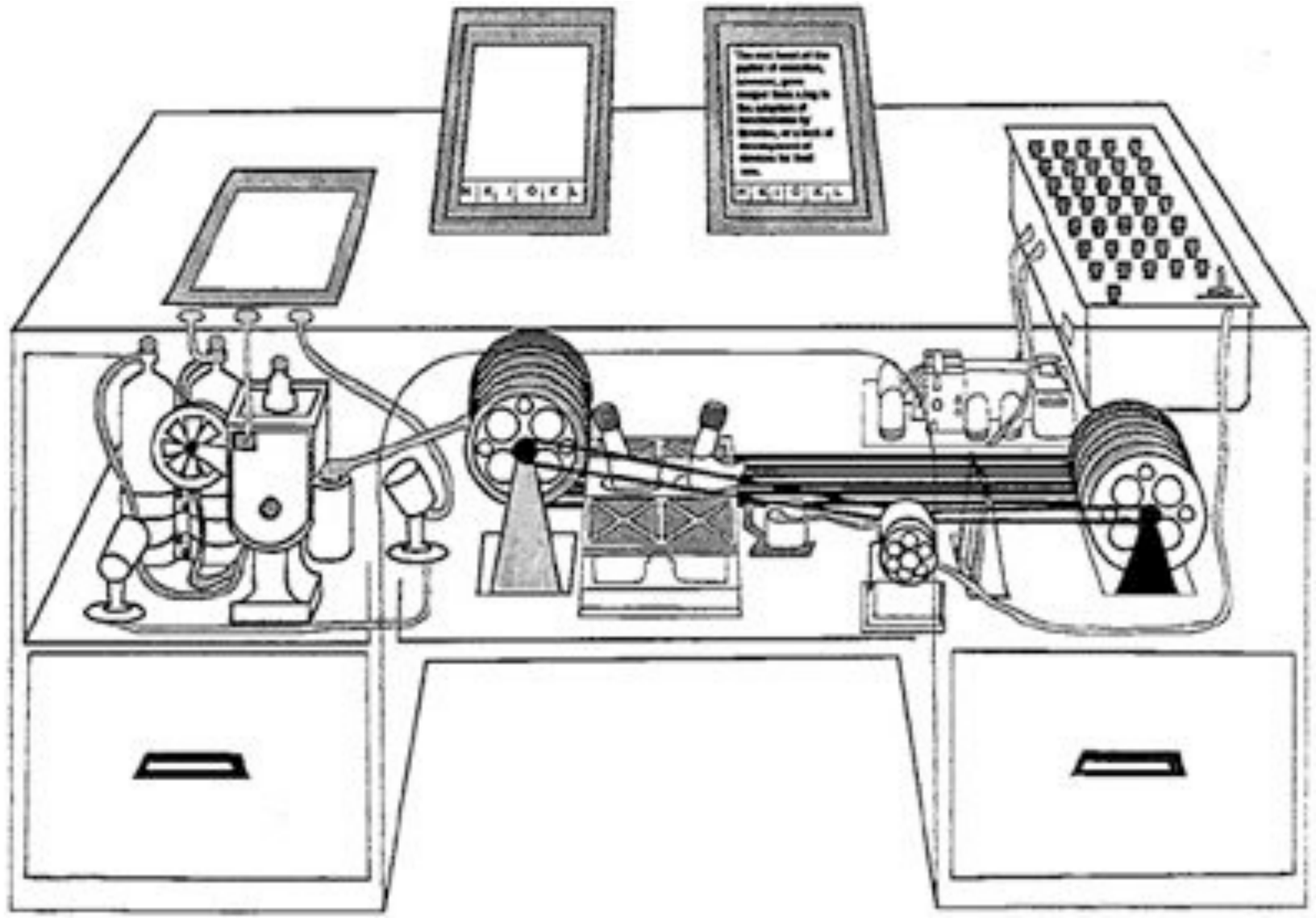
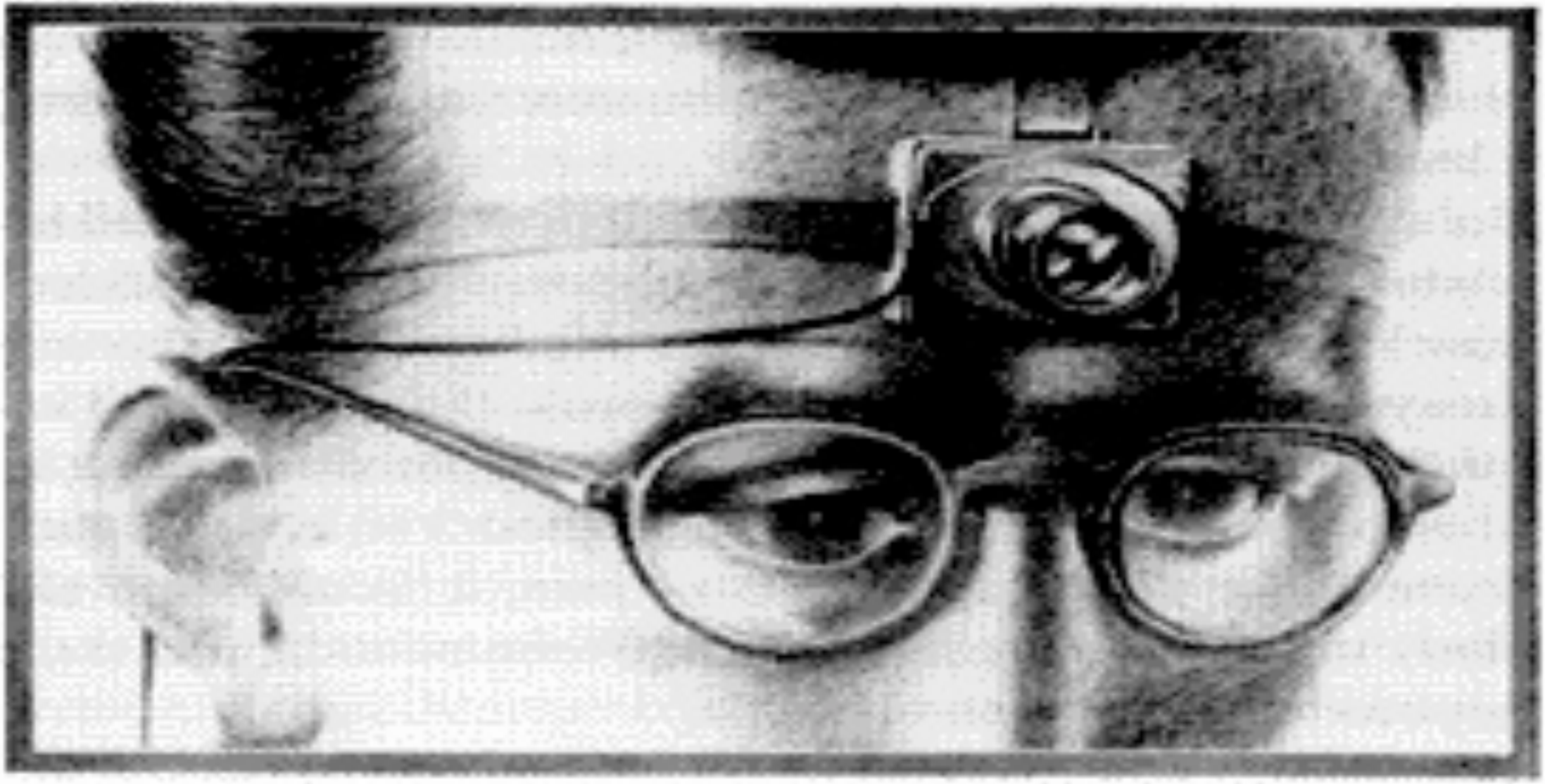
Intro to Human-Computer Interaction Design

