

9.00: Introduction to Psychology
Prof. Steven Pinker
Week 1, Lecture 1

What is Psychology?

- The science of how we:
 - See and hear (perception)
 - Move (motor control)
 - Think and speak (cognition & language)
 - Learn and grow (development)
 - Feel (emotion)
 - Relate to one another (social psychology)
 - Differ from one another (personality)

What psychology is *not*:

- Mind reading, manipulation, psychoanalyzing
- Self-help, recovery, 12-step programs (Frazier, Dr. Laura, Men are From Mars; Women who Love Too Much)
- Weird stuff: past lives, ESP, psycho killers...
- Today on Oprah:
 - Men who get sex-change operations so they can have lesbian relationships with their wives! ...with psychologist Rufus T. Firefly

Why People Don't Understand What Psychology Is

- Our own mental processes work so well that we are unaware of them!
- Arthur C. Clarke:
 - “Any sufficiently advanced technology is indistinguishable from magic.”
- How can we “go out of our minds” to appreciate how they work?

Two Ways to Go Out of Your Mind

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1. Compare human minds to animal minds

- Guppies eat their babies if given the chance. Why don't we?
- Many animals -- even bees -- respect the laws of probability as they forage. Why do humans seem to ignore the laws of probability by gambling and buying lottery tickets?
- Why do we find the thought of eating worms disgusting?

- Gibbons live alone and rarely have sex. Gorillas in harems and rarely have sex. Pygmy chimpanzees live in groups and have orgies around the clock. Why do humans pair up and have sex in private?
- In most primate species, males have nothing to do with offspring? Why do men become Dads?
- In other species, males can't stand each other. Why do humans (of both sexes) do each other favors, work in groups, become friends?

William James, 1890

It takes a mind debauched by learning to carry the process of making the natural seem strange, so far as to ask for the *why* of any instinctive human act. To the metaphysician alone can such questions occur as: Why do we smile, when pleased, and not scowl? Why are we unable to talk to a crowd as we talk to a single friend? Why does a particular maiden turn our wits so upside-down? The common man can only say, "*Of course* we smile, *of course* our heart palpitates at the sight of the crowd, *of course* we love the maiden, that beautiful soul clad in that perfect form, so palpably and flagrantly made for all eternity to be loved!"

And so, probably, does each animal feel about the particular things it tends to do in presence of particular objects. ... To the lion it is the lioness which is made to be loved; to the bear, the she-bear. To the broody hen the notion would probably seem monstrous that there should be a creature in the world to whom a nestful of eggs was not the utterly fascinating and precious and never-to-be-too-much-sat-upon object which it is to her.

2. Compare human minds to robot minds

- The robot gap:
- Robots in fiction:
 - Speedy, Cutie and Dave
 - Lost in Space
 - Rosie the Maid
 - R2D2, C3PO
 - The Terminator
 - Mystery Science Theatre 3000
- Why not in real life?



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Compare human minds to robot minds, continued

- First law of Artificial Intelligence:
 - “The hard problems are easy, and the easy problems are hard”
- Psychology as reverse-engineering
- The engineering problems of seeing, moving, common sense, love and hate

