROCESSING IN MIND AND MACHINE
J. F. Sowa
THE SYSTEMS PROGRAMMING SERIES

1970–1985

1970–1985

- Find the interpretation most consistent with what's already known

1970–1985

- Find the interpretation most consistent with what's already known
- Construe input as best match to own prior knowledge

1970–1985

- Find the interpretation most consistent with what's already known
- Construe input as best match to own prior knowledge

❸ Meaning is in the reader / hearer

1970–1985

- Example:

  The city councillors denied the demonstrators a permit because they were communists.

  Who are the communists?

1985–1995

1985–1995

1985–1995

- Interactive dialogues

1985–1995

- Interactive dialogues
- Gricean and pragmatic theories of "real" language use

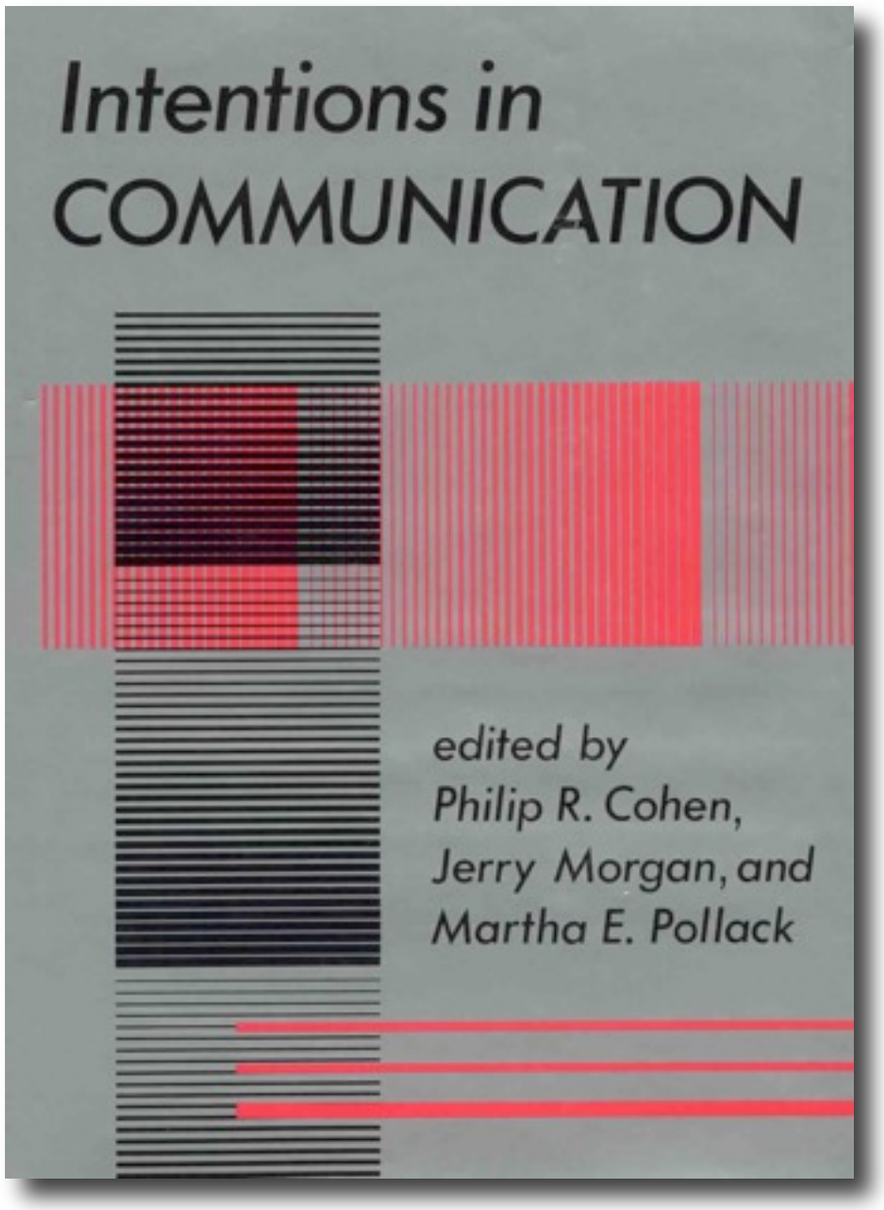
1985–1995

- Interactive dialogues
- Gricean and pragmatic theories of "real" language use
- Model the user to determine their goals and plans …

