Table of Contents

1 FOUR ACCOUNTS OF MENTAL STRUCTURE..............................................3
  1.1 NEO-CARTESIANISM: THE STRUCTURE OF THE MIND VIEWED AS THE STRUCTURE OF KNOWLEDGE ....3
  1.2 MENTAL STRUCTURE AS FUNCTIONAL ARCHITECTURE: HORIZONTAL FACULTIES ..................4
  1.3 MENTAL STRUCTURE AS FUNCTIONAL ARCHITECTURE: VERTICAL FACULTIES ...................5
  1.4 ASSOCIATIONISM (AND: "WHATEVER BECAME OF FACULTY PSYCHOLOGY") ..........................6
     1.4.1 Traditional Associationism ..............................................................................6
     1.4.2 Computational Associationism .......................................................................7
  1.5 SUMMARY ........................................................................................................8

2 A FUNCTIONAL TAXONOMY OF COGNITIVE MECHANISMS........................9

3 INPUT SYSTEMS AS MODULES..................................................................11
  3.1 INPUT SYSTEMS ARE DOMAIN SPECIFIC..........................................................11
  3.2 THE OPERATION OF INPUT SYSTEMS IS MANDATORY .....................................12
  3.3 LIMITED CENTRAL ACCESS TO THE MENTAL REPRESENTATIONS THAT INPUT SYSTEMS COMPUTE .....12
  3.4 INPUT SYSTEMS ARE FAST .............................................................................13
  3.5 INPUT SYSTEMS ARE INFORMATIONALLY ENCAPSULATED ...................................13
  3.6 INPUT ANALYZERS HAVE SHALLOW OUTPUTS .................................................16
  3.7 INPUT SYSTEMS ARE ASSOCIATED WITH FIXED NEURAL ARCHITECTURES .............17
  3.8 INPUT SYSTEMS EXHIBIT CHARACTERISTIC AND SPECIFIC BREAKDOWN PATTERNS .......18
  3.9 THE ONTOGENY OF INPUT SYSTEMS EXHIBITS A CHARACTERISTIC PACE AND SEQUENCING ....18

4 CENTRAL SYSTEMS ....................................................................................19
  4.1 WHY CENTRAL SYSTEMS ARE UNENCAPSULATED AND NON-MODULAR .................19
  4.2 ANALOGY WITH SCIENTIFIC REASONING .....................................................19
  4.3 THE FRAME PROBLEM ....................................................................................20
  4.4 SUMMARY .......................................................................................................21

5 CAVEATS AND CONCLUSIONS .....................................................................22
  5.1 EPISTEMIC BOUNDENESS .............................................................................22
  5.2 THE PROSPECTS FOR COGNITIVE SCIENCE IF THE MODULARITY THESIS IS TRUE .......23
Prologue

- **Faculty Psychology**: many fundamentally different kinds of psychological mechanism are needed to explain the facts of mental life. Sensation & perception; volition and cognition; learning and remembering; language and thought.
- Study characteristics of presumed faculties, then the ways they interact (especially overt behaviour).
- Fodor thinks the truth of the Faculty Psychology Programme is an open question, and aims to (1) distinguish the Modularity thesis (2) list the properties of modules (3) say which mental processes are modular (4) distinguish the Modularity Thesis for Epistemic Boundedness (the view that there are constraints on the type of things human beings can know & problems they can solve.
- Restricted to the psychology of cognitive processes (all that Fodor knows about).
1 Four Accounts of Mental Structure

- The structure of behaviour is derivative from mental structure, as effect is from cause.
- Fodor will contrast Faculty Psychology with alternative (but not necessarily mutually exclusive) accounts of the mind. Fodor will choose an eclectic mix.