Seeing

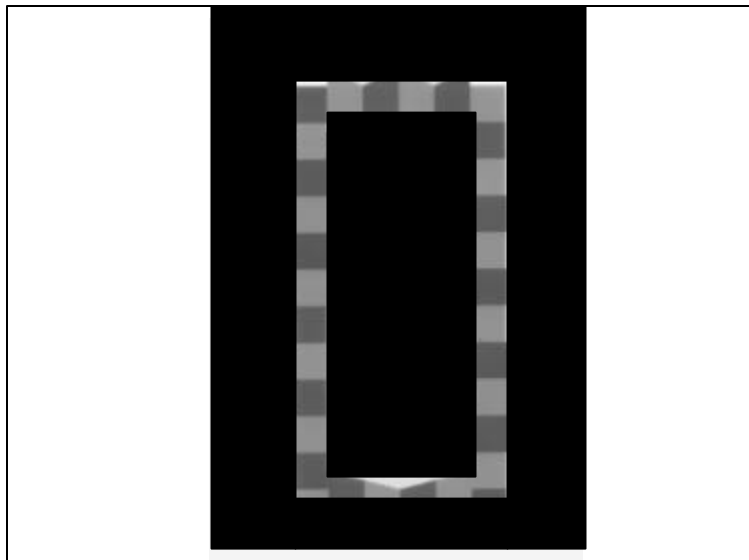
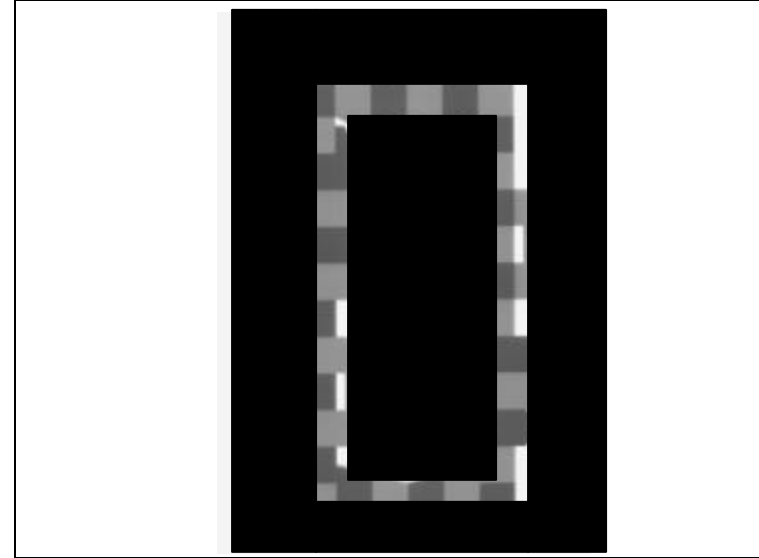
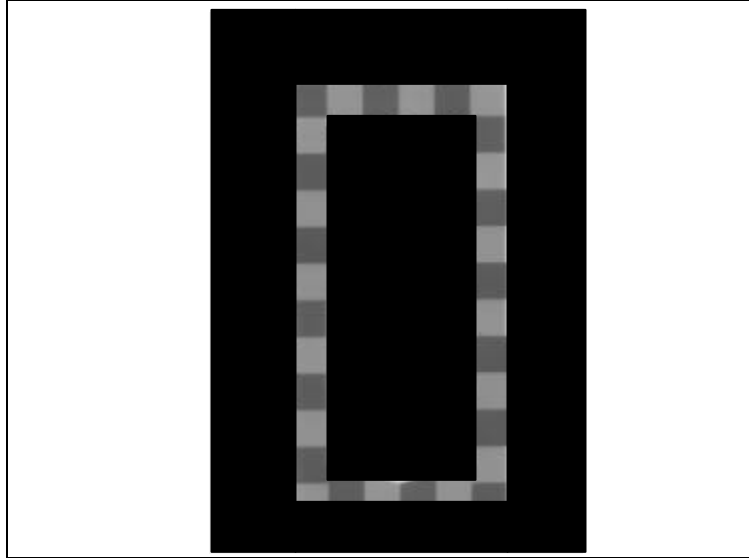
- Vision in science fiction movies
- Vision in reality

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Seeing, continued

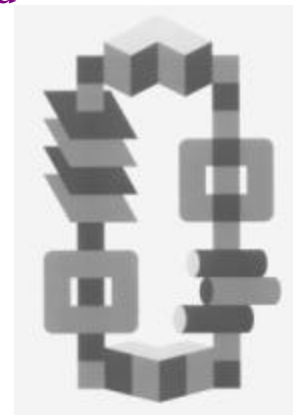
- The scene analysis problem:
 - Find the objects and surfaces in the numbers
- Problem:
 - The world is not a coloring book
- Dark area next to light area on retina=
Patches of different colors next to each other in the world (like tiles)?
- Not!

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The Scene Analysis Problem,
Continued

- Dark area next to light area on retina =
 - Pigment?
 - Shading?
 - 3D Occlusion?
 - 2D Occlusion?
 - Curvature?
 - Translucency?



