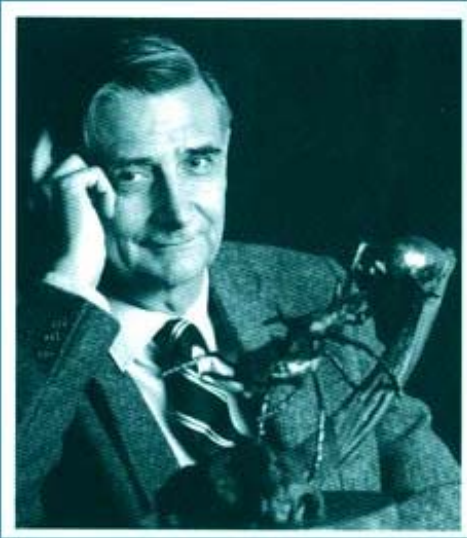


Sociobiology and Evolutionary Psychology



E. O. Wilson: *Sociobiology: The new synthesis* (1975)

- Most of the book deals with ants and ant social behavior
 - Recall: ants and other social insects exhibit kin selection
- Last chapter: Human Sociobiology
 - Human behavioral traits are adaptations
 - “Fashions in dress and speech.....are for the most part adaptive.”
 - “The requirement for an evolutionary approach to ethics is self-evident.”
- Reground the social sciences on evolutionary biology

Human Sociobiology

Traditional sociology and anthropology: account for the features of society in terms of environmental forces

“The central tenet of human sociology is that social behaviors are shaped by natural selection. In spite of perturbations due to time and lag, and random effect, those behaviors conferring the highest replacement rate in successive generations are expected to prevail throughout local populations and hence ultimately to influence the statistical distribution of culture on a worldwide basis” (Lumsden and Wilson)

The Sociobiology Gambit

If a trait is widespread in human culture, assume that it is a biological adaptation

Look for selection forces that would promote this trait

Propose (claim) that the trait is such a product of natural selection under those forces

Why do we like sugar?

Adaptationist account:

- Our ancestors needed to eat ripe fruit to meet their nutritional needs.
- When fruit is ripe, it is loaded with sugars.
- If our ancestor had a taste for sugar, he or she would be a little more likely to eat ripe fruit.
- His or her resulting good health would make him or her stronger and more attractive to potential mates.
- He or she might leave more offspring who, inheriting this taste for ripe fruit, would be more likely to survive to reproductive age.

Why do we have specific tastes in possible mates?

- To enhance the survival of our offspring, we want them to have the best genes
- If a mate is very healthy, vigorous, etc., his or her genes are probably better
- As Darwin noted, some animals develop bizarre traits so as to demonstrate their mate-worthiness

Differential parental investment

- David Barash: "Males tend to be selected for salesmanship; females for sales resistance [coyness]."
- Why? Differential costs:
 - females can carry limited offspring, face the risks of pregnancy, increased nutritional needs, etc.
 - males can, and do, walk away.
- It is in the female's interest to up the cost for males to enhance likelihood of long-term support. Males will try to get away with less, both before and after the birth of children.
- "It might not just be a cultural fluke that men bring flowers and candies, pay for dinner, and so forth." (C. George Boeree)

Male aggression

An expected consequence of the competition for mates

“males engage in a great deal of head-butting. But one can't help but notice that these contests "over" females seldom end in death or even serious injury in most species. That is because these contests are just that: contests. They are a matter of **displays** of virtues, and they usually include actions that serve as sign stimuli to the opponent that the contest has ended in his favor: **surrender signals**. Continued aggression is of little advantage to either the loser or the winner. Even male rattlesnakes don't bite each other!

“Sociobiologists predict that animals that are poorly equipped for aggression are unlikely to have developed surrender signals. Man, they say, is one of these creatures. But we developed technology, including a technology of destruction, and this technology "evolved" much too quickly for our biological evolution to provide us with compensating restraints on aggression. Experience tells us that guns are more dangerous than knives, though both are efficient killing machines, because a gun is faster and provides us with less time to consider our act rationally -- the only restraint left us.” (C. George Boeree)

Normative Implications?

