The social mind

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Question

On the origin of human intelligence? (mathematics, language, episodic memory)?
background

• My training and career - vision
  – Not social psychology
• Reductionism
• Primacy of social processing
• Many ways to study it
Expansion of the visual system
classical view of brain

1950s

post 1970s view

1980s

Half of primate brain and substantial fraction of human brain devoted to vision
Vision is “determining what is where by looking”  
- David Marr (1980)

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Enormity of vision
(in primates)
VISION

EVERYTHING ELSE

language, abstract thoughts, greed, sex, power, empathy, humor, literature, music, addiction, choice…

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Must be other visual functions that we are ignoring

more than

Vision is “determining what is where by looking”
-David Marr (1980)
Must be other visual functions that we are ignoring

- Action (visuo-motor control)
- Navigation
- Social perception and behavior
The social function of intellect

Image of Nicholas Humphrey removed due to copyright restrictions. Please see the video.
Experimental psychologists in Britain have tended to regard social psychology as a poor country cousin of their subject. . . . (Humphrey, 1976)
Turning psychology
Upside down ?
Thrust 1: Development of Intelligence

Thrust 2: Circuits for Intelligence

Thrust 3: Integration of Intelligence

Thrust 4: Social Intelligence
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An upside down psychology?

. . . the intellectual faculties of primates have evolved as an adaptation to the complexities of social living. For better or worse, styles of thinking which are primarily suited to social problem-solving colour the behavior of man and other primates even towards the inanimate world. (Humphrey, 1976)
Thrust 1: Development of Intelligence

Thrust 2: Circuits for Intelligence

Thrust 3: Integration of Intelligence

Thrust 4: Social Intelligence
Prediction
a characteristic of science?

What is more predictable?

- Physics – balls dropping, rock rolling, positions of particles
- Machine – alarm clock
- Biological - birds, monkeys, humans
Recognizing and acting on beliefs and desires of others
Dennett’s 3 levels for predicting behavior

• Physical stance – physics/chemistry
  – gravity, water

• Design stance – biology and engineering
  – Vehicle, Coffee maker,

• Intentional stance – for minds to understand other minds
  – beliefs, desires
Non-reductionistic approach to the social realm is gaining some legitimacy

• So how to proceed, what to study?
What about in the social realm?

Identify unexamined core common things and then explore them
Human social behavior

- Striving for dominance (hierarchy)
- Prosociality - Affiliation, succor, group support

Caring, teasing, laughter, revenge, warfare

Share with animals?

If so, then we have a treasure trove from biology
Incipient links to biology

- Similar to humans?
- Common design
- Intentional stance?
Battle at Kruger

https://www.youtube.com/watch?v=LU8DDYz68kM
Collective support

https://www.youtube.com/watch?v=LU8DDYz68kM
Teasing

http://www.dailymotion.com/video/x2ithut
https://www.youtube.com/watch?v=5qqdovHOgyU&feature=kp
Play (tickling)

https://www.youtube.com/watch?v=j-admRGFVNM

Jaak Panksepp
WAR
Meerkats

• 12 inches, 1 sq Km range, burrowing, foraging
• Kalahari desert
• Most studies social animal
• Troops of kin, led by alpha females
• Resist territorial infringement (have implicit concept of private property) - WAR
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Source: 2nd Royal Munster Fusiliers at Hulloch, WWI by Fortunino Matania.
Human social processing
Nalini Ambady

“Thin slices” of Behavior:
A few seconds of a silent video of an unfamiliar person reveals rich social info:

• Teacher Effectiveness Ratings:
  Viewing 30 seconds silent video of a prof teaching predicts end-of-semester teaching effectiveness ratings (independent of physical attractiveness).
  “Hence, a full semester’s worth of teaching performance was presaged by naïve strangers who viewed only 30-seconds of teacher nonverbal behavior.

• “Gaydar”: Viewers are more accurate than chance at guessing a persons’ sexual orientation from a one-second video clip (but not a snapshot) of a person talking about something unrelated to their s.o.

• From a 15-second silent clip of two people talking viewers can correctly infer whether they are lovers, friends, or strangers.

We perceive the social world in rich multidimensional social technicolor.
What cognitive and neural mechanisms underlie this ability?
What are the components of this ability?
Work in progress
Face recognition
Prosopagnosia

Faceblindness,

a face specific deficit?
Acquired prosopagnosia

- Brain lesion - right temporal-occipital junction
- Onset often obvious and dramatic
- Upper field loss (left quadrant)
- Achromotopsia, Topographagnosia
- ~100 cases (meta-analysis) Bouvier & Engel, Cerebral Cortex, 2005
Developmental prosopagnosia

- Until recently, thought to be very rare
- Can be as serious as acquired cases
- Leading to crippling social disabilities
  - Adults, children
- No identifiable brain injury

- Duchaine and Nakayama, Current Opinion in Neurobiology, 2006
Our website to educate and recruit persons suffering from prosopagnosia

~ 6000 registrants
Hundreds tested
www.faceblind.org
Some testimonials
JK, age early 30s, female, recent PhD (DP)

“This week I went to the wrong baby at my son's daycare and only realized that he was not my son when the entire daycare staff looked at me in horrified disbelief.”
Lost Friendships

Many a friendship was lost or damaged. It was bewildering to me to have a person quit speaking to me while saying that I had been extremely rude and personally having no idea what I had done.