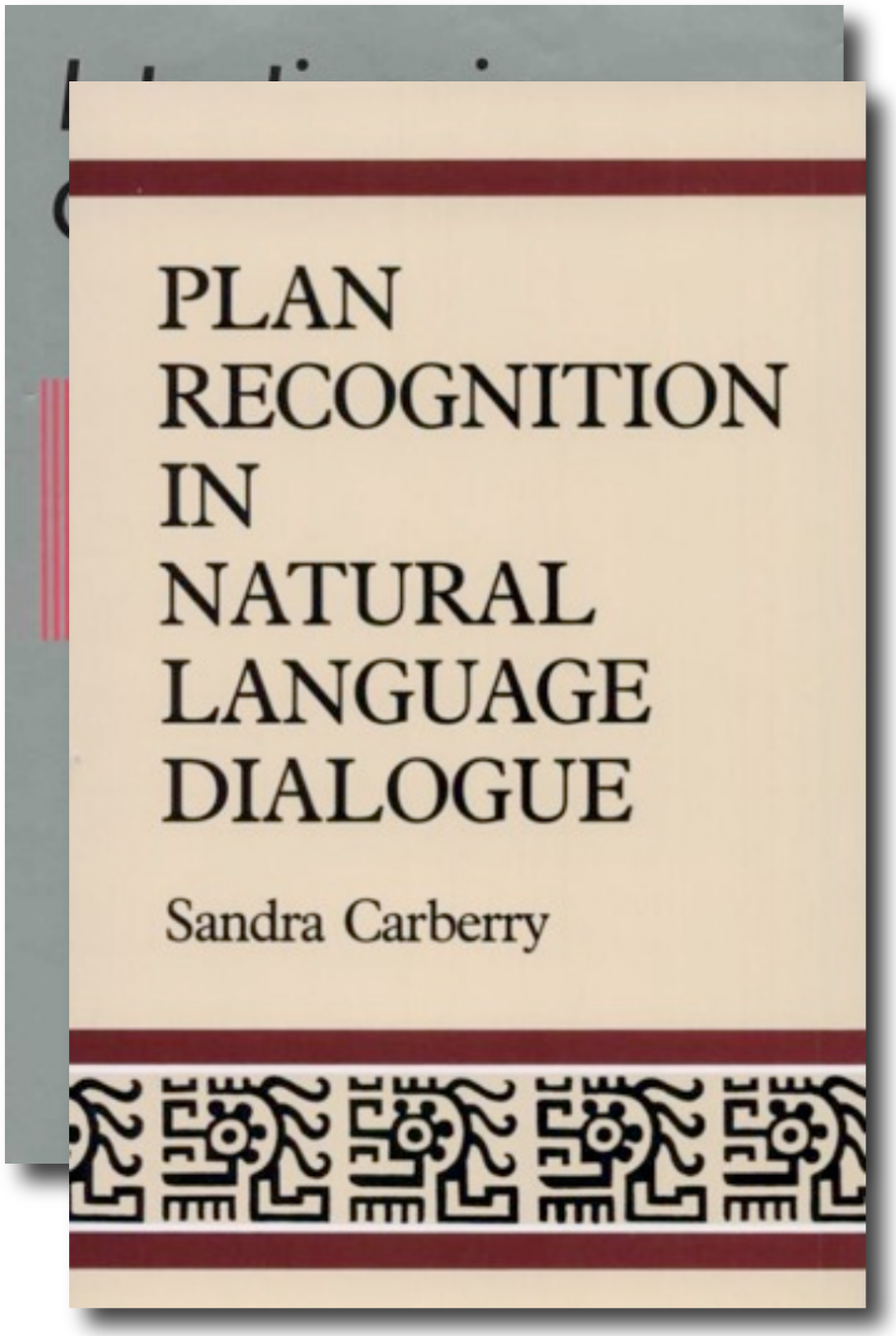
1985–1995

- Interactive dialogues
- Gricean and pragmatic theories of "real" language use
- Model the user to determine their goals and plans …
- … and hence real intent of their utterances

1985–1995


Intentions in
COMMUNICATION
edited by
Philip R. Cohen,
Jerry Morgan, and
Martha E. Pollack