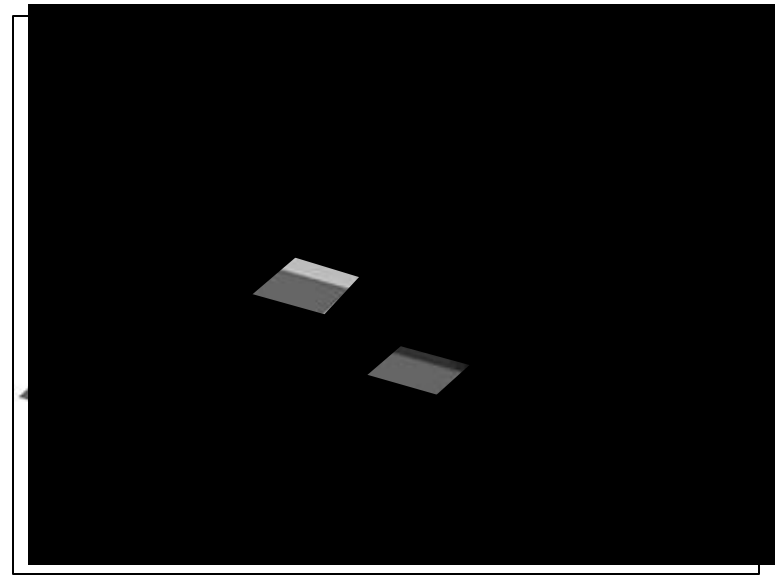
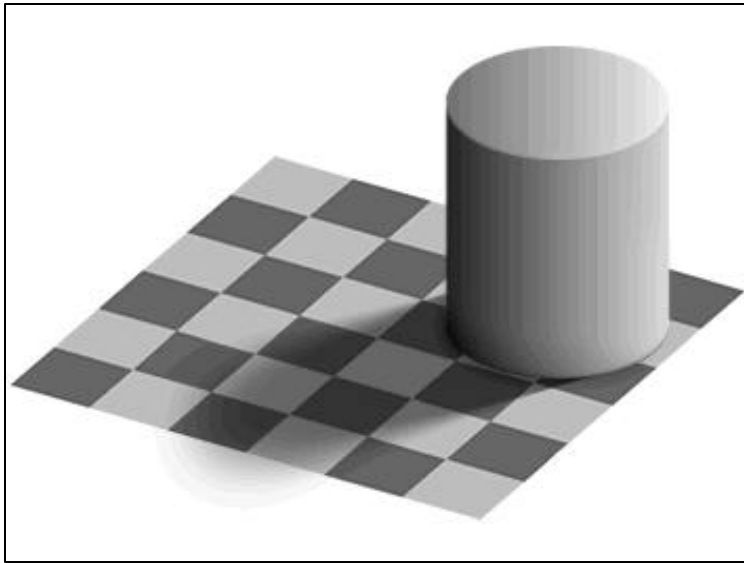
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Seeing, continued

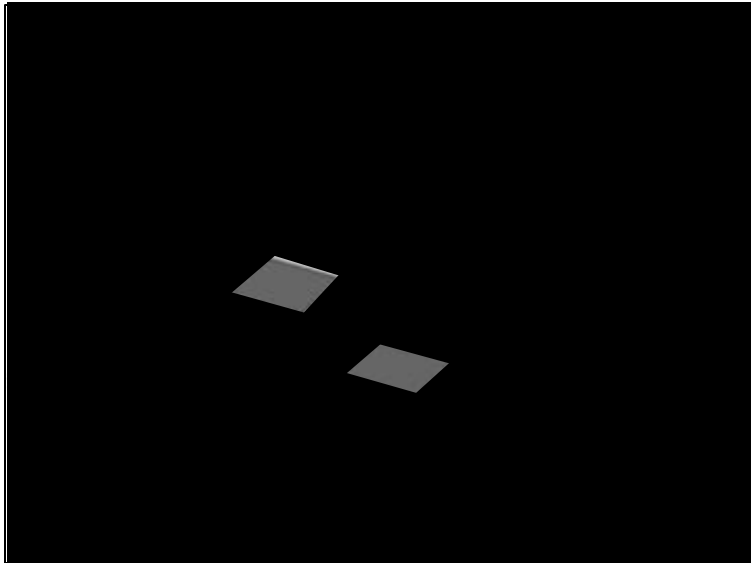
- The problem of Material versus Lighting
 - High values = white = snow
 - Low values = black = coal?
- Not!
- Illuminance *versus* reflectance