If we had kept in touch, I would be able to explain, but of course many of them have long quit speaking to me.

Female, PhD in mathematics
depression

“... I think prosopagnosia has worsened my current depression, if not the root cause of it. ... I prefer to be a recluse because I can’t confidently function any other way. “

Primarily a visual cognitive problem not a psychiatric deficit
Stealth trait/condition

• No point of comparison during development
• Nothing comparable to acuity, color, reading tests for kids
• Standard clinical face tests not diagnostic
  – Benton face perception test
  – Warrington face memory test
  – Compensating strategies
Testing for prosopagnosia

• Personal history
• Need for better objective tests
  – Cambridge Face Memory Test (CFMT)
  – Cambridge Face Perception Test
  – Abstract Art Test
  – Objects and Scenes
  – Verbal Paired Associate Memory
  – Age, Gender, attractiveness tests
Cambridge Face Memory Test

Must learn 6 New faces

Mimics real life Discourages feature Matching

Has graded items

Neuropsychologia 2006

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Extraordinary face memory
super-recognizers

Russell, Duchaine and Nakayama, 2009
“I have a photographic memory for faces. It has been my entire life, but it doesn't matter how many years pass, if I've seen your face before I will be able to recall it. It happens only with faces.”

“I often pick out the bit part actors, able to place them from brief roles in movies and television I have seen ten and fifteen years prior.”

“I have to pretend that I don’t remember people, because it seems like I stalk them, or that they mean more to me than they do when I recall that we saw each other once walking on campus four years ago in front of the quad!”
Face Recognition Tests

“Before They Were Famous” Test

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Nature – nurture?
Human face recognition ability is specific and highly heritable

Jeremy B. Wilmer\textsuperscript{a,1}, Laura Germine\textsuperscript{b}, Christopher F. Chabris\textsuperscript{c}, Garga Chatterjee\textsuperscript{b}, Mark Williams\textsuperscript{d}, Eric Loken, Ken Nakayama\textsuperscript{b}, and Bradley Duchaine\textsuperscript{f}
Test reliability
Test – re-test correlation

CFMT test-retest plot
(lines are least-squares line and line of equality)

\[ r = 0.70 \]

\[ N = 350 \]

Interval: 3-12 months
Compare correlation of scores between MZ and DZ twins

• Australian Twin Registry
  – 164 Pairs MZ twins
  – 125 Pairs DZ twins

\[ r = .7 \] (test re test)
sets upper bound
Australian Twin Registry


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Facial attractiveness

• Judgments are surprisingly consistent across observers (college age)
• averageness
• Masculinity-femininity
Individual subject (each scatter plot) ratings of faces vs mean ratings of faces

Ambady class, correlations with the mean ratings (first 15 subject slight blur condition s)

Red number represents correlation coefficent

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Correlation with mean
Gender vs attractiveness
Attractiveness vs gender

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Some social perception is much more rapid

• Working assumptions –

• Revealed only through motoric actions

• Too fast to be explicitly (consciously) perceived?
Commuters in a hurry

https://www.youtube.com/watch?v=6NLe4syTWgQ

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https://www.youtube.com/watch?v=6NLe4syTWgQ
Rapid Visual Social Perception

How can we study it?
discrete events
Penalty Kick

Kicker vs Goalie
Lab Version
Goalie block is effective if they reach kicker target with short delay
~ 150 milliseconds
Measure finger position of kicker and goalie

Specs:
- XYZ Position
- 240 Hz
- ~1 mm precision

Magnetic sensor on each subject’s finger
Experiment 1:

• Kicker decides when and where to move
Z,X and Y Positions
Comparing movement initiation times
Launch Points: speed threshold

Launch difference
RT over many trials is short and constant

• 60 trials plotted for 4 Kicker/Goalie pairs
Launch difference is fast compared to:

2-choice reaction times
250-400 msec
Is key press two choice reaction time a fair comparison?
Experiment 3: Playing human vs computer in same apparatus

• 20 random motion paths taken from Kicker data in previous experiment projected on screen
Playing against a computer-reconstructed human finger movement

Screen display seen by subjects
Human vs Computer opponent

\[ \Delta t = 89 \text{ ms} \]

\[ \Delta t = 94 \text{ ms} \]

Constant timing

Variable timing
No learning

Reaction Time (msec)

Naïve unpracticed subjects

Against Computer
Against Human

Trial Number
incidental preparatory movement exists and is accessible to goalie ~90 ms before the finger moves
Experiment 4

What section of the body is informative?

Method

Limit the Goalie’s visibility of body

( variable inter-trial intervals)
goalie view of kicker

All  Torso  Head
Results

90 milliseconds
All sections convey predictive information

milliseconds

RT(s)

90
85
73
conclusion

• There must be some telltale preparatory movements

• Remove those putative pre-movements from video
Summary

• Finger movement initiation is fast in an interactive game with human opponents
• Predictive information exists prior to finger movement
• This information is distributed over the body
• Humans can extract this information right away, without learning