1.1 Neo-Cartesianism: The Structure of the Mind viewed as the Structure of Knowledge

- Under Chomsky, Descartes’s doctrine of innate ideas has been rehabilitated as a theory of how the mind is structured (initially, intrinsically, genetically) into mental organs. Fodor will defend a rather different picture.
- Contrast Neo-Cartesianism with Empiricism, which sees development as uniform across cognitive domains, with the initial state of the mind being uniform and undifferentiated.
- Chomsky sees a parallel between mental and physical organs – the language or number faculties versus the hearts or wings. Both develop by an intrinsically determined process.
- What Chomsky sees as innate is a body of information. UG + PLD → G.
- Knowledge is a normative notion, having to do with standards of justification. Hence, Chomsky is willing to retreat from claims to knowledge to cognizance, provided this is treated as a propositional attitude.
- Innate information interacts with the PLD in a computational manner. Computation is a transformation of representations which respects semantic concepts of implication, confirmation & logical consequence (Ref: Haugland’s “Semantic Engines”).
- In cognitive development, what is endogenously given is computationally deployed.
- Chomsky accounts for the child’s language learning as the interaction of UG and PLD in virtue of their respective contents. HT and P&P. This only makes sense if what is innate has propositional content, eg. expressing linguistic universals or rule schemas.
- Hence there’s a difference between developing arms and language; the former doesn’t require cognizance. Hence, there’s a distinction between mental and physical organs.
- Linguistic abilities are deductive (detecting syntactic ambiguities and ungrammaticality), explained by the entailments of the generative grammar learned as a child. The contents of your beliefs explain linguistic capacities which in turn explain verbal behaviour.
- So, Chomsky means by “the language organ” that there are truths about the possible structure of language that human beings innately grasp. The maturing of the language faculty is the unfolding of the deductive consequences of innate beliefs in the light of the PLD. Chomsky shares Descartes’s paradigm for mental structure – the implicational structure of systems of semantically connected propositions.
- There are other things people may have in mind when they talk of endogenous psychological structures. Memory is an innately specified mental faculty, but not
in the Neo-Cartesian sense. Memory is a mechanism truly analogous to bodily organs, but isn’t a set of propositions that organisms are born cognizing. As an example, Miller’s Magic number seven – the length of a list of unrelated data items we can hold in memory. We’re not born with a proposition to this effect. Rather, this is a hardware issue that imposes limitations on our capacities.

- So, there are two completely different account of mental structures – one involves propositional content and the other psychological mechanism. They work together – you need mechanism to use what you know. For Chomsky, performance mechanisms explain how the structure of behaviour mirrors the propositional structures one cognizes.
- Faculties will come in useful in this respect, to explain how organisms infer one cognizing from another. They will mediate the representation, retention, retrieval and inferential elaboration of cognised propositions. They are not Neo-Cartesian mental organs but do count as bona fide mental organs which (or their ontogeny) are innately specified.
- So, distinguish faculties from Neo-Cartesian innate propositional knowledge.

1.2 Mental Structure as Functional Architecture: Horizontal Faculties

- Now turn to mechanisms. In contrast to Neo-Cartesian faculties, which are individuated by their propositional content, these faculties are functionally individuated by their typical effects. In this sense, a language faculty is the neurological machinery that mediates the assimilation and employment of verbal capacities.
- Empiricists who oppose faculties-cum-belief-structures can be closet nativists when it comes to faculties-cum-psychological mechanisms. Locke’s tabula rasa was devoid of objects of though (ideas) but contained whatever mechanisms are required to obtain ideas from experience. Ie. Locke allowed natural faculties such as perception, understanding and memory as well as mental powers such as abstraction, comparison and discernment.
- The mind can be sliced along a vertical or horizontal axis to give two sorts of non-Cartesian faculty.
- **Horizontal faculty psychology** allows that cognitive processes recruit faculties such as memory, imagination, attention, sensibility, perception etc. which interact, and define the process by their particular mix. However, the character of mentation is independent of its subject matter.
- Eg. the faculty of judgement is the same no matter what subject matter it is deployed on (aesthetic, legal, …).
- Plato’s example of memory as a birdcage, in which the memories are birds. Structure and contents. The horizontal aspect arises because where the memory is has nothing to do with its content; only, where there are several memory systems, to do with its age or amount of rehearsal. Ie. we don’t have separate memory locations for propositions, faces, events, tunes, …
- A memory that is “in” short term memory is one to which short-term memory processes, but not long-term ones, have access. Location is functional rather than spatial.
- A horizontal faculty is a functionally distinguishable cognitive system whose operations cross content domains.
• Each such distinct faculty must effect a characteristic pattern of transformations of mental representations (Fodor assumes the LOT hypothesis).

1.3  Mental Structure as Functional Architecture: Vertical Faculties

• **Vertical faculty psychology** traces back to Gall.

• Gall denied that there were any of the traditional horizontal faculties such as memory or judgement. Instead, Gall distinguishes propensities, dispositions, qualities, aptitudes and fundamental powers. Eg. an aptitude for music.

• We must distinguish (as Gall did not) proclivities from competencies. In intellectual capacities, we should identify an aptitude with competence in a certain cognitive domain, which makes them distinguished by their subject matter. The psychological mechanisms that subserve the capacities consequently differ.

• Gall’s examples form ethological analogies such as nest building and bird song. These are not to be viewed as applications of avian horizontal faculties. So, for man, one individual may be strong in one field and weak in another, so it’s wrong to posit a special faculty of intellect per se (just as it’s wrong to posit instinct per se for birds).