SCOTT KLEMMER

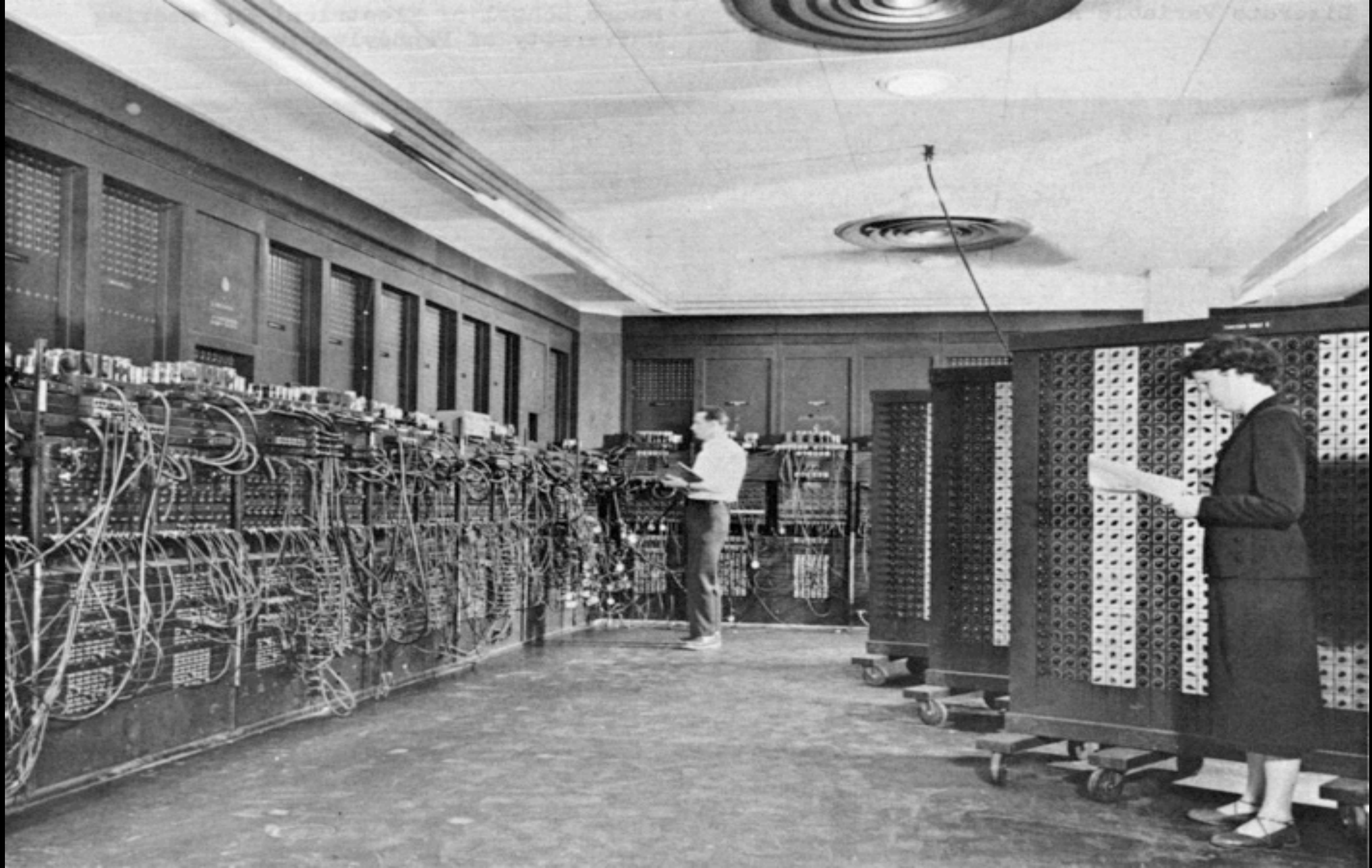
FALL 2011

cs147.stanford.edu





A scientist of the future records experiments with a tiny camera fitted with universal-focus lens. The small square in the eyeglass at the left sights the object (*LIFE* 19(11), p. 112).

