Revolution:Philadelphia 2005
Peter Storkerson
Southern Illinois University

Communication Research Foundations, Methods and Results

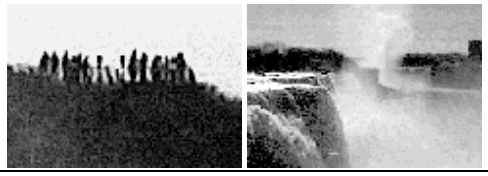
Good Morning.
I will be talking about research into how people interpret communications. This work informs design by analyzing human interpretation, particularly as aspects of presentation affect it. This is basic research into the anatomy of communication: how it works; how we mean. Its primary goal is to help ground communication design as a discipline and foster communicative competence, creativity and innovation among designers.

I will not describe the experiments themselves in detail; that information is published elsewhere and readily available in articles and on the web.[1] I am concerned here with the grounds of research. How communication needs to be understood if it is to be validly studied from the standpoint of its construction, i.e. its design.

The 'why' is straightforward. The core activity of communication design is communication. Communication design operates by altering physical presentation, but our knowledge of the relations between communication and physical presentation is vague at best. We have no detailed mappings between meaning and specific design decisions. We rely far too much on our own intuitions, superstitions and on copying. We have great difficulty describing our work or demonstrating it in ways that make sense to non-designers, which is ironic for designers as communicators.

---

[1] Storkerson, Peter. 2001. *Cross-Mode Communications in Multimedia*. dissertation. Illinois Institute of Technology. <www.communicationcognition.com>

	'We dump enough heat from power plants to run the whole Japanese economy because our power sources are fifty miles away from their customers.'
Camera zooms back from crowd to the waterfall they're standing on.	Spoken text on electric power

So I run experiments in which I show brief movies to people. These movies are comprised of video and spoken language segments that may or may not make sense together. The contents of the two modes are non-redundant, so that each has a certain independence, each conditions understanding of the other, and when put together, they can have a domain of meaning different from either alone. This is not an unusual form of communication; it's common in news reports with voice-overs, documentaries and in movies through montage.

After showing each movie, I ask questions like:

- Did the movie make sense?
- How confident are you of that conclusion?
- Did you like the movie (content)?
- Was it easy or difficult to watch (presentation)?
- How did you to put movie together (description)?

2. I make "objective" measurements:
   - Response times (latencies).
   - Memory (recognition).
   - Facial expression.
   - Galvanic skin response.

3. I elicit descriptions and use protocol analysis to analyze them ford depth of understanding.
4. I test recollection.

I also alter presentations in various ways to measure the effects of these manipulations on received meaning. Such alterations can include:

- Sensory v. Symbolic modes of presentation.
- Relative timings of modes.
- Serial order.
- Pace.
- Visual organization.
- Audio: representative or non-representative (iconic, indexical, narrative).
- Out of domain suggestive references.

I have been developing studies of more complex sequences of movies and patterns of interaction.

I've discovered ways of confirming popular beliefs about communication and measuring them, and I've discovered things that run against the grain of common belief. For instance:

- Very different people (men, women, young, old, highly educated and little educated) actually interpret things quite similarly.
- Symbolic and sensory modes (like text and image) are generally equally important, but they play very different roles.
- Different people can be communicated with in the same ways and can be led to the same interpretations.
- Differences in presentation can substantially alter interpretation.

In short, interpretation, by which we mean received meaning, can be studied and measured. Such studies can clarify and answer meaningful questions about communications and how to design them.