• The example of acuity – this is a parameter of vision, audition, taste or intellect, not a faculty as such. Similarly, intellect. Similarly, perception and memory are attributes of the fundamental psychological faculties, and not faculties themselves. Horizontal, unlike vertical, faculties consequently have no localisation in the brain. A musician has to utilise all the horizontal faculties if he’s to be a musician. Our talents don’t originate through sensory data but are innate. Education is most useful for middling innate abilities.

• Fodor now considers a couple of Gall’s arguments against horizontal faculties:

• (1) If there were a horizontal faculty of memory, someone good at remembering one sort of thing ought to be good at all. They aren’t, so there isn’t one. Fodor thinks this fallacious, provided the employment of a horizontal faculty differs between domains. A horizontal faculty theorist can argue that it’s the mix of faculties that’s critical to any capacity. Chess-players remember chess positions because they understand them. So, a horizontal faculty theorist need not be perturbed by lack of correlation across cognitive domains.

• (2) Gall identifies distinct vertical faculties, subserved by distinct psychological and neural mechanisms, if individuals differ in their possession of them. This was a departure from the approach to faculties which had hitherto focused on common characteristics. Distinctions in musical ability are as well explained by different mixes, more or less optimal, of the horizontal faculties as of a need for a vertical musical faculty.

• Fodor thinks Gall’s fundamental confusion is between genetic determination an species specificity. An aptitude for baseball can be heritable (as a specific mix of physiological and perceptual-motor endowments) without being a species-specific or vertical faculty with an evolutionary history like an instinct. Vertical faculties and instincts ought to be relatively invariant across populations.

• A mixed model of horizontal and vertical faculties may be best, and Fodor will return to this possibility later.

• We should distinguish four elements of Gall’s ‘fundamental power’. Vertical faculties are: (1) domain specific; (2) genetically determined; (3) have distinct
neural structures and (4) are computationally autonomous. The last point is that vertical faculties do not share, and hence don’t compete for, horizontal resources such as memory etc. They are distinct in their functions and relatively independent in their performance of those functions.

• This differs from Chomsky’s account. Chomsky thinks there may be a mathematical faculty, but by this he thinks that some mathematical information is innately specified. Gall would have claimed further that the psychological mechanisms that underwrite mathematical ability are also innately specified. Mathematical memory (and such like) are only nominally related to memory employed by other vertical faculties. Mathematical mental operations don’t rely on or interfere with others.

• Chomsky is only interested in the first of innateness and computational autonomy, which are quite different properties of computational systems, in his concept of a mental organ. The question of horizontal versus vertical faculties is entirely separate from the question of innate versus learned capacities. Horizontal faculty theorists are not thereby empiricists – most nativists have historically been of this persuasion.

• Phrenology arose from two errors – (1) assuming that the size of a brain area was proportionate to the development of the mental organ situated there, and (2) assuming that the skull covers the brain as a glove the hand.

1.4  Associationism (and: ‘Whatever became of Faculty Psychology’?)

1.4.1  Traditional Associationism

• Associationism rejects most of faculty psychology. Faculties at best are constructs out of more fundamental types of entity.

• A census of faculties is not the same as a list of the capacities of the mind (as associationists claim). Faculty psychology is, instead, a theory of the structure of the causal mechanisms that underlie the mind’s capacities.

• The faculty psychologist doesn’t claim that the singing faculty sings, but that the organism sings in virtue of the operation of the various faculties it possesses.

• Another argument is that faculty explanation is a pseudo-explanation (eg. invoking a terpsichorean faculty to explain dancing). The supposedly conclusive objection relies on faculties being individuated by their effects, ie. functions. Functionalism now enables philosophy of mind to steer between eliminative materialism and dualism. See Block “What is Functionalism” in Readings, Vol 1. The language faculty is whatever is the normal cause of one’s ability to speak, just as pain is whatever is the normal cause of pain behaviour.

• Theory construction ought to find uniformities between heterogenous surface appearance, which is why we don’t expect an exact faculty / capacity match. The theorist wants the maximum psychological explanation from the smallest inventory of causal mechanisms, using the interaction of underlying causes.

• What did for faculty psychology was not these feeble arguments, but an alternative theory. Just as empiricism provided an alternative to innate ideas to explain mental content, so did associationism to innate cognitive architecture to explain mental processes.

• Fodor summarises associationism as acknowledging the following explanatory apparatus, which is supposed to explain all cognitive phenomena. (a)
Psychological structures constructed out of elements: reflexes for behavioural associationists and from ideas for mentalist associationists. (b) A relation of association defined over the elements. (c) Laws of association – principles in virtue of which experience associates ideas or conditions reflexes. (d) Various parameters, such as the strength of the associative relations, or the operand level of reflexes.