1985–1995


PLAN
RECOGNITION
IN
NATURAL
LANGUAGE
DIALOGUE
Sandra Carberry

1985–1995

1985–1995

- A text means whatever the speaker thinks it means or intends it to mean

1985–1995

- A text means whatever the speaker thinks it means or intends it to mean

❷ Meaning is in the writer / speaker

1985–1995

- A text means whatever the speaker thinks it means or intends it to mean
  - ❷ Meaning is in the writer / speaker
- The computer's job is to read the user's mind

1985–1995

- Example:

  Talking to domestic robot:

  I'd like a beer

  → *Bring me a beer and do it right now*

1995–2009

1995–2009

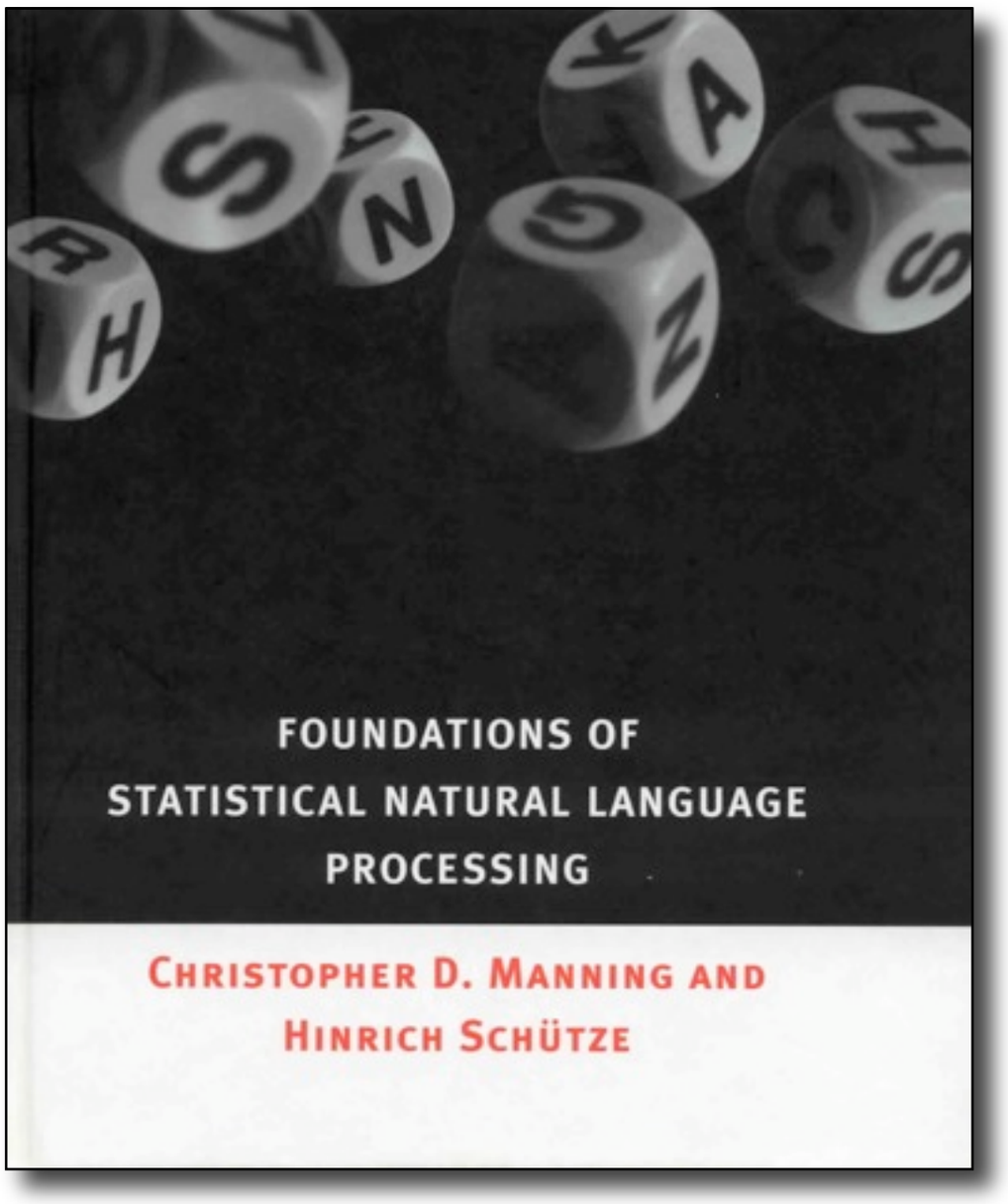
1995–2009

- Large, non-interactive texts

1995–2009

- Large, non-interactive texts
- Statistical and machine-learning methods

1995–2009


FOUNDATIONS OF
STATISTICAL NATURAL LANGUAGE
PROCESSING
CHRISTOPHER D. MANNING AND
HINRICH SCHÜTZE

1995–2009

1995–2009

- Text regarded as *objet trouvé* (‘found object’)