- OK, so men are naturally promiscuous
 - So you cannot blame them for having affairs
- Aggression among males is natural
 - Not much we can do about it, so accept it
- Naturalistic ethics: facts about the natural world, including biology, determine ethical rightness or wrongness
- “Naturalistic fallacy”?
 - Claim: cannot drive *ought* from *is*

Critiques of Sociobiology

- Assumes that behaviors are largely under genetic control when at best the evidence is that they are heritable
- Treats behaviors as atomistic, but in fact most behaviors are products of complex interactions
- Human minds (and animal minds) may do a lot more than calculate the best genetic outcome
- Minds and culture may both enjoy a large degree of autonomy from biology



Round 2: Evolutionary Psychology

- The heated controversy over sociobiology began to dissipate in the late 1980s
- But a new movement began that called itself “evolutionary psychology”
- Evolutionary psychology is not just a commitment to giving an evolutionary account of basic cognitive mechanisms
- It adopts strong commitments to
 - The modularity of mental processes
 - A strong adaptationist view of these modules
 - Adaptations to conditions of the Pleistocene

Evolutionary Psychology

“The goal of research in evolutionary psychology is to discover and understand the design of the human mind. Evolutionary psychology is an *approach* to psychology, in which knowledge and principles from evolutionary biology are put to use in research on the structure of the human mind. . . . It is a *way of thinking* about psychology that can be applied to any topic within it.

“In this view, the mind is a *set of information-processing machines* that were *designed by natural selection* to solve adaptive *problems faced by our hunter-gatherer* ancestors. This way of thinking about the brain, mind, and behavior is changing how scientists approach old topics, and opening up new ones.” (Cosmides and Tooby, *Evolutionary Psychology: A Primer*)

The Mind as a set of specialized modules

All normal human minds reliably develop a standard collection of reasoning and regulatory circuits that are functionally specialized and, frequently, domain-specific. These circuits organize the way we interpret our experiences, inject certain recurrent concepts and motivations into our mental life, and provide universal frames of meaning that allow us to understand the actions and intentions of others. Beneath the level of surface variability, all humans share certain views and assumptions about the nature of the world and human action by virtue of these human universal reasoning circuits.



General processes vs modularity

From Descartes, a strong emphasis on the unity of mind

- Flourens' opposition to phrenology
- Opposition to brain localization in 20th century: Lashley, Head, . . .
- Behaviorists general learning principles

But cognitive psychology has tended to emphasize the division of the mind into specific processors, responsible for different cognitive processes

- Memory, language, object recognition, etc.
- Strategies for dissociation designed to separate processing components functionally (and structurally in neuropsychology)



Noam Chomsky

Chomsky's mental organs proposal

“We may usefully think of the language faculty, the number faculty, and other ‘mental organs,’ as analogous to the heart or the visual system or the system of motor coordination and planning. . . . In short, there seems little reason to insist that the brain is unique in the biological world, in that it is unstructured and undifferentiated, developing on the basis of uniform principles of growth or learning—say those of some learning theory, or some yet-to-be-conceived general-purpose learning strategy—that are common to all domains” (1980, p. 3).

Fodor's modularity of mind

Distinction between horizontal and vertical modules.

Vertical modules:

- domain-specific
- mandatory in their operation
- allow only limited central access to the computations of the modules
- fast,
- *informationally encapsulated*
- have shallow outputs
- associated with fixed neural architectures
- exhibit characteristic and specific breakdown patterns
- exhibit a characteristic pace and sequencing in their development

Central Cognition

Fodor restricted modules to language and sensory processing

Denied modularity of central cognition

- Quinean (degree of confirmation of any belief depends on its relation to any other belief)
- Isotropic (anything a person knows is relevant to determining whether to believe a given proposition)

So central cognition not informationally encapsulated

Fodor's first law of the non-existence of cognitive science

Others (especially evolutionary psychologists) look for modularity all the way in

Coupled with view that selection must select for modules

Challenges to Fodorian Modularity

Evidence for top-down (as opposed to bottom-up) processing

Speech processing

- Word recognition based on acoustic and phonetic information alone—syntax and semantics have no influence

Evidence from shadow speech—people restore the correct word despite distortions, which they do not do when the sound is presented in isolation

- Controversial case: McGurk Effect

Evolutionary Psychology: Modules all the way through

“We have all these specialized neural circuits because the same mechanism is rarely capable of solving different adaptive problems. For example, we all have neural circuitry designed to choose nutritious food on the basis of taste and smell -- circuitry that governs our food choice. But imagine a woman who used this same neural circuitry to choose a mate. She would choose a strange mate indeed (perhaps a huge chocolate bar?). To solve the adaptive problem of finding the right mate, our choices must be guided by *qualitatively different standards* than when choosing the right food, or the right habitat. Consequently, the brain must be composed of a large collection of circuits, with different circuits specialized for solving different problems. You can think of each of these specialized circuits as a mini-computer that is dedicated to solving one problem.”