- The associationist tries to show that there’s nothing for faculties to explain. So, for Hume, memory and imagination differ only in vivacity. This implausible suggestion illustrates the approach of replacing presumptive psychological mechanisms by parameters of the association relation or properties of the associated relata.
- The associationist answer to the question “how many faculties (primitive psychological mechanisms)” is properly “one – the capacity to form associations”.

### 1.4.2 Computational Associationism

- Fodor considers at length the computational associationists who, rather than replacing faculty theory seek to reconstruct it along computational lines. Fodor thinks they’ve lost the plot. Even a Turing machine needs a minimal architecture. If associated mental representations are connected by rule, rather than mutual attraction, the rules need to be stored somewhere with mechanisms to apply them. This functional architecture is just what associationists wanted to do without.
- You can’t tell from the inputs/outputs of a computational system whether it’s using primitive bits of mental architecture or one that’s compiled from smaller bits. An “assembled” virtual machine can run the same programs and produce the same I/O as another hard-wired one. All that a faculty theorist and a computational associationist would disagree on would be whether the psychological mechanisms that mediate the machine’s capacities are constructs or primitive.
- The reason we care is that assembled mechanisms might be learned, whereas primitive ones wouldn’t be, leading to hopes of an empiricist theory of cognitive development.
- However, this undermines the traditional associationist programme, which was to mirror the relations between mental events on environmental ones. Ideas become associated because of a spatio-temporal links between the things they are ideas of. This gives a link between mature cognitive competencies and their ontogeny.
- In contrast, the logical possibility of the construction of arbitrarily complicated processes from elementary ones doesn’t begin to show that this can be effected by approved associationist methods.
- The richer the mental structure proposed, the less likely this structure is to arise from environmental regularities. This is where POSAs come in! While one can produce a “General Problem Solver” from the elements computational associationists are willing to envisage – since parsers, scene-recognisers etc. are species of computer – it doesn’t follow that these can be constructed from the information given in experience.
- This undermines the point of associationism, which is to demonstrate learnability.
- Computational associationism is a failed attempt to reconcile faculty psychology with empiricism. Nativists are suspicious of constructivism in psychology,
expecting a close parallel between innate cognitive architecture and physical (brain) architecture.

- No one expects the brain to be like a Turing machine. While it’s logically possible that innately specified computational systems could be put together from elementary operations, and learning could result in elaborate and specific neural morphology, neither possibility seems likely.

- The importance of stressing the difference between virtual and physical architecture is to show that the actual organisation of the mind is just one of the possibilities that could have arisen given variable environmental dictates. However, a natural interpretation of neural hard-wiring is that it packages powerful computational capacities into primitive unanalysed operations.

1.5 Summary

- Thus far Fodor has raised the following questions about cognitive systems:
  1. Are they domain-specific or do they cross content-domains. Vertical or horizontal?
  2. Are they innately specified or structured by learning?
  3. Are they assembled out of sub-processes or does their virtual architecture map directly onto neural implementation?
  4. Hardwired or implemented by relatively equipotential neural mechanisms?
  5. Are they computationally autonomous, or share horizontal resources (memory etc.) with other processes.

- Modularity ought to admit of degrees. Instead of defining modularity, Fodor will seek to answer the above questions. Informational encapsulation has yet to arise in discussion. However, modules are vertical faculties characterised as domain-specific, innately-specified, hardwired, autonomous and not assembled.

- In what follows, Fodor will discuss further characteristics of modules, and propose which cognitive systems are in fact modular. He will conclude:
  1. The modules are co-extensive with a functionally definable subset of cognitive systems.
  2. Other cognitive systems are non-modular – ie. they use horizontal faculties.
  3. Cognitive science has made, and can make, no progress on non-modular processes (such as thought or belief-fixation) because of their non-modularity. So we should receive convincing arguments for non-modularity with gloom.
2 A Functional Taxonomy of Cognitive Mechanisms

- There’s a tendency for philosophers of mind, given the computational theory of mind, to think of analogous to Turing machines, which are the most general computers.

- However, the functional architecture of Turing machines is too simple, and they are closed computational systems, whereas organisms are forever exchanging information with their environments, and much of their cognitive structure mediates such exchanges.

- So, if we think of Turing machines as models of cognitive psychology, we must see them as embedded in a matrix of subsidiary systems which provide the central machine with information about the world expressed in mental symbols.