1995–2009

- Text regarded as *objet trouvé* ('found object')
- Meaning is "extracted" by "processing" the words and their context

1995–2009

- Text regarded as *objet trouvé* (‘found object’)
- Meaning is “extracted” by “processing” the words and their context

1. Meaning is in the text

1995–2009

- Text regarded as *objet trouvé* ('found object')
- Meaning is "extracted" by "processing" the words and their context
  1. Meaning is in the text
- "The text is all we have."

1995–2009

- Examples:

  Find articles on raptor migration in Colorado.

  Find follow-ups to this news story.

  Summarize this report.

  Monitor this chat room.

Roles of the linguistic computer

Roles of the linguistic computer

1970–1985: Independent agent

Roles of the linguistic computer

1970–1985: Independent agent

1985–1995: Servant of the user

Roles of the linguistic computer

1970–1985: Independent agent

1985–1995: Servant of the user

1995–2009: Reader and transformer of text

Computational linguistics vacillates between the three views of locus of text-meaning

Computational linguistics vacillates between the three views of locus of text-meaning

But computational linguists don't notice and don't care

Computational linguistics vacillates between the three views of locus of text-meaning

But computational linguists don't notice and don't care

Philosophically naïve

Two types of system

Two types of system

- Observer: Reads external text on behalf of a user

Two types of system

- Observer: Reads external text on behalf of a user
- Conversant: Actively participates in a dialogue with a user

CL's naïve assumptions about meaning

CL's naïve assumptions about meaning

- User *or* writer is perfect language user

CL's naïve assumptions about meaning

- User *or* writer is perfect language user
- If observer: User's knowledge and agenda are same as the writer's

CL's naïve assumptions about meaning

- User *or* writer is perfect language user
- If observer: User's knowledge and agenda are same as the writer's
- If conversant: System's knowledge and agenda are same as user's

CL's naïve assumptions about meaning

- Meaning is conveyed solely by positives

CL's naïve assumptions about meaning

- Meaning is conveyed solely by positives
- No distinction between meaning and interpretation

2009–2016

2009–2016

- Elimination of assumption of identical agendas

2009–2016

- Elimination of assumption of identical agendas
- Interpretation distinguished from meaning