Seeing, continued

- 100 brightness units = 1000 candles x 10% black surface
- 100 brightness units = 111 candles x 90% white surface
- Coal outdoors = snowball indoors
- “Lightness constancy”
- The television illusion

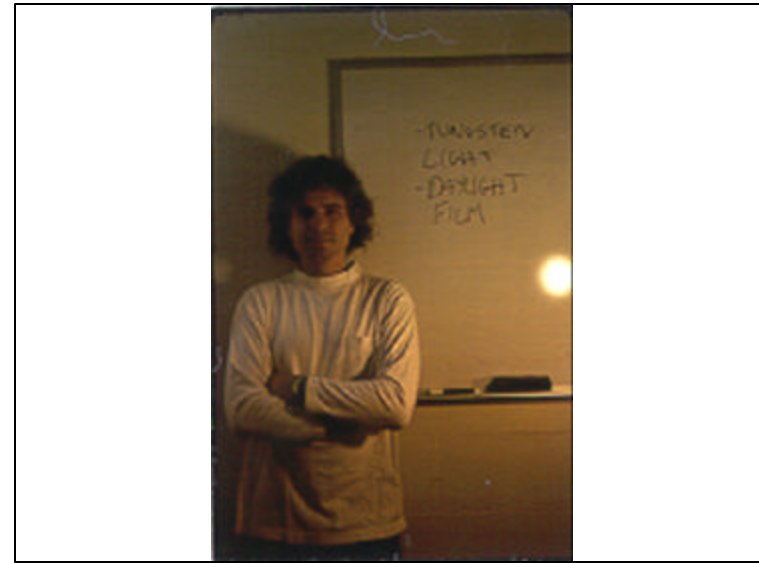
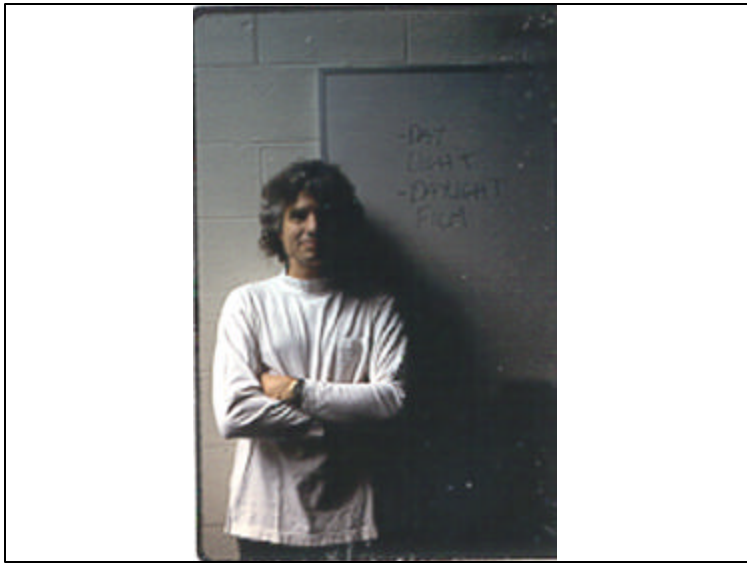


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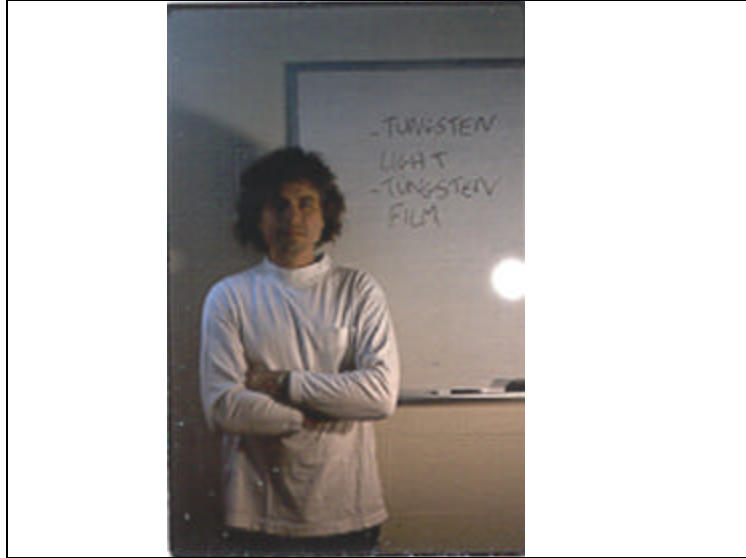