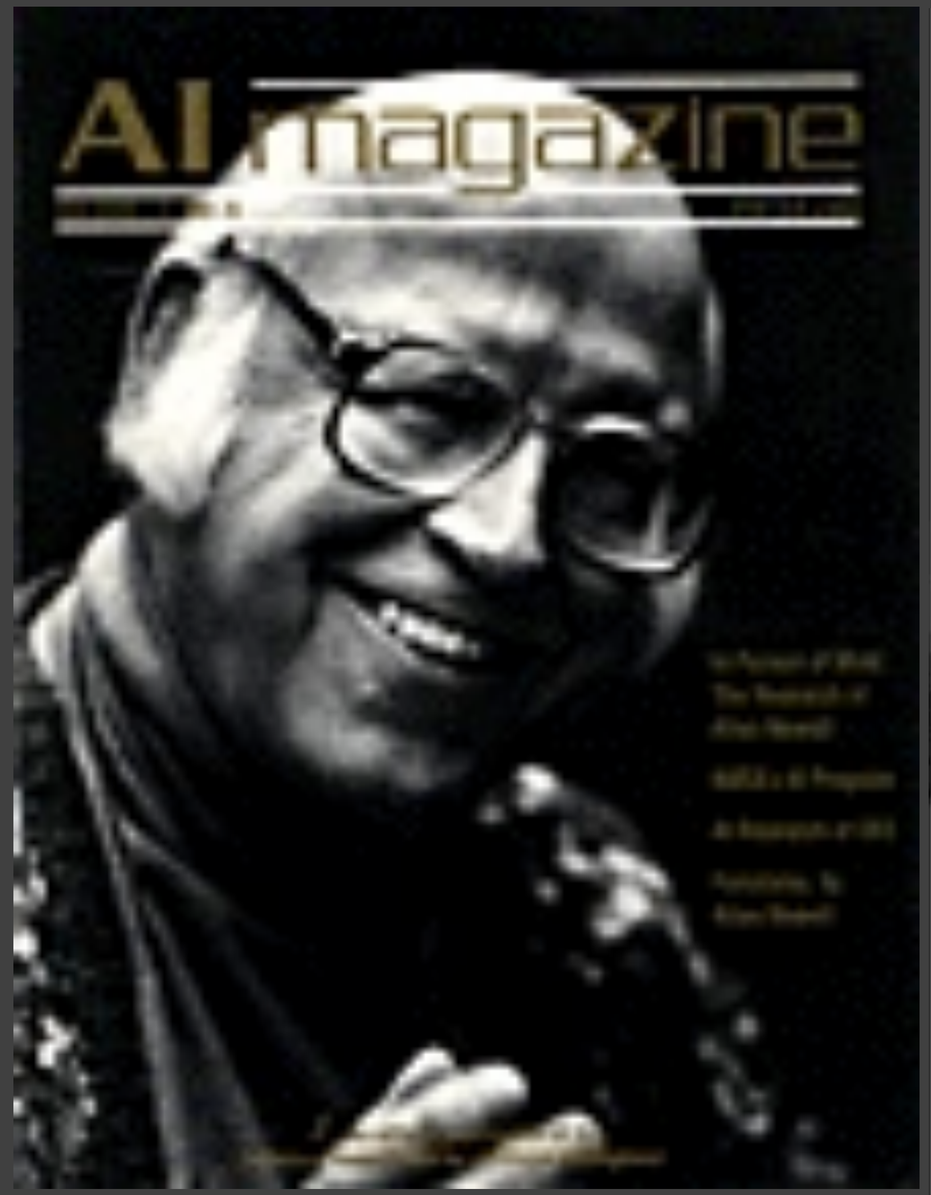


Memex Inspires Ivan Sutherland

Memex Inspires Doug Engelbart

Inspires Alan Kay

“The best way to predict the future is to invent it”



Xerox
Note 1
(Correction Copy)

Allen Newell
(retyped 11 Feb 73)

Notes on a Proposal for a Psychological Research Unit

The purpose of these notes, of which this is the first, is to act as a working vehicle to explore the notion of a psychological laboratory within a computer science oriented industrial research laboratory. The specific context is the Xerox Research Laboratory in Palo Alto.

I consider these notes to be working documents -- not the record of prior analysis, but an integral part of an analysis in progress. Hence ideas expressed in them may be exploratory and stipulative, to be contradicted by ideas expressed subsequently. They may also be somewhat discursive.

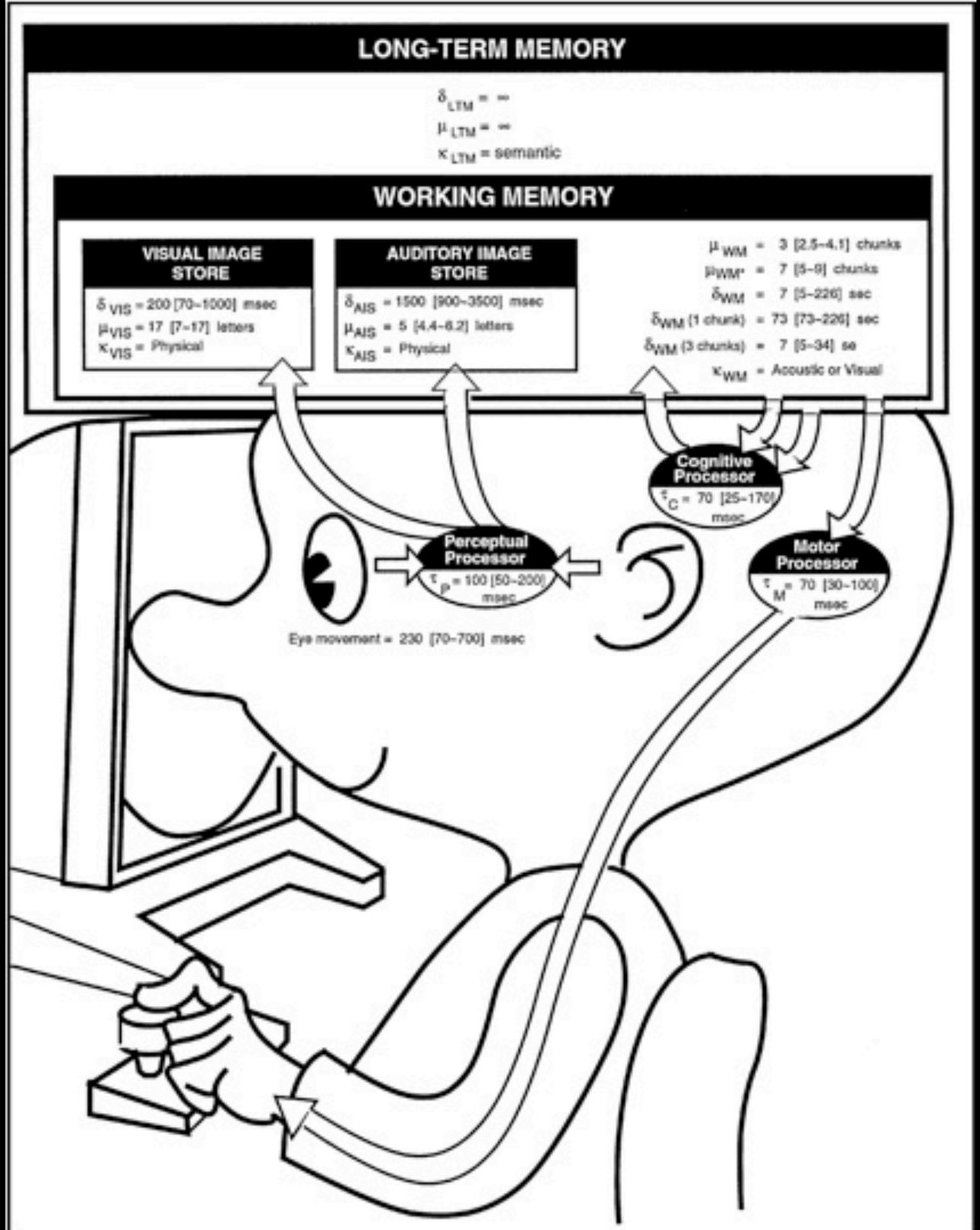
Basic proposition. The central idea that these notes are to explore is contained in a set of somewhat independent propositions:

(1) There is emerging a psychology of cognitive behavior that will permit calculation of behavior in new situations and with new humans (called information processing psychology currently).

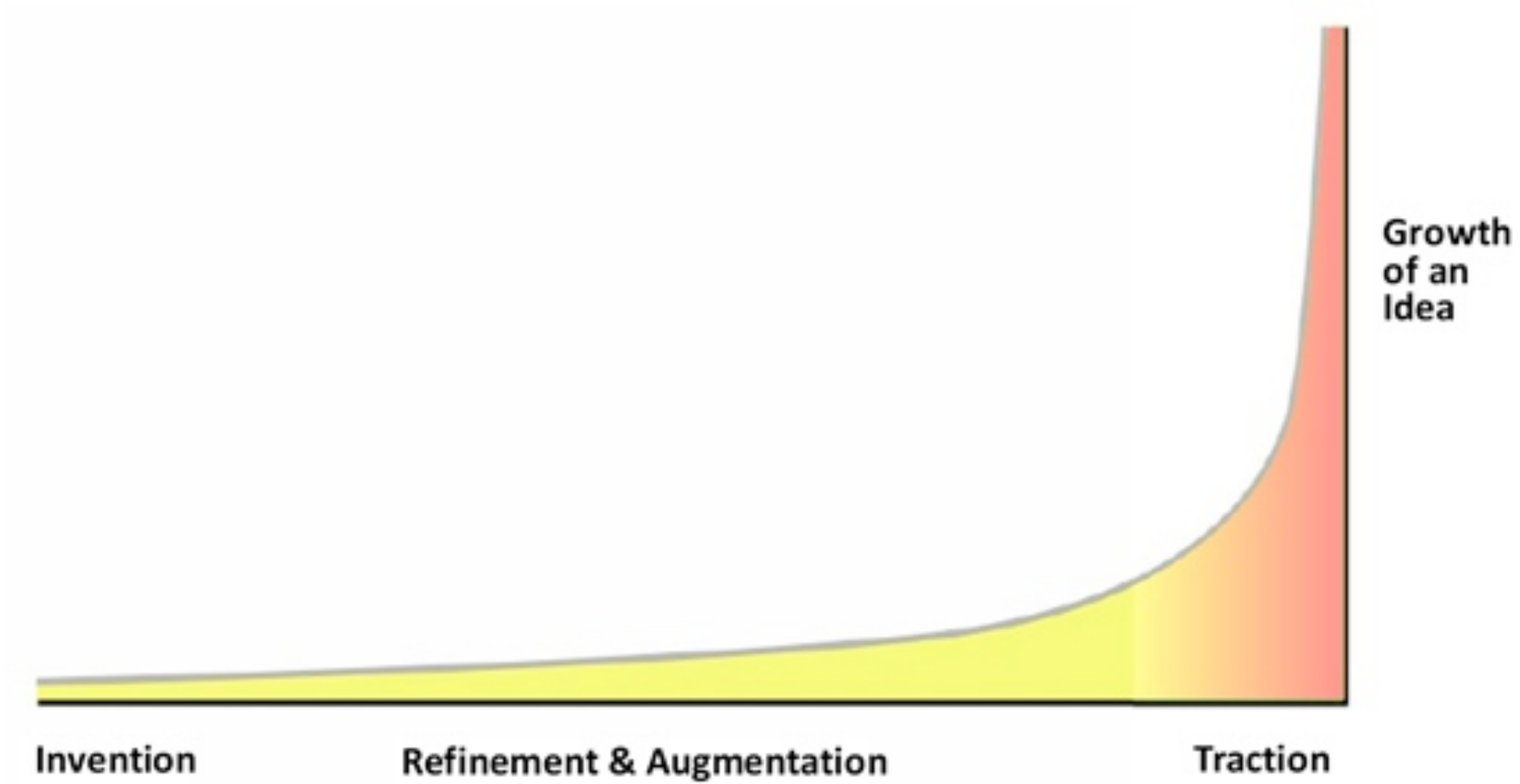
(2) Several of the tasks that are central to the activities of computing -- programming, debugging, etc. -- are tasks that appear to be within the early scope of this emerging theory.

(3) Computer science in general is extremely one-sided (for understandable reasons) in the treatment of its phenomena: almost no effort goes into understanding the nature of the human user. This applies to the design of programming languages, debugging systems, operating systems, etc.

(4) There is a substantial payoff (in dollars) to be had by really designing systems with detailed understanding of the way the human must process the information attendant thereto.


LONG-TERM MEMORY
δ_{LTM} = ∞
μ_{LTM} = ∞
κ_{LTM} = semantic
WORKING MEMORY
VISUAL IMAGE STORE
δ_{VIS} = 200 [70–1000] msec
μ_{VIS} = 17 [7–17] letters
κ_{VIS} = Physical
AUDITORY IMAGE STORE
δ_{AIS} = 1500 [900–3500] msec
μ_{AIS} = 5 [4.4–6.2] letters
κ_{AIS} = Physical
μ_{WM} = 3 [2.5–4.1] chunks
$\mu_{WM'}$ = 7 [5–9] chunks
δ_{WM} = 7 [5–226] sec
δ_{WM} (1 chunk) = 73 [73–226] sec
δ_{WM} (3 chunks) = 7 [5–34] se
κ_{WM} = Acoustic or Visual
Cognitive Processor
τ_C = 70 [25–170] msec
Perceptual Processor
τ_P = 100 [50–200] msec
Motor Processor
τ_M = 70 [30–100] msec
Eye movement = 230 [70–700] msec

Bill Buxton:
The “Long Nose” of Innovation



To learn more about this history...