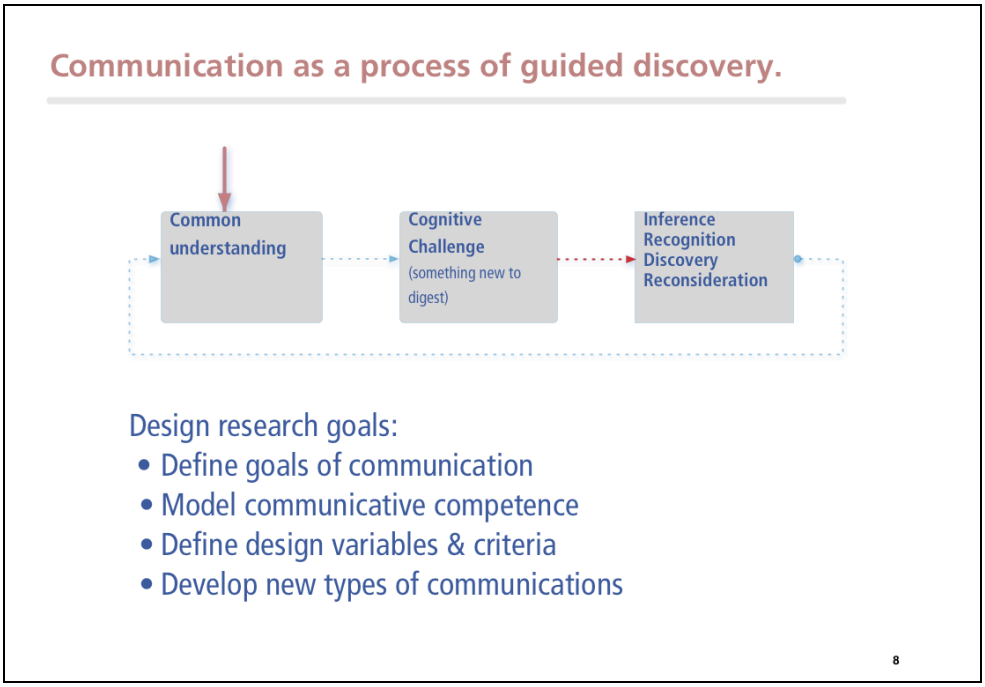
What emerges from my studies is a cognitive or "how we think" approach to communication. To describe this, let me first make some distinctions to jettison unnecessary baggage. By cognition, I mean how we make sense of things or learn from them—no more, no less. It is made up of **perceiving**, both active and passive (seeing, hearing, smelling, feeling when you touch, weight when you lift, etc), **thinking** about or considering, **inferring** guessing or judging, **recollecting** or recognizing, etc. We do this in a fairly organized way in which we make the best sense we can of what's around us.

This 'cognitive processing' produces **knowing** and **knowledge**. Knowing is a feeling: the 'I get it' sense that you have succeeded in making sense of something. Knowledge is the 'it' that you get, whatever that 'it' may be even if it is that the person who's talking is a liar. **Knowing and knowledge are these, no more, no less than the sense of getting something and the thing that is gotten**. Successful communication reliably results in a knowing that accords with the sender's desired knowing, as in 'I understand what you're telling me'. This is absolutely not the same as 'I agree with you'. It signifies that that you and I share a common 'cognitive object' that we can discuss or do something about. Persuasion entails good communication but good communication does not entail persuasion.

Much of the language we use to speak of communication is vague and confused. **"Interpretation", "meaning" and "content' refer to much the same thing—a**

thing for which there does not seem to be a single adequate term. They look at it from different angles, raising different issues. 'Interpretation' stresses the receiver's construction and the different ways in which something can be construed. 'Meaning' takes an observer's point of view as focused on the communication; an 'objective' determination of interpretive correctness: the interpretation(s) that can be supported. It may not accord with either the sender's intentions or the receiver's interpretation. 'Content' refers to the difference between what is presented and what is meant. When the teenager arrives home at 2:am complaining about a flat tire, this can routinely be interpreted as 'I know I am late but it *really* wasn't my fault.' We all know how often conversations are based on unspoken but mutually recognized grounds and agendas. Implicit comprehension grounds role behavior.

Interpretation is an individual, cognitive matter, in which each receiver is quite alone. We read, listen and watch as individuals. Interpreting uses individual cognitive procedures. In that sense, it is not unlike driving to the store to get some milk. It is based on perception of the events taking place: on physical, sensory cues, some familiarity with the subject matter, a certain cognitive competence or implicit, intuitive ability to process and act on information: operating the car, finding the store, searching out the milk, knowing milk when you see it, remembering that it's why you're here, etc.