- Computational processes are syntactic, so the information-presenting devices must do so in a form the Turing machine can understand. The perceptual mechanisms must make the world accessible to thought. Not every representation of the world will do.

- Fodor has had difficulty deciding what to call these subsidiary systems. He’s rejected:
  1. Perceptual Systems (rejected because perception is not the only system to present the world to thought, and also because perception is involved in belief-fixation which he wants to exclude from the scope of the subsidiary systems),
  2. ‘Compilers’ on the grounds that they make representations accessible to central systems (rejected because real compilers are functions from programs onto programs), and
  3. Transducers (rejected because they are analog systems thereby to be contrasted with computational systems). Transducers convert proximal stimulations into (approximately) covarying neural signals, preserving information and altering only its format).
  4. Compiled Transducers. Representations at the interface between the subsidiary and central systems are only abstractly related to proximal stimulation. “Compiled” indicates an internal computational structure, and “transducer” indicates informational encapsulation (rejected because of likely confusion since neither term has its standard meaning).

- Computer theory has no term for the function Fodor is trying to describe because computers usually interface with the environment via human beings, the programmer substituting for the subsidiary computational systems described above. Hence, Fodor will call them Input Systems, Input Analysers or Interface Systems. They are post-transducive mechanisms.

- Hence, we have a 3-fold taxonomy of transducers, input systems and central processors, which present information serially. This isn’t supposed to exhaust the types of psychological mechanism. There may be other modules involved in speech and locomotion that Fodor won’t discuss.

- Input analysers are inference performing systems, rather than mere translators that preserve informational content. They characterise things in the world, rather than merely surface stimulation of the organism.

- This distinction between input and central systems is that between perception and cognition. Object identification has been detached form cognition at large. Perceptual analysis is consequently not a species of thought.
• What advantage does this trichotomy give? Separating perception from thought would have speed implications, but this gets the evolutionary perspective the wrong way round, because the perceptual systems (input analysers) probably came first. The move would have been from automatic and rigidly domain-specific systems to domain-free inferential capacities needed to mediate the higher flights of cognition.

• Fodor needs to show that the input analysers have interesting things in common - that they constitute a natural kind – and differ from cognitive processes at large.

• Fodor addresses the traditional divide of perception on the one hand and thought-and-language on the other. In the case Fodor’s considering, he thinks a different taxonomy is illuminating.

• Language parsing is undertaken by input systems. Utterances, such as sentence tokens, are objects to be perceptually identified in the same way as mountains. A token-to-type structural decomposition is required, which is just what input systems do.

• Fodor thinks there are few harder questions than explaining how input systems interpret transduced information and make it available to the central systems. However, he suggests that regularities are assumed that allow the deduction of distal layout from transducer output. The example is of motion from the sequence of energy distributions at the retina on the assumption of rigidity in bodies, leading to the deduction of a moving three-dimensional shape, the shape being inferred by an algorithm.

• Fodor parallels visual with speech recognition. The assumptions are respectively the laws of light reflection and the convention of truth-telling, respectively. These allow inference from what one hears / sees to the way the world is. Neither is infallible. It’s the central system that’s responsible for belief-fixation, because it has access to background information on trustworthiness of the information sources.

• What input systems have in common apart from their functional similarities is that they are modules and share the properties common to vertical faculties.

• Fodor will supply effectively a thought experiment about what you’d expect the data to look like if the modularity thesis is true of input systems; he claims that the data isn’t incompatible with expectations.
3 Input Systems as Modules

- Fodor now gives the characteristics of input modules, which may well be shared by other modules, but which central systems lack.