- Fred Turner, From Counterculture to Cyberculture
- John Markoff, What the Dormouse Said

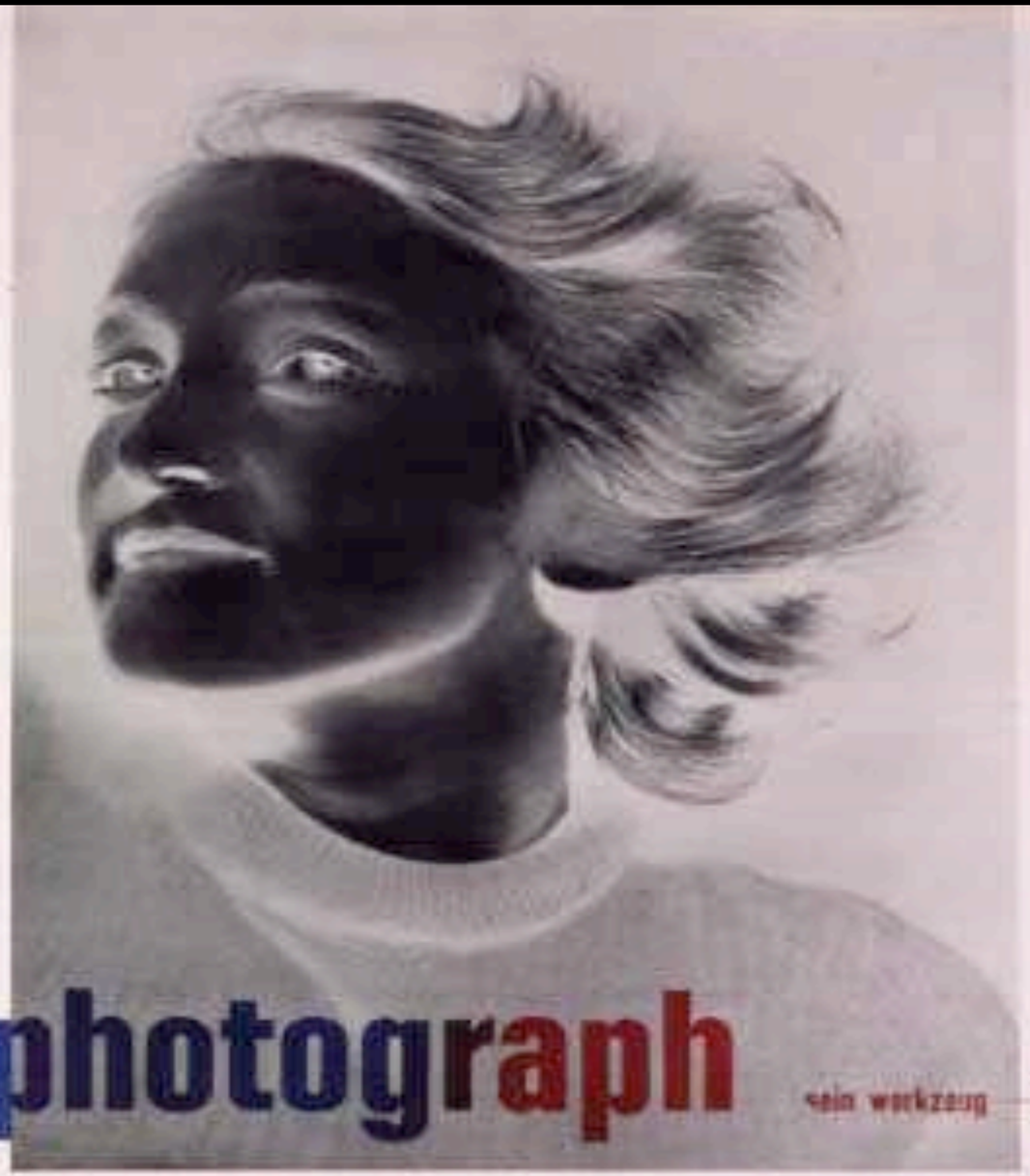
Computer Science

Applied Psychology

Design


BAUHAUS

gewerbemuseum basel ausstellung



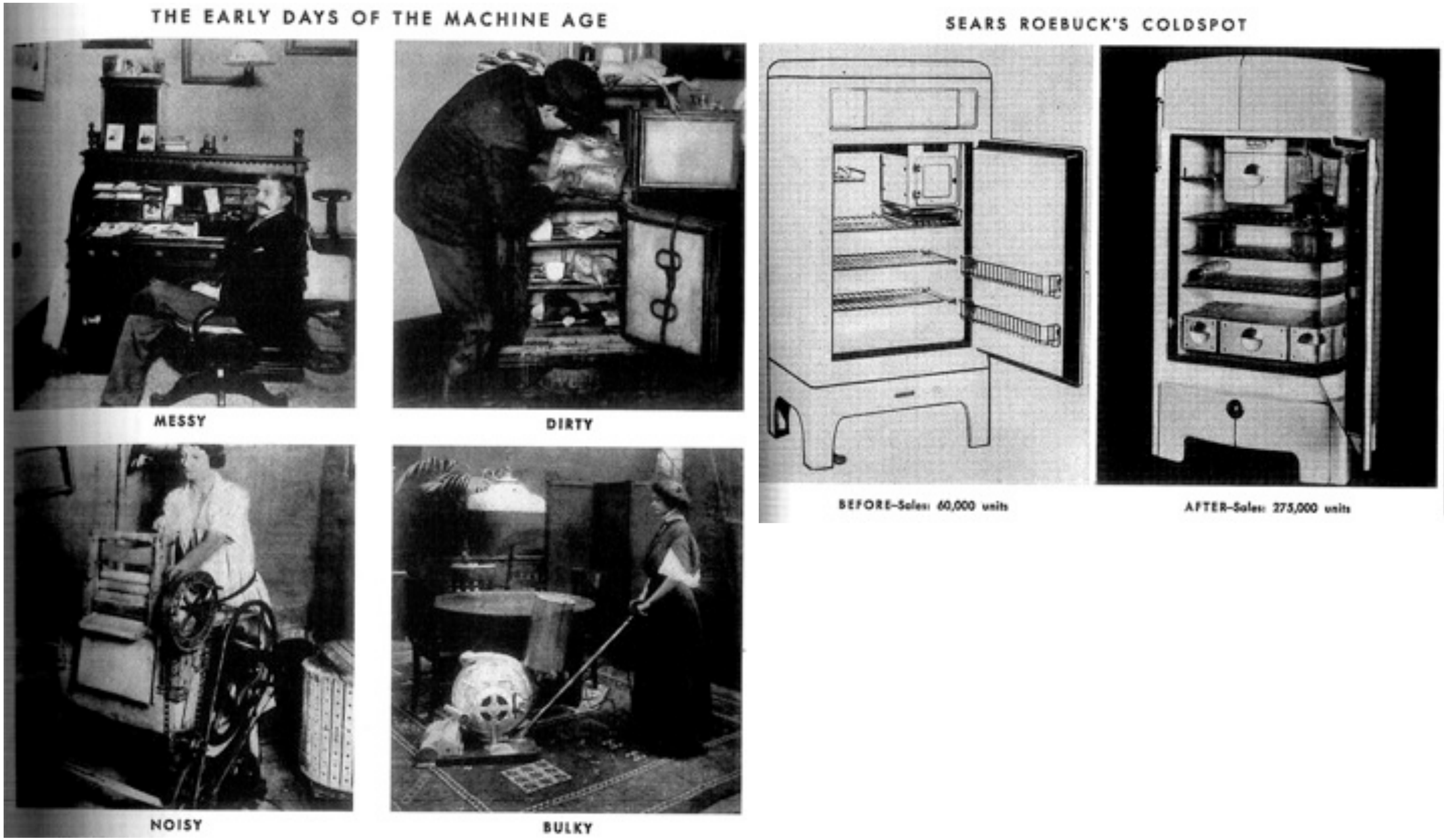
der berufsphotograph

ein werkzeug — seine arbeiten

8. mai — 6. juni

werktags		14–19	
mittwochs		14–19	19–21
sonntags	10–12	14–19	
abdruck frei			

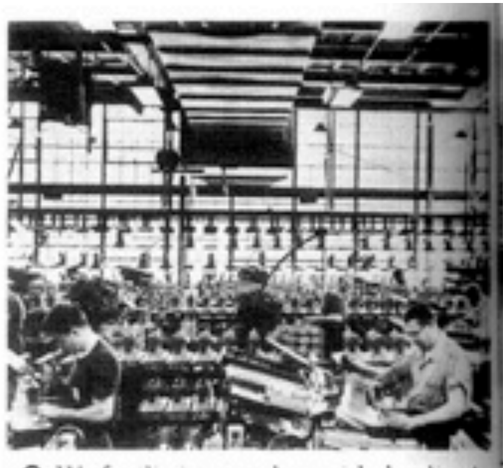
Raymond Loewy



Henry Dreyfuss

The distance between drawing board and assembly line is not one inspired leap for the industrial designer but rather a series of careful and patient steps. Our development of Singer's Model 600 sewing machine is typical. Although there is an infinity of steps in between, the eight shown here are fundamental to our approach to a client's problem.