Related problem: *Color constancy*

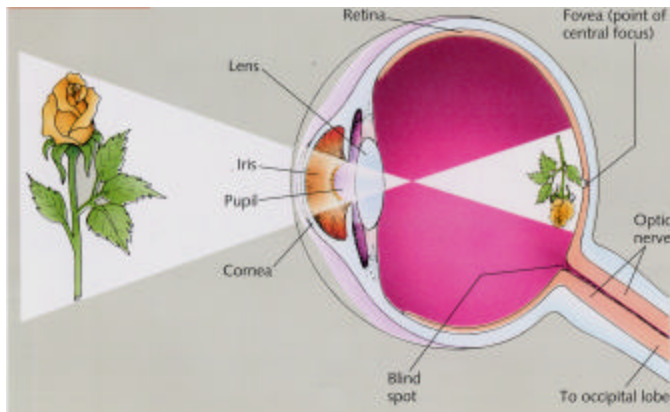
- Color of surface versus color of illumination
- Vision solves it; photography doesn't



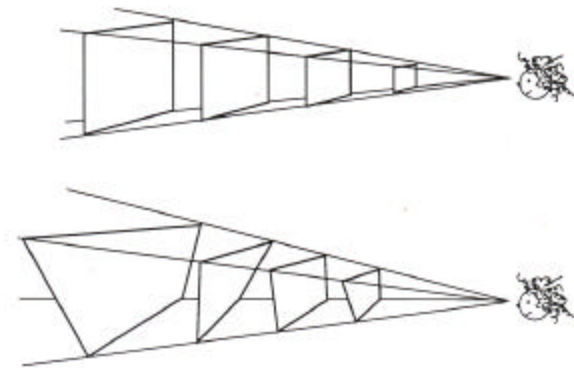
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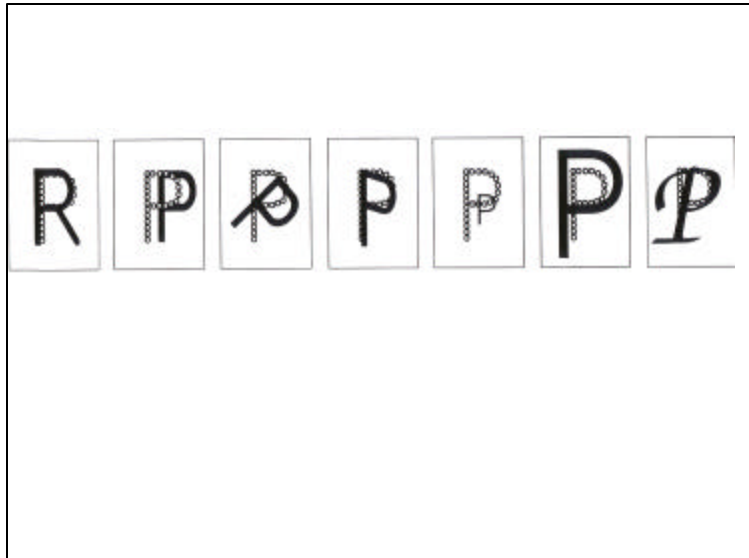
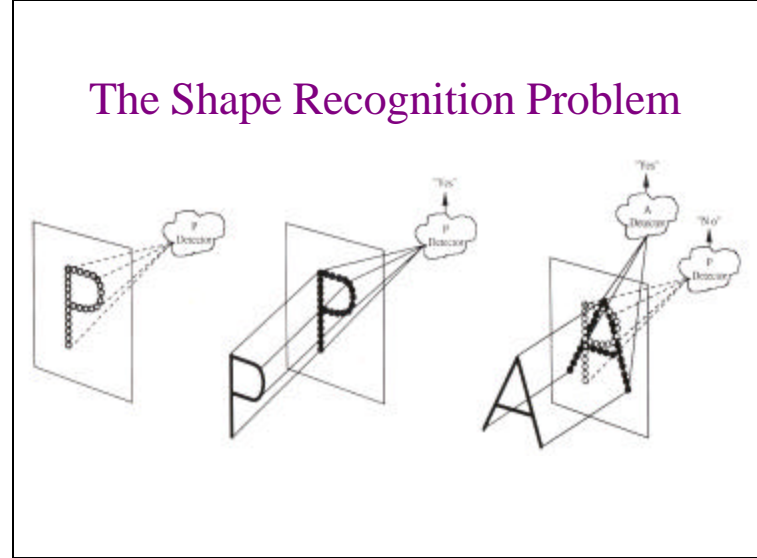
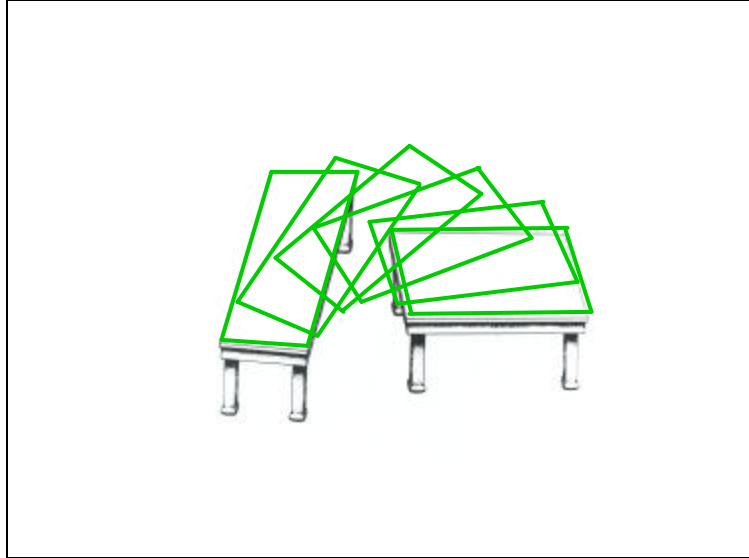
Seeing, continued: The Ambiguity of the Retinal Image