2009–2016

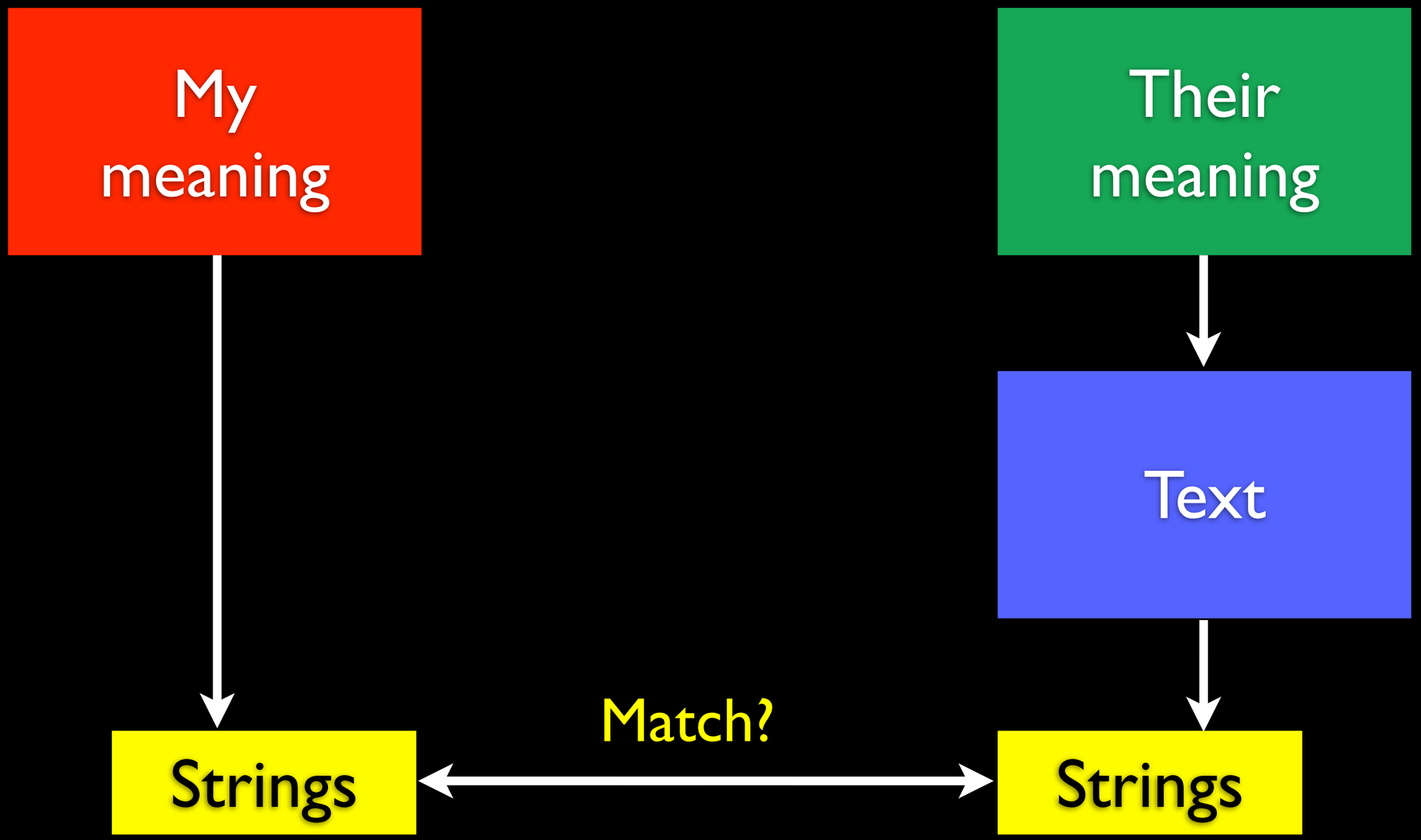
- Elimination of assumption of identical agendas
- Interpretation distinguished from meaning
- Return of in-reader and in-writer views

Google
has turned us all into
researchers

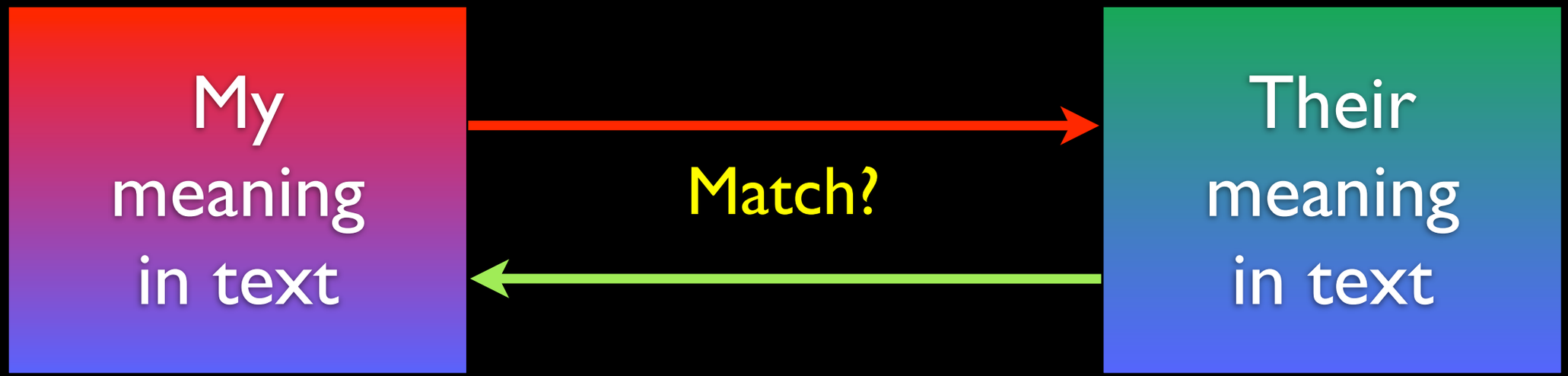
Google
has turned us all into
researchers