More on Modules (cont.)

“Such dedicated mini-computers are sometimes called *modules*. There is, then, a sense in which you can view the brain as a collection of dedicated mini-computers -- a collection of modules. There must, of course, be circuits whose design is specialized for integrating the output of all these dedicated mini-computers to produce behavior. So, more precisely, one can view the brain as a collection of dedicated mini-computers whose operations are *functionally integrated* to produce behavior.” Cosmides and Tooby, *Evolutionary Psychology: A Primer*

Five Principles of Evolutionary Psychology

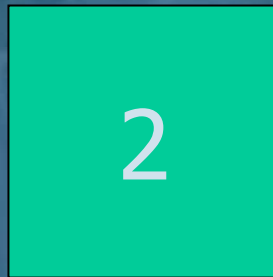
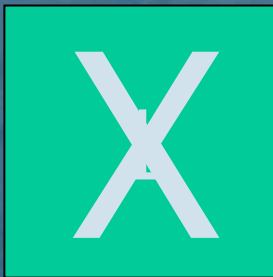
1. **The brain is a physical system. It functions as a computer. Its circuits are designed to generate behavior that is appropriate to your environmental circumstances.**
2. **Our neural circuits were designed by natural selection to solve problems that our ancestors faced during our species' evolutionary history.**
3. **Consciousness is just the tip of the iceberg; most of what goes on in your mind is hidden from you. As a result, your conscious experience can mislead you into thinking that our circuitry is simpler than it really is. Most problems that you experience as easy to solve are very difficult to solve -- they require very complicated neural circuitry**
4. **Different neural circuits are specialized for solving different adaptive problems.**
5. **Our modern skulls house a stone age mind.**

A Stone-age Mind

“The key to understanding how the modern mind works is to realize that its circuits were not designed to solve the day-to-day problems of a modern American -- they were designed to solve the day-to-day problems of our hunter-gatherer ancestors. These stone age priorities produced a brain far better at solving some problems than others. For example, it is easier for us to deal with small, hunter-gatherer-band sized groups of people than with crowds of thousands; it is easier for us to learn to fear snakes than electric sockets, even though electric sockets pose a larger threat than snakes do in most American communities. In many cases, our brains are *better* at solving the kinds of problems our ancestors faced on the African savannahs than they are at solving the more familiar tasks we face in a college classroom or a modern city. In saying that our modern skulls house a stone age mind, we do not mean to imply that our minds are unsophisticated. Quite the contrary: they are very sophisticated computers, whose circuits are elegantly designed to solve the kinds of problems our ancestors routinely faced.”

General Reasoning vs. Cheater Detection

Which of the following cards do you need to turn over to either confirm or falsify the hypothesis that **if a card has an even number on one side, it has a vowel on the other?**



Only about 25% of subjects get problems such as this right

Transformed Problem

Which of the following cases do you need to consider to see if someone is cheating on the following principle
if you charge a purchase on your credit card, you must pay be bill?

Person
Pays
bill

Person
doesn't
pay bill

Person
charges
purchase

Person
doesn't
charge

Now 65-80% get the right answer

Cheater Detection and Social Contracts

To achieve self-sacrifice (altruism) without kin selection, need reciprocal altruism

I'll scratch your back if you scratch my back

Useful to have the payoffs delayed

I'll do this for you now if you agree to do that for my children later

Don't want to make such deals with cheaters, so useful to have a means of detecting cheaters

Conclusion: evolution created a cheater detection module!

False Belief Task

While Sarah is watching, you and Jimmy put a dollar under square 1



After Sarah leaves, you and Jimmy move the dollar to under square 2

You now ask Jimmy where Sarah will look for the dollar. If Jimmy is 3-4, he will say under square 2

Theory of Mind Module

What Jimmy lacks is referred to as a *theory of mind*, which he will probably develop around age 5

One explanation for autism is that autistics lack a theory of mind

Claim: theory of mind is a module which can appear independently of others

It was an evolutionary adaptation

Cognitivism without Modularity?

Is there a middle ground between general learning rules and modularity?