Size and Shape Constancy



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Moving

- “The invention of the wheel”
- Why are there no wheels in nature?
 - 1. It’s hard to grow a wheel.
 - 2. There are no roads or rails in nature!
- Wheels need continuous ridge
- Legs can use isolated footholds.
- **BUT:** Control problem

Moving, continued

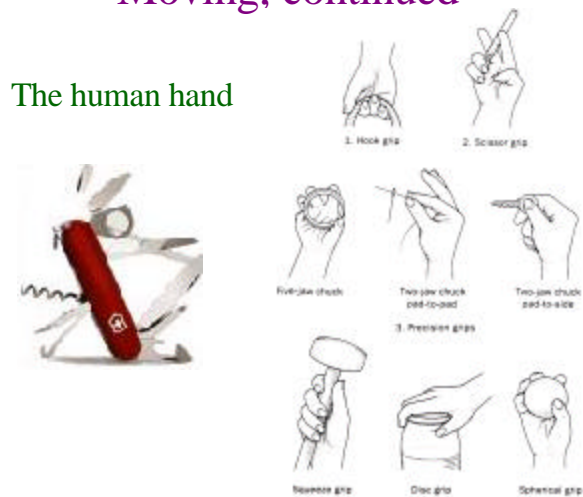
- Wheels are easy
 - Just turn; point of support changes continuously
- Legs are hard
 - Point of support changes all at once
 - Alternate:
 - Keep leg on ground; bear weight; propel
 - Take weight off leg so you can move it forward
- One solution

Moving, continued

- Insects and quadrupeds versus bipeds ...
- Walking:
 - Tip over and break fall
- Running:
 - Flight!
- Advantages:
 - Widely spaced footholds, squeezed between obstacles, jump over obstacles

Moving, continued

- The human hand



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Thinking

- What is a concept?
- Hard concepts
 - “Beauty”
 - “Jazz”
 - “Dialectical materialism”
- Are there any *easy* concepts?
 - “Bachelor”: n. An adult human male who has never been married.