3.1 Input Systems are Domain Specific

- Fodor doesn’t think there’s one input system per sensory modality, plus one for language, but rather that there are many specialised computational mechanisms within, or even across, these modalities responsible for generating hypotheses about the distal sources behind proximal stimulation. There are usually restrictions on the range of information sources available for projecting hypotheses, or on the range of distal sources accommodated, or both.
- Examples for vision are colour perception, shape analysis and analysing spatial relationships. Additionally there may be higher-level systems such as those concerned with conspecific face recognition or with visual guidance of bodily movement. For audition, we might have computational systems to assign grammatical structure to token utterances, melodic or rhythmic structure detection or conspecific voice recognition.
- We need to watch out that domain specificity isn’t trivialised into (say) cow recognition. The important issue is that rather than utilising horizontal faculties, vertical faculties, distinct psychological mechanisms corresponding to distinct stimulus domains, are used.
- Example of differential analysis of acoustic data, such as the initial sound of a consonant, depending on whether the context is speech or other sound. Only a relatively restricted class of stimulations can invoke an input analyser. The more eccentric a domain of input, requiring information specific to that domain, the more likely it is that a special-purpose cognitive system will be available.
- Cow perception – if achieved by comparing stimulus with prototype – would be carried out by a process that recognises other objects, so doesn’t need its own module. It can share with any other prototype-recogniser; the mechanisms for calculating distance from a visual prototype should be fairly similar across prototypes.
- Such a module wouldn’t work for sentence-recognition, which would recognise stimulus-properties specific to sentences, being sensitive to universal properties of languages and unresponsive but in this domain.
- Example of language learning, which only operates successfully in domains where the language universals to which the learning system is attuned are satisfied. The same may be true of language perception, with language perception having access to the realisation of linguistic universals in the appropriate language, ie. a grammar.
- Fodor isn’t overoptimistic about the argument from the eccentricity of stimulus domains to modules. Chess-playing exploits lots of eccentric information, yet almost no-one wants to posit a chess faculty (though it does profit from specialised hardware, and breeds prodigies). However, a motivation for modularisation must be that it performs idiosyncratic calculations. Eccentric domains argue best for modules in the presence of other reasons for positing them.
3.2 The Operation of Input Systems is Mandatory

- You can’t help but hear an utterance of a sentence in a language you know as just that, even when asked merely to focus on the phonetic elements, nor fail to see a visual array as of objects in 3-D space.
- Despite the huge computational power absorbed by input systems, we appear to have no choice but to use them when opportunity arises. We can’t hear a speech as noise even when we would prefer to. Of course one can disable a transducer (by sticking fingers in ears) but otherwise have to avoid focusing on one thing by taking advantage of the difficulty of focusing on two things – i.e. by focusing on something else. Even so, the unattended-to channel is still processed to some degree. At least, input analysis is mandatory in that it’s the only route transducer output can take to the central systems. Transducer outputs must be processed by input systems to affect thought.
- Fodor admits that it may be the case that painters can switch off the input modules to see the transducer output, and similarly phoneticians, though this tells us little about normal processing, and may in any case be a tendentious interpretation. An alternative view is that such people learn to correct perceptions by overriding the constancy effects. Chinese and Swedish sound like noise, but English sounds like English. Input mechanisms approximate reflexes, being automatically triggered by the stimuli they apply to.
- The mandatoriness of input systems is in contrast to our control over our thoughts, which serve our requirements. Freudians point out that at least some of our thoughts are mandatory or obsessional. However, intellectual sophistication involves exerting control over our central representational capacities. In contrast, one can’t help hearing what’s said (and not just what’s uttered).

3.3 Limited Central Access to the Mental Representations that Input Systems Compute

- Despite input systems decomposing proximal stimuli in a series of stages, none of these intermediate positions are accessible to thought. Whereas input-system processing computation goes from bottom up, central system access goes from top down.
- A psychological party trick is to ask someone to use their watch to tell you the time, and then ask what the shape of the numerals on the watch-face was (usually no idea). Similarly, it’s often difficult to remember whether one’s interlocutor wore glasses or a beard, even though these are important for recognition.
- Similarly, details of syntax or vocabulary are quickly forgotten – only the gist is remembered, whereas these details must register in order for the gist to be extracted.
- An explanation is that only high-level representations are stored – intermediate levels are discarded as soon as their “goodness” has been extracted, or retained only at exceptional cost, a prototypical feature of modular systems.
- Multi-layer processing is illustrated by the fact that subjects are quicker at recognising the identity of pairs of letters in the same font (t, t) than in different fonts (T, t) when the pairs are presented simultaneously. However, this effect declines asymptotically with the interstimulus interval when the letters are presented sequentially. The explanation is that shape is computed before
alphabetical value. This means that the input modules cannot be totally opaque, and that what this means is that intermediate computations are not recorded – ie. opacity is a feature of how input processors interface with memory systems. It’s less a matter of information being unconscious as unrecalled.

- There are often grounds for suggesting that subjects' behaviour is guided by things in the input systems they can’t report. Eg. only acoustic differences that have linguistic value are perceptible, but inaccessible differences do affect reaction times.
- The reason why lower computational layers are normally inaccessible is that proximal stimulus is often a poor representation of distal layouts, and higher computational layers correct for this. Hence, ready accessibility of lower layers would undo the work of higher layers.