The experience of the physical document is the receiver's sole access to content. With a cognitive or 'how we think' theory of communication we can analyze and design communications as spatial and temporal configurations, which prompt receivers to themselves construct desired interpretations. **We can see communications as presenting challenges or questions, along with**

resources that steer receivers toward certain interpretations that address them. **There is no causal relationship between communication and the interpretation, but interpretive procedures are reasoned and minimally idiosyncratic (we're doing our best). Successful, predictable communication requires anticipation of receivers and their use of those procedures.**

This model proposes important communication design research goals:

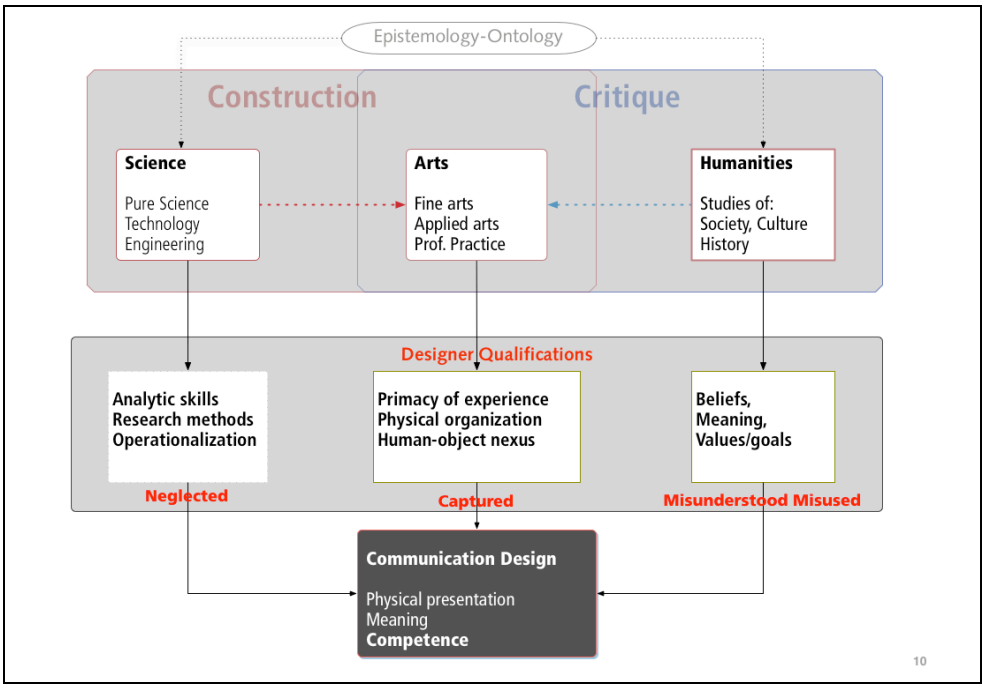
1. Define goals of communication in terms of receivers.
2. Model communicative competence at a sufficient level of detail.
3. Define design variables & criteria by mapping those aspects of presentation that are relevant to resulting interpretation.
4. Use the discovered variables to develop new and/or more effective types of communications

I want to step further back to the reasons for adopting this way of thinking. It was not an arbitrary choice with which I began, nor was it merely a matter of analyzing observing communications and developing a model from those observations. It grew out of the research.

There are many kinds of research thus many kinds of 'knowledge'. Research extends and informs practice. If you are a hand surgeon, your practice can provide rich knowledge, but that knowledge has its limits: its domain. You might come across someone whose joints are becoming fused. While you might be able to offer palliatives, you're unlikely to recognize or figure out what's going on, if you are confronted by some types of arthritis, because they exist in other domains, e.g. autoimmune response. Here, you need knowledge that crosses and links domains and enables you to cross domains so that you can diagnose the *causes,* interpreting them from *symptoms* as content is interpreted from subject matter. **Research that questions and crosses domains of understanding is as much about ideas, models, and theories as about facts.**

As I studied phenomena in communication, I came to recognize that I needed to do basic research to make sense of the domains and of my own questions. **Basic research focuses on fundamental models: to redefine basic terms or domains of understanding in ways that make more sense. Basic research steps back to examine everyday ideas that, upon examination, we discover that we really don't understand, like communication.**

The theoretical approaches used here reflect the deep questions I found in the field of communication and where it sits vis-à-vis scientific and humanist approaches to knowledge.



Here is a very rough and somewhat crude taxonomy of disciplines. It shows two fundamental knowledge cultures, corresponding to C.P. Snow's "Two Cultures'[2]. I'm calling them 'constructive' and 'critical' for a reason. Sciences construct and humanities critique. Ultimately if sciences had no practical physical outcomes, they would not exist, and if humanities did not give us revealing assessments of ourselves, they would not exist. The goals of construction and critique are not always visible in the work done under their rubrics, but they define, motivate and frame that work.