- Arthur has been living happily with Alice for the last five years. They have a two year old daughter and have never officially married.
- Bruce was going to be drafted, so he arranged with his friend Barbara to have a justice of the peace marry them so he would be exempt. They have never lived together. He dates a number of women, and plans to have the marriage annulled as soon as he finds someone he wants to marry.
- Charlie is 17 years old. He lives at home with his parents and is in high school.
- David is 17 years old. He left home at 13, started a small business, and is now a successful young entrepreneur leading a playboy's lifestyle in his penthouse apartment.
- Eli and Edgar are homosexual lovers who have been living together for many years.
- Faisal is allowed by the law of his native Abu Dhabi to have three wives. He currently has two and is interested in meeting another potential fiancée.
- Father Gregory is the bishop of the Catholic cathedral at Groton upon Thames.

Thinking, continued

- Is common sense a database of facts?
- Some things you know (but a robot doesn't):
 - Irving put his dog in the car. Is his dog in the house?
 - Sheila went to church. Did her head go with her?
 - Bruce is in the house. Did he enter the house through an opening?
 - Mabel is alive at 9AM and alive at 5PM. Was she alive at noon?
 - Jack bought a new goldfish. Was it wearing underwear?

What is “common sense”?

- Basic concepts of object, person, time and space
 - Objects can only be in one place at one time
 - Water is wet
 - Everyone has a mother
 - When you let go of things they usually fall
 - When people die, they stay dead
 - ...

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Thinking, continued

- Solution to the common sense problem:
 - Give the robot some core facts, and *rules* to deduce new facts from them
- A problem:
 - Finding the right rules

Thinking, continued: Finding Rules for common Sense

- Mavis lives in Chicago with her husband Fred.
- Millie lives in Chicago with her husband Fred.
- Therefore, Mavis and Millie live in the same city.
- Therefore, Mavis and Millie have the same husband.

Finding rules for common sense, continued:

- If you leave an unlocked car with a key in it for ten seconds, it will probably be there when you get back
- If you leave an unlocked car with a key in it for ten years, it will probably *not* be there when you get back

Feelings: Aggression

- What should a robot want?
- Isaac Asimov's Fundamental Rules of Robotics
 - 1. A robot may not injure a human being or, through inaction, allow a human being to come to harm
 - 2. A robot must obey orders given it by human beings except where such orders would conflict with the First Law.
 - 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

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Aggression, continued

- Rule 3: Self-preservation
- But why Rules 1 & 2?
- Why an order to obey orders?
- Why a command not to do harm?

Aggression, continued

- The Hal Fallacy:
 - Intelligence = evil
- Mythology:
 - Adam & Eve
 - Prometheus
 - Pandora's Box
 - Golem
 - Faust
 - Sorcerer's Apprentice



Aggression, continued

- Reality: Aggression is a Difficult Engineering Problem!
 - Why are organisms aggressive?
 - Darwin: competition; “Survival of the fittest”; “Nature red in tooth and claw”
- But: you could get hurt!
 - What benefit could be worth the cost?
 - Symmetry of conflict
 - Benefit to bystanders
 - Everyone becomes a bystander!
 - Coalitions and the problem of cooperation

Feelings: Love

- Why do fools fall in love?
- Love as an engineering problem.
- The part of love that is easy to explain:
 - The mating market.
 - Assortative mating.

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Love, continued

- The part of love that is hard to explain:
 - Capriciousness
 - Involuntariness of love
- Evidence the system works
- What it suggests about your mind

Summary: Everyday Mental Miracles We take for Granted

- Seeing objects and their true colors, sizes, and shapes
- Walking and grasping
- Using common sense
- Committing acts of aggression
- Falling in Love

Hamlet:

What a piece of work is a man!
How noble in reason!
How infinite in faculty!
In form, in moving, how express and
admirable!
In action, how like an angel!
In apprehension, how like a god!

Course Logistics

- Course details: on syllabus
 - Please read carefully
- Sections: Indicate available times
- First assignment: Due next week in section
- Goals:
 - Get you thinking and writing
 - Introduce you to the textbook
- Writing Tutor