3.4 **Input Systems are Fast**

- Identification of sentences and visual arrays are amongst the fastest psychological processes. Parsing of sentences is of the same order of rapidity (0.25 sec) as a “push the left button if the left light flashes” test, as is indicated by “fast shadowing” of speech (with comprehension), ie. repetition with 0.25 sec latency. This is likely constrained by the need to process syllables, which are produced at the rate of about 4/s, so going faster would overrun the ability of the speech system to signal linguistic distinctions (the syllable being the smallest unit of linguistic significance).
- It’s less clear in visual processing when a given array has been identified. People exposed to 2,560 photographic images of random natural scenes at 10 second intervals could respond with 90% accuracy an hour later whether an image had or had not been encountered before. More recent studies indicate 2 seconds as the threshold exposure time.
- Another experiment is where the subject has a scene described to him beforehand, and then has to identify a photograph that matches it. This is successful 75% of the time if the interval between photos is 0.125 sec., while the asymptote, at 96% accuracy, is at 0.167 sec.
- Two immediate lessons – contrast the slowness of central processing functions, such as problem-solving, and note why such fast psychological processes are mandatory. For input processing, increased difficulty of the problem makes only a difference of milliseconds, not months. Note also that the processing involved in parsing psychological posers like “the horse that raced past the barn fell” is almost certainly not that involved in normal sentence recognition. Also, that input processes, like reflexes, are fast because they are stupid. Making your mind up takes time.

3.5 **Input Systems are Informationally Encapsulated**

- This section focuses on language, though the lessons are supposed to apply to all input modules.
- Fodor wants to say that input devices that decode sentence structures are cut off from the great body of information the subject knows. There is no feedback.
- However, there are counterexamples. Firstly, phonemes spliced out and replaced by coughs don’t impact the understanding of the relevant words, which are heard
as normal with a cough “in the background”. Similarly, visual scotomata don’t produce a phenomenal blind spot – information about higher-level redundancies is fed back to fill in the gaps, much as in our inability to notice our blind spot.

- Fodor thinks (contrary to many cognitive scientists, who make these feedback phenomena a paradigm) that there can’t be pervasive feedback in perceptual systems, even though there may be in some.

- There are many illusions (like the Muller-Lyer illusion) that persist even after they are explained, lines measured etc.

- If we voluntarily move our eyes, we don’t get the illusion of scene movement. This has been said to involve feedback. However, if the eyeball is physically poked, we do get the illusion of movement. However, even though I can report on the fact that I’ve voluntarily moved my eyeball with my finger, the scene still moves. The analyser in charge of the perceptual integration of your retinal stimulations is encapsulated for this information.

- The key point is that feedback supplies redundant information. Feedback is effective only where, prior to the stimulus, the perceiver knows a lot about what the stimulus will be like. However, the point of perception is that we should find out about the world when it’s not how we expect it to be. Hence, perceptual analysis of unanticipated stimuli is possible only when the outputs for the transducer are insensitive to the expectations of the perceiver, and the input analysers are up to the job of computing a representation of the stimulus based only on what the transducers supply. The perception of novelty depends on bottom to top perceptual mechanisms. Organisms that see what they expect, rather than what’s there, have a tendency to decease.

- Perceptual analysis is a case of non-demonstrative inference, because the outputs from the transducers underdetermine perceptual analyses. The input systems project and confirm hypotheses on the basis of a body of data. In the case of sentence recognition, hypotheses are constructed from the subject’s mental lexicon and the perceptual problem is to determine which hypothesis fits the impinging utterance token. The problem is solved by a confirmation function which maps lexical hypotheses against acoustic data and gives a value expressive of the degree of confirmation of the former by the latter.

- Encapsulation comes down to the claim that the data available to the confirmation function is much less than the totality of information represented within the organism. Information is restricted at each stage of the process to what is strictly relevant, even if other information might help in some circumstances. This increases the speed of input modules, because only a fraction of the information that might conceivably be relevant is admitted. Only the central processor is interested in everything the organism knows.

- We don’t want to have to consider everything we know about panthers in the course of identifying one. The point is not to reduce memory searching, but to reduce the number of confirmation functions that need to be calculated. It is prepared to trade false positives for speed.

- An analogy with reflexes: even though I know that the last thing you’d do is poke me in the eye, if your finger comes close to my eye, I’ll blink – again a false positive in the interests of speed.

- Gall’s view of vertical faculties being autonomous was that there were no horizontal faculties for them to share in. However, there are experiments that reveal that at least some mental processes compete for resources such as short-
term memory, and allocation to one process degrades the performance of another. For modules, however, the issue is informational autonomy, rather than autonomy of computational resources.