Construction is exemplified by science, technology and engineering.

- It is built around what can be done: developing competence and ranges of actions / outcomes.
- Pure sciences discover what is out there and how it works.
- Technologies determine how what's out there can be applied to construct things.
- Engineering is about actually making them.
- Construction is object rather than subject oriented.
- It requires operationalization: translating concepts into specific expectations so concepts can be examined with questions that can actually be answered.
- It requires demonstration often by experiment.
- Morality is extrinsic to construction –though not necessarily to those who are engaged in it. Objects in themselves are neither benign nor malignant; they simply are.

Critique is the realm of the humanities.

[2] Snow, C.P. 1965. *Two Cultures*. Cambridge University Press.

- Critique is directed at us as subjects and the history of human thought, culture, meaning and values.
- It tends toward exegesis and speculation rather than experimentation. Its major concern is not the universe but how it is or has been seen.
- It tends toward description and explanation rather than prediction.
- It is, perforce, less concerned with operationalization: ideas It is concerned with implication: what something means.
- Values and beliefs, which are extrinsic to construction, are intrinsic, and constructive of the humanities.

There is not only the ignorance these cultures have of each other, but the depth of the divide that separates them.[3] It is difficult to communicate across the divide. Here's one way to put it.

> **We know instinctively that we are not trapped in our own subjectivity, we are sure that we do go beyond our brains and our internal mental states, but we do not know how to justify this conviction. We do not know how to show that our contact with 'the real world' is not an illusion, not a mere subjective projection**.[4]

This is the paradox separating sciences from humanities that Husserl called "The Crisis of European Sciences'.[5] **Communication is at the point of this contradiction**: Are we observers or products? How does communication relate us to the world and to each other? Does it? Do we really understand each other? Is rhetoric persuasive lying or does it reflect something objective and truthful? Can we believe in what we believe?

The arts have occupied the conjunction and contradictions of the constructive and critical. Practical arts used and valued scientific knowledge but worked beyond the limits of knowledge, where actions could not be fully mapped into determinate outcomes. That gap was a space for human freedom. The surgeon is informed by medical knowledge, but confronts the gaps between that knowledge and what he or she finds on the table, thus the art of surgery.

- Arts are simultaneously informed by both constructive and critical moments.
- Arts juxtapose and reconcile and use the scientific and humanist poles to create intelligible experiences: actual outcomes in the world.
- While sciences and humanities develop conceptual systems, arts focus on the production of concrete experience as the measure of success.
- The limitations of humanist and scientific knowledge left gaps between them in which the arts could operate in an ambiguous space without having to deal

---

[3] Snow, C.P . 1959. *The Two Cultures and the Scientific Revolution*. Cambridge University Press.

[4] Sokolowski, Robert. 2000. *Introduction to Phenomenology*. Cambridge University Press. p 11

[5] Husserl, Edmond. *The Crisis of European Sciences and Transcendental Phenomenology; an Introduction to Phenomenological Philosophy*. Cavid Carr Tr. 1970. Northwestern University Press.

with the contradictions between them. Rapid advances in knowledge over the last two centuries have changed that.

- Communication arts relate physical properties to meaning making, combining analytic reduction and synthesis. This is particularly characteristic of communication design, in which physical characteristics, which are not taken to be meaningful in themselves, are manipulated to create and alter content.

In the current era, visual fine arts have dealt with the stresses of their position in part by abandoning and rejecting science. The void left has been partially filled by Critical, social, cultural political ideas issuing from the humanities, which often motivate or sometimes dominate artistic work. There sometimes remains an unwillingness to engage in critical analysis of ideas and self-analysis of the humanities leading to an intellectual naïveté. **Insofar as design programs are based in Fine Art, they can succumb to the same limitations: neglect of scientific thought and standards, naïve readings of humanities and capture in craft or "making".**

Communication designers, too, must work across construction and critique, but they must separate themselves in some ways from the visual fine arts. This is not to oppose current trends in fine art, where they may be highly productive; that is not a matter for a designer to comment upon. But, it is important to draw a sharp distinction between fine artist and communication designer.