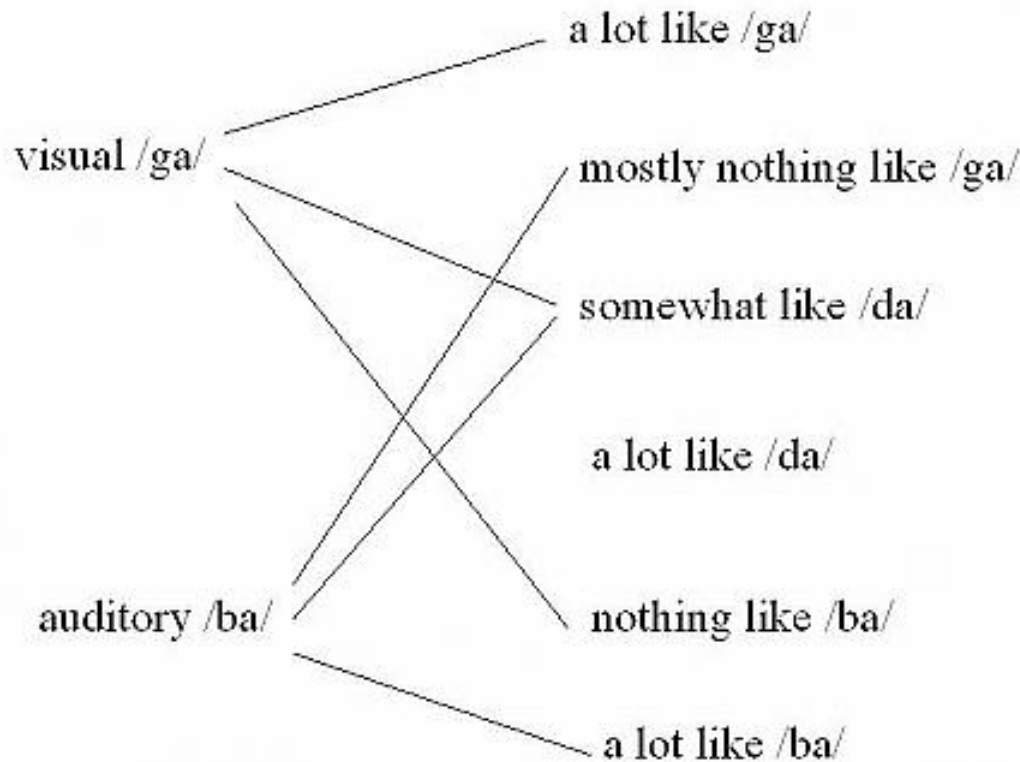
Mind comprised of distinct processors (carry out different types of information processing) but

- at a far lower level than modules usually defined
- constitute a highly interactive system

McGurk Effect

stimulus input

speech alternatives



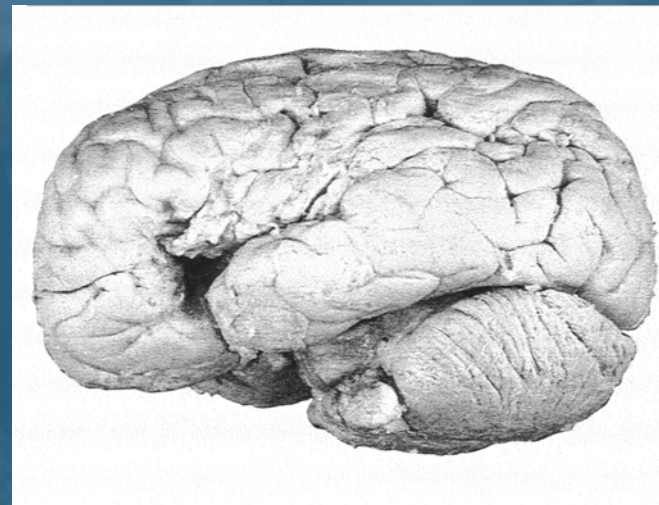
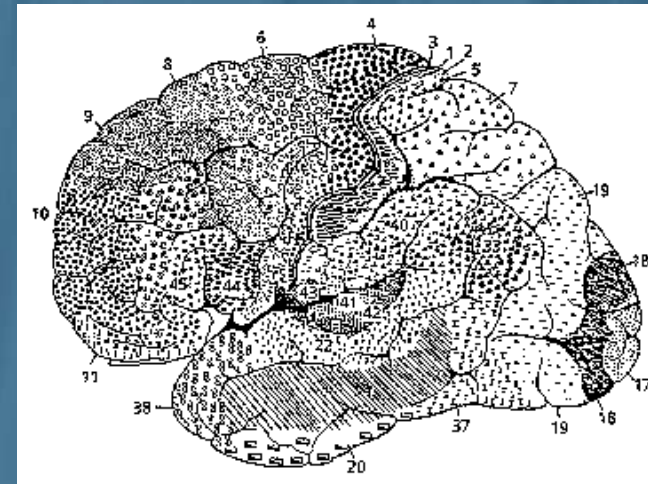
Seeing someone say “ga” while hearing “ba” results in perception of intermediate sound