1 We start by studying the competition. We analyze models and illustrations of other companies' merchandise, both here and from abroad.

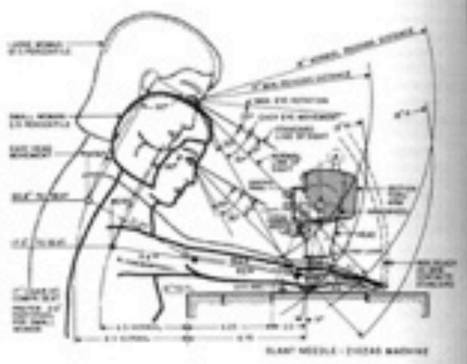


2 We familiarize ourselves with the client's manufacturing facilities. We like to know the limitations as well as the potentials of his plants.

3 We learn how the product will be used. In developing Model 600, our designers took a Singer sewing course, Singer zig-zag stitching and all.

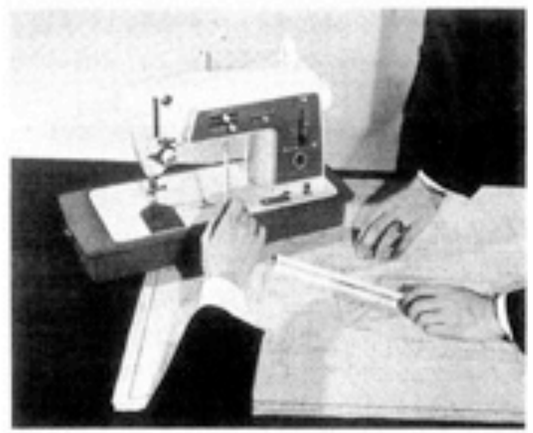
4 After consultations with top management, sales executives and engineers, we develop a variety of idea sketches.