- Communication designers need to focus on receivers and regard communications not as achievements but simply as methods.
- Designers need to be precisely aware of their communicative intents, plan work accordingly and be versatile in their use of modes and strategies to predict and produce specific results.
- Designers communicate for others rather than themselves.
- They need to be able to communicate with clients in the clients' languages, to understand needs, which will often not correspond to demands.
- Designers must demonstrate their performance in ways that clients will recognize and respect. Designers need to be able to define and measure results.
- Fundamentally fine art is not immediately useful or practical but communication design is pragmatic, even when it uses an art-like appearance.
- Originality, which is often valued in fine art, is not a primary goal in communication design. Quite to the contrary, conventions may be as they are for good reason and it is important to use languages that will be understood by receivers.

In short, the specific amalgam of construction and critique we find in fine art is not adequate to communication design.

Communication designers should explicitly understand and use the knowledge and methods of sciences, arts and humanities. Communication designers need to have measures of:

- Analytic skills, research methods and operational rigor of scientists and engineers.
- Understanding of meaning, values and goals (needs, demands) that have been developed in the humanities.
- A primary orientation toward experience and competence in realizing it.
- Recognition of the inherent contradictions between construction and critique, thus, an understanding of the knowledge available to their practice.

We can see some of this union in product design, but it remains a distant goal for the communication design and education. Recently, a detailed plan was floated, proposing a new, comprehensive design school for the University of California,[6] which includes concentrations in design studies, interaction design, product design and spatial design but excludes any mention of communication among its curricular foci. **There is something wrong with this picture. Communication and communication design are seen as activities not worthy of serious study.**[7] **This stems not only from the historical location of design programs but also from the contradictory position of communication at the conjunction of the two cultures.**

Here are some of the specific issues that present themselves to communication design.

First, communication is an activity involving a set procedures taking place in time and space (speaking, listening showing, watching, taking turns, arguing…). It operates through individuals and in situations. The view that communication is a major way of learning leads us, however uncomfortably, toward a rhetorical conception of knowledge.

Second, receivers create knowledge and knowing. Knowing is the 'I get it' feeling. Knowledge is whatever I 'get'. Since knowing is a result of my perceptions, thinking and remembering, it's subject to how they work in time and space, thus interacting with physical aspects of presentation. So: you can't separate knowledge, Content Interpretation from presentation. Communication design becomes important.

Third, very often the meaning is not directly available to anyone, sender, receiver or observer because in is not directly stated. It is what is unstated: what is needed to decode what is stated and why it is stated (we call this content).

---

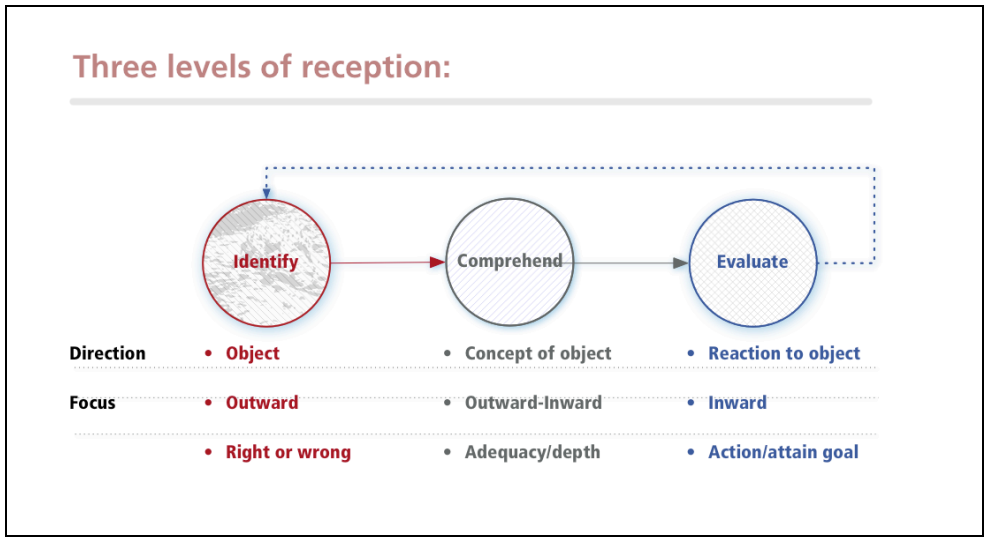
[6] http://www.evc.uci.edu/growth/design/SoD-proposal.pdf