Could be entirely within language module (motor theory of speech perception)

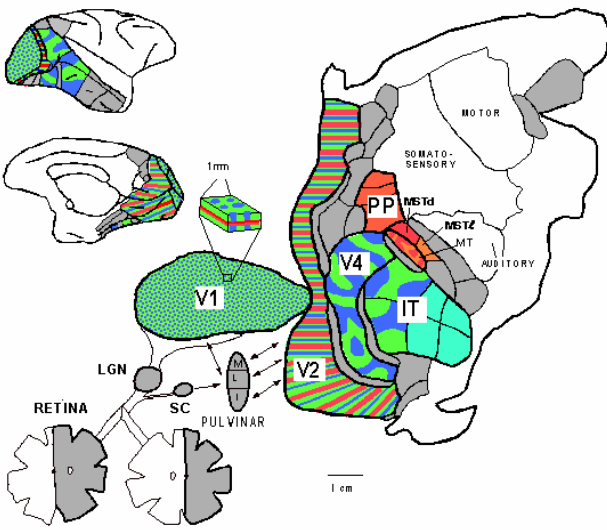
Massaro: rather invokes more general processing: integration of information and top-down as well as bottom-up processing

Is the brain modular?

- One of the things neuroscientists try to do is decompose the brain into different components and link different activities with these components
- It thus seems to be engaged in producing a modular account of neural function
- Example: Broca's area and language

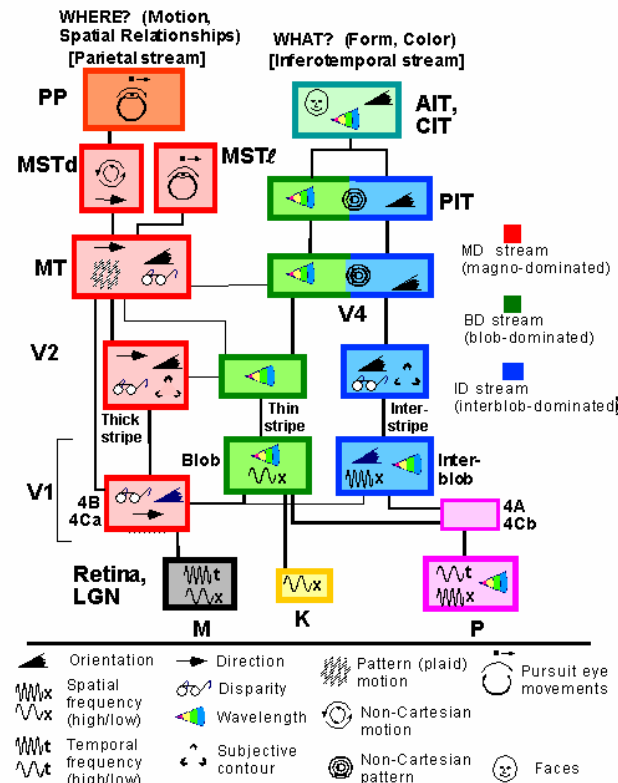


Decomposition at a finer grain



“... **elementary operations**, defined on the basis of information processing analyses of task performance, are localized in different regions of the brain. Because many such elementary operations are involved in any cognitive task, **a set of distributed functional areas must be orchestrated in the performance of even simple cognitive tasks.**

... A functional area of the brain is **not a task area**: there is no “**tennis forehand area**” to be discovered. Likewise, no area of the brain is devoted to a very complex function; “attention” or “language” is not localized in a particular Brodmann area or lobe. Any task or “function” utilizes a complex and distributed set of brain areas” (Petersen and Fiez, 1993, p. 513).



Hierarchy of Visual Processing Areas

32 different visual processing areas

Approx. one-third of the possible interconnections are realized

Most forward projections are matched by recurrent ones