but with only
an impoverished view of meaning

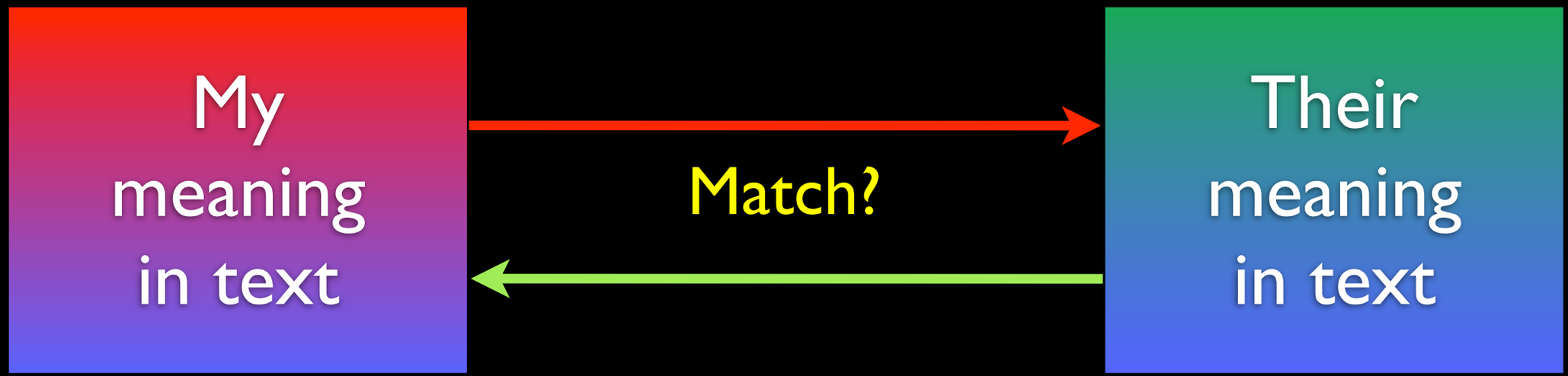
In 2009



By 2016



By 2016



❶ What does this mean for me?

❷ What are they trying to say?

2009–2016

1. What does this mean for me?

2009–2016

❶ What does this mean for me?

- *Goal:* Research intermediaries that can interpret from the user's perspective

2009–2016

❶ What does this mean for me?

- *Goal:* Research intermediaries that can interpret from the user's perspective
- To get at reader's meaning, system first needs to understand their purpose and their viewpoint

2009–2016

❶ What does this mean for me?

- A document may answer a user's question without any intent by the author to do so

2009–2016

❶ What does this mean for me?

- A document may answer a user's question without any intent by the author to do so
- Especially abstract, wide-ranging, or unusual questions and query-oriented multi-document summarization

2009–2016

- Examples:

  Find evidence that …

  … Norway is capable of developing WMD
  … society is too tolerant of drunk drivers
  … the President is doing a great job

2009–2016

- Learning by reading
  - Integrating content of new document into existing knowledge base

“The text is all we have.”

“~~The text is all we have.~~”

We know our own beliefs and goals

2009–2016

❷ What are they trying to say?

2009–2016

❷ What are they trying to say?

- *Goal:* Research intermediaries that can interpret text from the writer's perspective

2009–2016

❷ What are they trying to say?

- *Goal:* Research intermediaries that can interpret text from the writer's perspective
- Hermeneutic (interpretive) task

2009–2016

❷ What are they trying to say?

- *Goal:* Research intermediaries that can interpret text from the writer's perspective
- Hermeneutic (interpretive) task
- Intelligence gathering

2009–2016

2009–2016

- Examples:

2009–2016

- Examples:
  - Sentiment analysis and classification

2009–2016

- Examples:
  - Sentiment analysis and classification
  - Opinion extraction and ideological analysis

2009–2016

- Examples:
  - Sentiment analysis and classification
  - Opinion extraction and ideological analysis
  - Learning by reading: answering test questions

2009–2016

- Examples:
  - Sentiment analysis and classification
  - Opinion extraction and ideological analysis
  - Learning by reading: answering test questions
  - Interlingual machine translation

“All we have is the text.”