5 Now we're ready to study the design in three dimensions. We start this phase of the work with a rough clay model.

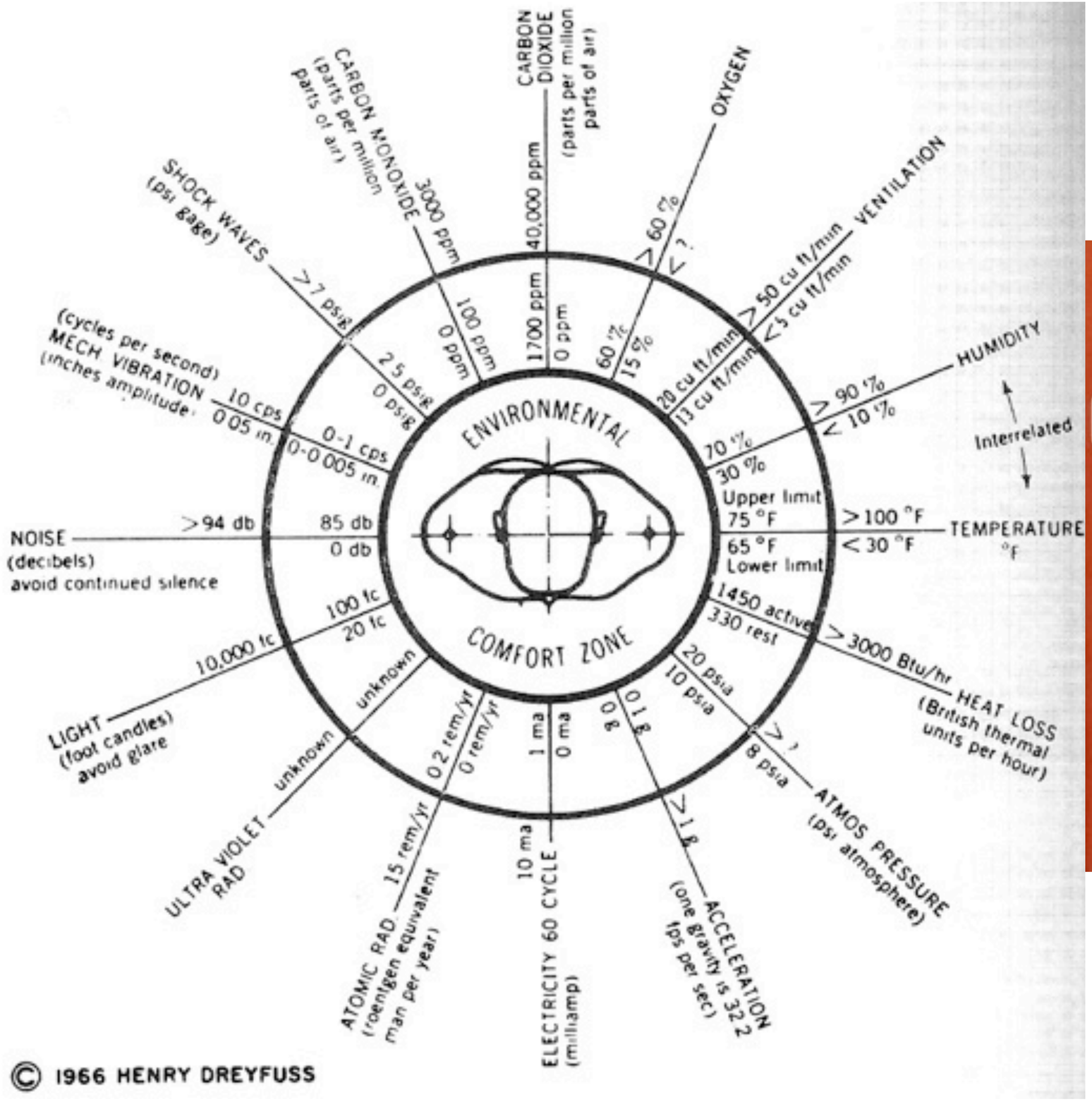


6 Using the anthropometric techniques we originated, we turn to human engineering. We see how a mother and daughter will use the machine.

7 Through each step there is close collaboration with our client's engineers. Working drawings are made and checked against their pilot model.



8 A prototype model—identical to the production-line product in every detail—completes the project. Exit designer. Enter sales team.


ENVIRONMENTAL
COMFORT ZONE
CARBON DIOXIDE
(parts per million parts of air)
40,000 ppm
1700 ppm
0 ppm
OXYGEN
60 %
15 %
VENTILATION
> 50 cu ft/min
< 5 cu ft/min
20 cu ft/min
13 cu ft/min
HUMIDITY
> 90 %
< 10 %
70 %
30 %
Interrelated
TEMPERATURE °F
Upper limit
75 °F
65 °F
Lower limit
> 100 °F
< 30 °F
1450 active
330 rest
HEAT LOSS
(British thermal units per hour)
> 3000 Btu/hr
20 psia
10 psia
ATMOS PRESSURE
(psi atmosphere)
8 psia
> 1 g
ACCELERATION
(one gravity is 32.2 fps per sec)
10 ma
ELECTRICITY 60 CYCLE
(milliamp)
0 ma
1 ma
0 rem/yr
0.2 rem/yr
ATOMIC RAD
(roentgen equivalent man per year)
15 rem/yr
unknown
ULTRA VIOLET RAD
unknown
LIGHT
(foot candles)
avoid glare
10,000 fc
100 fc
20 fc
NOISE
(decibels)
avoid continued silence
> 94 db
85 db
0 db
(cycles per second)
MECH VIBRATION
(inches amplitude)
10 cps
0.05 in.
0-1 cps
0-0.005 in.
SHOCK WAVES
(psi gage)
> 7 psig
2.5 psig
0 psig
CARBON MONOXIDE
(parts per million parts of air)
3000 ppm
100 ppm
0 ppm
© 1966 HENRY DREYFUSS


This is JOSEPHINE
the average American female — and JOE is a typical 6 year old.

Course Values

Course Values

- People

Course Values

- People
- Prototype

Course Values

- People
- Prototype
- Compare

Course Values

- People
- Prototype
- Compare
- Iterate

Course Values

- People
- Prototype
- Compare
- Iterate
- Principles

Quarter-Long Project

teams of three

Shared Weekly in Studio

FINAL PRESENTATIONS FRIDAY

12/9

4 units

Background

CS106B or equivalent

role in the curriculum

LECTURE Mon & Weds, 2.15-3.05pm

LAB Fridays, 2.15-3.30pm *(optional)*

STUDIO Fridays, sign up

To take cs147
you must apply online
by Wednesday 5pm

Weekly Studio Ritual

- Projects due each Friday 8am
- Participate in studio
- Reflect on & self-assess your work

CourseWare

has all the information

it's where to send all questions

Visit office hours!

CS147: Introduction to Human-Computer Interaction Design (Fall 2011)

Recent Announcements

Add Announcement

All Announcements...

Course Description

Through lectures and a project, learn the fundamentals of human-computer interaction & design thinking. Work together in teams of three on a quarter-long project. Each week, in small design studios, present and discuss work with peers. The setting for the course is mobile web applications. The constraints of this small form factor make this an exciting challenge. At the end of the course, present to a jury of IT and design leaders. CS147L, an optional 1-unit lab teaches web programming. Projects should address one of the following three briefs.

Design Briefs

CHANGE: *Transform behavior*
TIME: *Redesign the representation*
GLANCE: *just a few essential bits*

More Information

Submitting Work
Attendance
Grading
Self-assessment
Prerequisites
FAQs
Contacting Us

Syllabus & Readings

Each lecture has a reading associated with it -- you must log in to CourseWare to access them. Please skim the readings before lectures, and use them as a study guide when preparing for the quizzes in Week 3, 6, and 9. The readings should also be helpful as reference materials for the main project, and beyond this class.