[7] See UCI School of Design Online Conference. PHD Design List, 16-20 November, 2003. <http://www.jiscmail.ac.uk/cgi-bin/webadmin?A2=ind03&L=phd-design&T=0&O=D&P=139548>

Fourth, communication elevates the problem of objectivity and subjectivity and to the status of epistemology: how we can know *anything*? One solution to the problem of objectivity and subjectivity is to jettison objectivity. It is often said that "two people may interpret the same thing differently'. People do misunderstand each other, especially across cultures. But without something in common to affix interpretation, we have no way of understanding how people communicate at all how, they can learn to understand each other, and how they learn from each other.

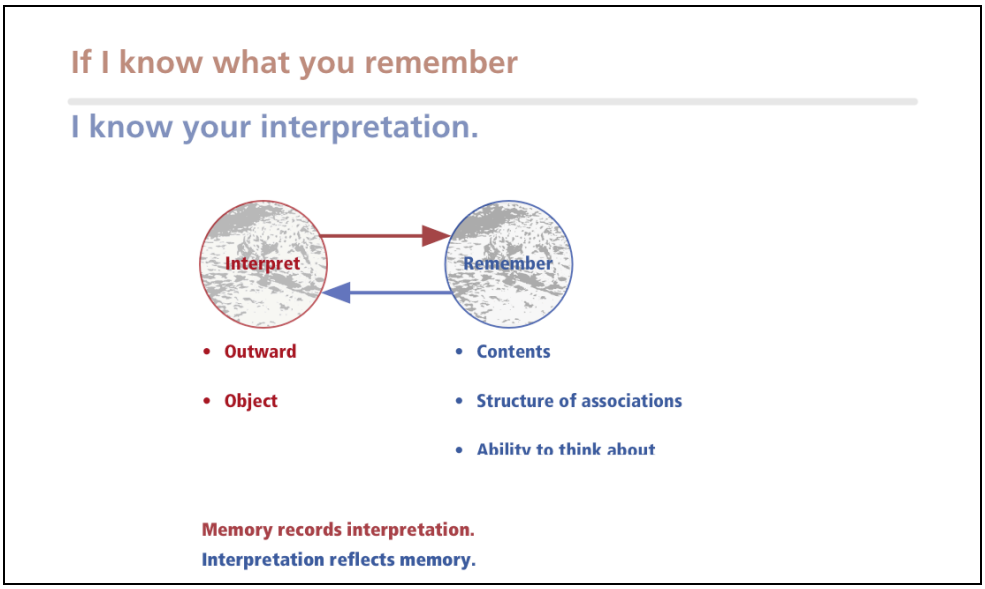
Communication design depends on our ability to understand each other. It requires us to develop an understanding of the process to support competent design. We need to competently and reliably induce specific interpretations in populations by manipulating spatial and temporal configurations.

My response to this is to use the processes of perceiving, thinking, remembering and feeling as a human competence underlying individual and cultural differences, which enables us to communicate and learn. This model focuses on the physical communication, how it is constructed and processed. Within this model, receivers create interpretation, but it is based on practical, outside oriented problems of construing what is outside and independent of us. Interpretation strives for objective correctness. If this model works, it can give us the flexible links between subjective and objective that a model of communication needs.



Here we need to make a few more clarifying distinctions, between identifying what's out there, which is what I'm calling interpretation, comprehension, which is the associations that enrich interpretation and evaluation, which is how I feel about it. These are all called 'meaning' but they're really quite different and should not be confused. Of the three, interpretation as identification is objective and foundational. It's the base for the others. If we