“~~All we have is the text.~~”

We know the writer and the context

Future roles of the linguistic computer

Future roles of the linguistic computer

– Servant of the user

Future roles of the linguistic computer

- Servant of the user
- "Neutral" reader and transformer of text

Future roles of the linguistic computer

- Servant of the user
- "Neutral" reader and transformer of text
- Proxy for the world

Future roles of the linguistic computer

- Servant of the user
- "Neutral" reader and transformer of text
- Proxy for the world
- Proxy for the user in the world

Future roles of the linguistic computer

– Mediates between the user and the world

Future roles of the linguistic computer

- Mediates between the user and the world
- Interprets the world to me

Future roles of the linguistic computer

- Mediates between the user and the world
- Interprets the world to me
- Interprets me to the world

Recovering from misunderstanding

Interpretive freedom is not unlimited

Interpretive freedom is not unlimited

Even in the reader-based view, readers can be wrong

Interpretive freedom is not unlimited

The text is a given

Interpretive freedom is not unlimited

The text is a given

– Mishearing, misreading are errors

Interpretive freedom is not unlimited

The rules of language and linguistic processing are given

Interpretive freedom is not unlimited

The rules of language and linguistic processing are given

- Anaphora resolution, homonym disambiguation, phrase attachment, …

Interpretive freedom is not unlimited

But the text might be mis-generated with respect to intent

Interpretive freedom is not unlimited

But the text might be mis-generated with respect to intent

- Typos, malapropisms, slips of the tongue, …

Interpretive freedom is not unlimited

But the text might be mis-generated with respect to intent

- Typos, malapropisms, slips of the tongue, …
- Unintended ambiguities, misleading cues

If present text is unexpected or uninterpretable

If present text is unexpected or uninterpretable

then hypothesize a present or earlier misunderstanding

If present text is unexpected or uninterpretable

then hypothesize a present or earlier misunderstanding

by self or other

If present text is unexpected or uninterpretable

then hypothesize a present or earlier misunderstanding

by self or other

Re-interpret or clarify

Example

Data from Terasaki 1976

Example

MOTHER: Do you know who's going to that meeting?

Data from Terasaki 1976

Example

MOTHER: Do you know who's going to that meeting?

RUSS: Who?

Data from Terasaki 1976

Example

MOTHER: Do you know who's going to that meeting?

RUSS: Who?

MOTHER: I don't know.

Data from Terasaki 1976

Example

MOTHER: Do you know who's going to that meeting?

RUSS: Who?

MOTHER: I don't know.

RUSS: Oh. Probably Mrs McOwen and some of the teachers.

Data from Terasaki 1976

Collaborative repair of misunderstanding

- Repair of text-level misunderstanding

Collaborative repair of misunderstanding

- Repair of text-level misunderstanding
- Speaker and listener negotiate and refine meaning of prior utterance

Collaborative repair of misunderstanding

- Repair of text-level misunderstanding
- Speaker and listener negotiate and refine meaning of prior utterance
- Integrates speaker-based and listener-based views of meaning

Collaborative repair of misunderstanding

- Repair of text-level misunderstanding
- Speaker and listener negotiate and refine meaning of prior utterance
- Integrates speaker-based and listener-based views of meaning
- Computational models of this process
  (McRoy and Hirst 1995)

Conclusion

Conclusion

- Three loci of text-meaning
  - in text, in writer, in reader

Conclusion

- Three loci of text-meaning
  - in text, in writer, in reader
- CL varies in its view
  - but has lately forgotten the writer and reader

Conclusion

- Three loci of text-meaning
  - in text, in writer, in reader
- CL varies in its view
  - but has lately forgotten the writer and reader
- New applications will bring them back

Conclusion

- Further sophistication in text-meaning

Conclusion

- Further sophistication in text-meaning
  - Collaborative construction of meaning in interaction and elicitation of knowledge

Conclusion

- Further sophistication in text-meaning
  - Collaborative construction of meaning in interaction and elicitation of knowledge
  - Searching for and reconciling different interpretations of text

Future role of the linguistic computer

Future role of the linguistic computer

– Mediation and reconciliation

Future role of the linguistic computer

– Mediation and reconciliation

– Peace in the Middle East