	Monday	Wednesday	Assignment
1	*September 26* Introduction	*September 28* Needfinding Needfinding Handout	Design exercise
2	*October 3* User-Centered Design Gardin, Analyzing User Research	*October 5* Prototyping Snyder, Making a Paper Prototype	Discovery Groups form in this studio
3	*October 10* Input Guest Lecturer: Stu Card Jef Raskin, Fitt's and Hick's law	*October 12* Heuristic Evaluation **Quiz 1** Nielsen, Ten Heuristics for Evaluation	Prototyping
4	*October 17* Direct Manipulation Hutchins/Hollan/Norman, Direct Manipulation	*October 19* Representation Matters Norman, Things That Make Us Smart	Heuristic evaluation
5	*October 24* Visual Design Tidwell, Organizing the Content	*October 26* Information Design Tufte, Data Density and Small Multiples	A skeleton and a plan
6	*October 31* Software Tools **Quiz 2** von Hippel, Toolkits	*November 2* Designing for Diverse Contexts Multiscale Design	Meat on the bones
7	*November 1* Evaluating Designs David W. Martin, How to Do Experiments	*November 3* Conducting a User Study The Cartoon Guide to Statistics	Ready for testing
8	*November 7* Web-Scale Experiments Ron Kohavi et. al., Practical Guide to Controlled Experiments on the Web	*November 9* Collaboration on the Web Ben Shneiderman, Collaboration and Social Media Participation	User Test Results
9	*November 14* Social Software	*November 16* Human-Information Interaction Guest Lecture: Stu Card **Quiz 3** Marti Hearst, Search User Interfaces, Ch 1 Jared Spool, Information Scent	Fit & finish
		Thanksgiving break	
10	*November 28* What We Learned... and What's Next Mark Weiser, The Computer for the 21st Century	*November 30* Presenting Design Work	Results

Upcoming Assignments

Assignment 0
Due - Wed, Sep 28 at 5:00pm

Assignment 1: Introducing a Human-Centered Design Process
How many designers does it take to replace a light bulb? Designer: "You
Due - Fri, Sep 30 at 8:00am

All Assignments...

Upcoming Office Hours

Add

All Office Hours...

Upcoming Lectures

There are no upcoming lectures

All Lectures...

The first assignment

Edit Grades

Assignment 1: Introducing a Human-Centered Design Process

Due date: Fri, Sep 30 at 8:00am

How many designers does it take to replace a light bulb?
Designer: "You don't need a new light bulb, you need a new kind of illumination experience".

Brief

Think about some of the designs that you consider to be great innovations. Quite likely, they came about because the design team was able to see a new problem or opportunity, or reframe things in a new way. As the light bulb joke illustrates, an important strategy of successful designers is to reframe things so that... we can see things in a new light. This first week's exercise is intended to work your perception and reframing "muscles". How creative can you be? (Later exercises will work different "muscles".) For this first project...

Your mission is to redesign the experience of waiting in line.

An important part of the designer's role is to come up with a point of view. For example, your point of view might be that standing in line is intrinsic, but being bored isn't. What can we do with our time that is more productive, more interesting, or more entertaining than just wait? Maybe it's reading the news, playing a game, or preempt the parents by giving them a surprise call? Alternatively, your point of view might be to eliminate the line by preordering, or hire people to act as placeholders in the line? Or maybe this is precious time for us to do nothing? A few minutes to space out, or quickly center ourselves. No matter what you come up with, it should be something that improves the experience of standing in line.

This assignment will introduce iterative design so that during the main course project, the steps of the design process will be more familiar.

Assignment

1. Observing people helps designers learn more about their needs, goals, desires, abilities, values, and situation. In this assignment, we bootstrapped this process for you by observing and interviewing people about standing in line. You can find the video here. Go through the video. If you like, observe and interview line-waiters yourself. Use insights from it as background material, and brainstorm ideas for how you would redesign the waiting in line experience. Go for volume when you brainstorm, you should come up with at least 20 different ideas. Ask a couple of people to get together and brainstorm with you, you will find that it's easier to find inspiration when you work together.
2. Select your two favorite ideas and give a 1-sentence explanation of why you chose each.
3. Take these two ideas and rapidly prototype them. Really rapidly. No computers. If it's screen-based, use 3 x 5 index cards and a sharpie. Anything that won't fit is too detailed. Go for very, very simple. Here are some examples of paper prototypes. If your idea is more conceptual, rapidly prototype the experience however you see fit. Use any props you think will effectively convey the look and feel of the user experience, but remember to keep it simple. As a rule of thumb, each prototype should take about a half-hour to produce. Take pictures.
4. Now you are ready for feedback: find some users to try your prototype. Go to the place you intend your design to be used. Find someone who will use your prototype as if it was a real application. (Explain that you'd like their help, and that it'll take 5-10 minutes of their time.) Given that your prototype is made of pulp, markers, and imagination, you'll need to be an active operator. For example, if a user "clicks" a button, you simulate what would happen by changing screens (new index card). Do not tell the user what to do. Prototypes are a probe; a way to get feedback and learn how to improve your design. Success is not blithely saying "people really liked it" but rather "I learned all of these cool things that will make the design better". Iterative design is about "failing" early and often, in order to rapidly arrive at a great design. Take notes and pictures of what users do and say. Pay attention to when people get confused or if they offer feedback on what they liked or didn't like.
5. Use your notes to help you reflect on the feedback you received; distill a list of major insights that could inform a future revision.

Submit

- Full list of ideas you brainstormed. Express your ideas as "headlines", explaining the main concept in less than one line. For this brainstorm, you can work with as many people as you want (inside or outside the class). So their contribution is acknowledged, list their names.
- For each of the two prototypes, one sentence explaining why you chose it.
- Photos of your prototype
- Photos of user testing (make sure that at least one photograph shows the setting of the test so we can see it's an authentic setting.)
- List of insights from user testing

In studio

Bring your laptop to studio, you will need it to submit your self-assessment.

Studio Leaders

- Rio Akasaka
- Alex Blessing
- Pierre Kreitmann
- Chinmay Kulkarni
- Rob Ryan
- Remington Wong
- Dan Wiesenthal

Questions ?