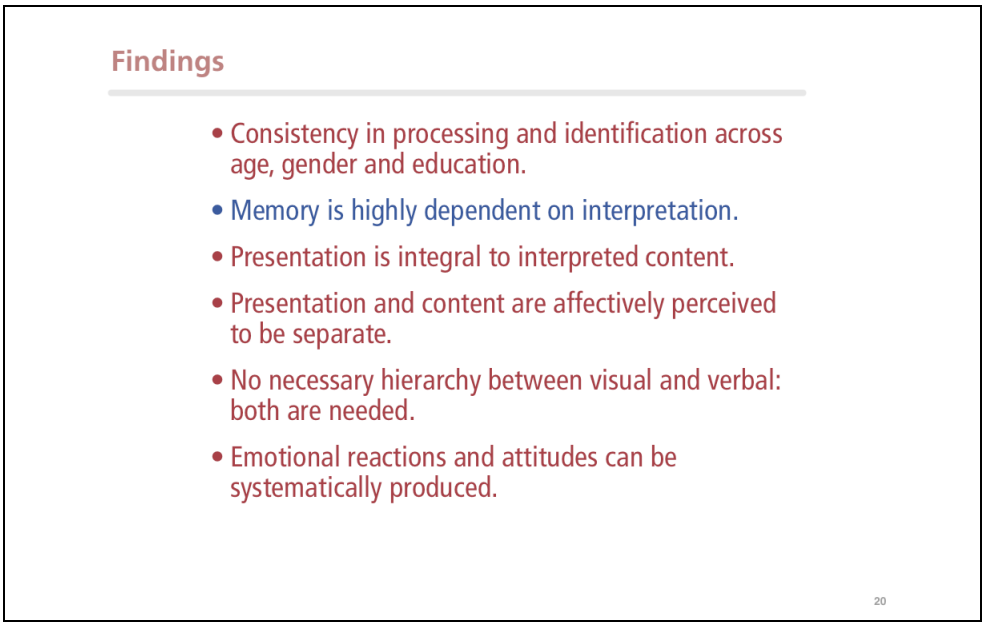
define interpretation rigorously, in this way, we can then deal with the other problems and their interrelations in turn.



Now, and this comes from psychological research, there is strong evidence that memory is a record not of external events but of the interpretation of them and the work of interpreting. **We remember things we make sense of and we remember them as we made of them**. Thus, if I know what you remember of something, I know how you can think about it. I know your interpretation of it. That memory conditions subsequent interpretation.

If interpretation depends on human procedures that take place in space and time, interpretation can in principle be affected by presentation, and empirical studies of perceptual and cognitive factors are potentially foundational.

It was to test these hypotheses that I made movies, asked questions, and made measurements. I manipulated relations between videos and texts and tested recall. In current experiments, I am working on direct measurements of affect.



As this summary shows, there is no necessary contradiction between the idea of a specific communicative goal and a receiver based concept of meaning. A detailed description experimental protocols and results is beyond the scope of this presentation, but this conclusion was strongly demonstrated. Interpretation can be studied. People are broadly similar in how they work to make sense. Presentation and content are intimately related.

This is a new approach to designing as the practice of challenging receivers, giving them interpretive work to do while providing cues that will enable them to make specific interpretations. The payoffs of this research are:

- Improved measurement and determination of reception (better than self reports or focus groups).
- A method for analyzing goals and making predictions that can be made and tested.
- Development of new variables to uncover new design possibilities.
- Knowledge based approach to design.
- Communicable to clients.
- Development of an integrated research agenda.
- Effective teaching, both graduate and undergraduate.

In terms of research in general, I believe that there are very important lessons here.

a. Theory and research are inseparable; they are integral to each other.
b. Without theory, validity, meaning and significance of observations cannot be determined.
c. Design is in various ways, said to be unique, informed by a "design knowledge" that emerges from practice and is intimately connected to it. This knowledge is incommensurable with the knowledge of both sciences and

humanities.

This view does not hold up very well. Different inquiries have different characteristics and problematics, but they have similarities, too, which make it possible to compare them. Comparative studies can illuminate them and reveal what's underneath.

Happily, this research has led from some questions about how to design to theoretical questions as deep as epistemology and ontology and back to research that actually indicates ways of approaching design. Along the way it provokes many more questions and offers many more avenues of investigation than solutions. This is creativity, opening productive, new possibilities for designing communications and for understanding design. The immediate outcomes of this research were not the goal. They were important reality checks on the theory, and they are hints of what may become possible as theoretical concepts, methods and findings are elaborated and refined.

I would like to return to the science-humanities cleavage. The experimental part of the research looks like science. Perhaps it's an assault on humanist turf and values. There is no need for this view as long as we understand the epistemological grounds of the research, which is why it is so important to get them right and communicate them along with the findings. The commitment to communication as something that is important to constructing shared knowledge carries with it a notion that knowledge is matter of personal and species experience, reasoning and judgment. We cannot assert any absolute or 'truth' status. In addition, the theory comes from a person or persons, with all of the limitations.

There are always other ways of looking, but some ways of looking are better than others, and persons or species who persist in idiosyncratic ways of interpreting the world tend not to live to reproduce. Reality, whatever it is, constrains us to reach accords with it at every turn.

In terms of our own equipment, there things we have control over and there are things we can't change, like the broken appearance of a pencil in a half full glass of water, that we hear lightening and thunder as separate, that we intuitively recognize that two groups of two pencils and one group of four pencils have the same number of pencils. There are people who do not perceive motion, who cannot remember anything from one moment to the next, or who do not recognize that the person entering the room is the one who left a few seconds ago, even though they can recognize that the two persons are identical. When family members visit, these people think they see replicates. These things can't be taught to persons missing the capacities for them. We don't think of these people as just having different interpretations, and we know the specific areas of brain damage that cause these syndromes.

Experiments with normal rats demonstrate something else that's interesting. Perception works schematically, by judgment. Rats are conditioned to identify a rectangle by being rewarding for going to the rectangle. Later, when confronted by the same rectangle and a more rectangular rectangle they spontaneously choose the more rectangular one. In this experiment, rats don't see "similarity" or map one figure on another so much as they schematize; rectangularity is good, the more the better, and this happens in perception.

All of these are demonstrations that there are widely shared lower level structures and procedures underlying conscious life. They lead us toward a cognitive epistemology, which underlies communication. Linguists are now considering rhetorics in terms of underlying thought processes[8]. Brain studies have demonstrated how much the brain functions in geometric mappings, leading to notions of "geometry of thought"[9], which can ground our understanding of the roots of embodiment in language and thinking. Mathematician Michael Layton demonstrates a logic to how objects are formed by forces such that objects' shapes encode not only what happened to them, but also the narrative or order in which it happened. His work has proven valid and valuable, for instance, in cloud and weather analysis. It is interesting when applied to artistic and visual forms, indicating that meaningful forms relate to narrative encoding, thus the possibility that humans have a hard-wired sensitivity to such narratives.[10]

This is all relevant to communication design. Communication designers rhetorically manipulate physical (spatial, temporal and sensory) characteristics in service of meaning. Diagrams characteristically leverage perception by applying it to other domains. Line graphs encode time and change (growth, diminution, rate) and apply them to other domains, like the stock market. That's how they work. The visual categories of inclusion, exclusion, overlap, clustering and separation, activity and rest are deeply and intuitively meaningful.

But, many designers seem largely ignorant of these researches. It's important to recognize that the understandings needed to address and empirically study communication are only now coming into being.

The idea that designers or anyone will, individually, develop the knowledge and expertise required to master the problem of communication is simply unrealistic. Infrastructures need to be developed and they need to be coordinated. Communication design needs a research agenda that includes basic research and a division of labor ion research areas and expertise.

---

[8] Fauconnier, Gilles, Turner, Mark. 2002. *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. Basic Books.

[9] Gärdenfors, Peter. 2004. *Conceptual Space: The geometry of thought*. MIT Press,

[10] Leyton, Michael. 2001. *A Generative Theory of Shape*. Springer.

One of the critical problems at present is that some designers individually want to build a more disciplined and grounded approach to their field but don't know where to begin: what they need to know and what they don't need to know. Designers really need to know what they don't need to know because otherwise the problems are overwhelming. Long developed fields require some common knowledge and language, and then allow specializations. Designers can do this in the area of knowledge acquisition.

Most importantly, many designers, if not in the majority, are indifferent or hostile to research, researchers, and knowledge in their field. Perhaps they see it as irrelevant, a waste of time, a threat to status or creativity or as colonization from science. Research and knowledge are friends. They will never grasp things in a holistic or fully satisfactory way, but current intuitionist practice doesn't do that either. Ignorance is not bliss.

Not all designers or design educators need to be researchers, and designers need not be threatened by research. What's needed is for research and researchers to be allowed in departments and be able to contribute to curricula. The two sides of a coin may be different from each other, but they will work best together.