- Fodor now needs to argue that the input systems are informationally encapsulated, but will content himself with pointing out caveats in the data that’s alleged in favour of the contrary view:
  
  1. No-one doubts that there must be some top-down information flow to correct input analyses that won’t reconcile with the organism’s background knowledge. This is why Fodor won’t identify input analysis with perception, a conservative process that fixes belief. This doesn’t of itself argue that the informational layers within the input module are penetrable, rather than the output of the process being interacted with. We can circumvent the problem somewhat by restricting the level at which the module cuts off and the central processor takes over. Interpreting a speakers intentions might not be the province of the language-comprehension module. Similarly, the visual input analysis module might deliver only ‘primal sketches’. Hence the informational encapsulation problem is linked to that of individuating input modules and specifying their outputs.

  2. Some cognitive processes that aren’t modular do what modules do. Their cognitive penetrability is irrelevant to input modules. Fodor’s example is of sentence completion – the easier it is to guess the speakers intentions and complete the sentence correctly, the higher the “Cloze value”. High Cloze-value sentences can be understood under conditions of greater distortion than can low Cloze-value sentences. However, this doesn’t show that the input systems have access to the organism’s expectations. The subject is (rather painfully) reconstructing what he can’t hear, and it’s not clear that the same mechanisms that mediate the automatic and fluent processes of normal speech perception are involved. Context-anomalous items are inhibited, but this is after the input processors have delivered their tentative output.

  3. Informational encapsulation has to be carefully distinguished from the claim that there is top-down information flow within the systems. Eg. phoneme restoration only shows that there’s top-down flow of lexical information within the language module, which has access to the lexicon. We also need to distinguish, again, what goes on within the module from what happens after it has delivered its output.

- Fodor presses cases that look like penetration of modules. The Cloze-valued “sentence completion” case is extended. It’s easy to add the missing word “bug” in the context that involves spies. It seems [I couldn’t quite fathom the example] that subjects respond favourably to lexically related words such “microphone” flashed on a screen as prompts. This looks like encapsulation-penetration. However, they also seem to respond to prompts like “insect”. Fodor’s explanation is that there’s a network of associations within the lexicon that enables an unintelligent module to impersonate an intelligent processor. “Insect” is connected to “spy” via “bug”. While association is too stupid to explain the totality of the mental, this stupidity is a virtue when it comes to input modules. Note that the interconnections of the lexicon are accessible off-line and updated by what one knows. This doesn’t break the encapsulation rule.

- Input analysers perform more complex processing than reflexes, in that they perform inference-like operations on incoming stimuli. However, they are
compatible with reflexes as far as information encapsulation is concerned. An input module can be encapsulated if it exploits the information it itself holds.

- Fodor quotes Stich’s discussion of subdoxastic belief (what Chomsky calls cognizing), the epistemic relation between a speaker/hearer and his native grammar. As well as being unconscious, subdoxastic beliefs are inferentially unintegrated. That is, unlike beliefs per se, their consequences don’t impact our other beliefs. The question then is, why should unconsciousness and inferential unintegration co-occur? Why should subdoxastic states be inferentially encapsulated? This distinguishes subdoxastic beliefs from ordinary unconscious beliefs, which may yet partake in unconscious inferential processes.

- Fodor, however, thinks that there are subdoxastic beliefs (like beliefs in the rules of logic) that are not encapsulated, since they are used all the time in inferential processes. Fodor concludes that there can therefore be no intrinsic connection between encapsulation and unconsciousness.

- However, input systems do seem not to exchange subdoxastic information with central systems, making them encapsulated. Fodor concludes that this is the only situation in which subdoxastic states are encapsulated.

### 3.6 Input Analyzers have Shallow Outputs

- Fodor rehearses the parallel between two distinctions: (observation and inference) and (perception and cognition). Foundationalism restricts observation to infallible introspective reports whereas recent “revisionism” denies any difference between seeing that a proton has left a trail in a cloud chamber and seeing a spot on someone’s tie, maybe because all observation-statements are theory-laden.

- Fodor’s not much worried by the thought that inductive empiricism might not be grounded in indubitable observation statements, so doesn’t care where the epistemological distinction lies. However, it is important for modularity theory to determine where the input modules end and central cognition begins. Tautologically, distinct functional components cannot interfere everywhere without failing to be distinct. They must interface only be their inputs and outputs.

- However, the real issue is that there’s a trade-off between encapsulation and richness of output. The richer the output, the greater the access there must have been to what the organism knows, and hence the less the encapsulation. The shallower the outputs from input systems, the more plausible that the coding is encapsulated. Delivering information about protons must break encapsulation, whereas information about shapes and colours doesn’t.

- Fodor will consider the outputs from the language and visual processors – ie. the constraints on the level of information delivered in order to maintain the input modules as mandatory, fast and relevant while remaining informationally encapsulated.

- Fodor suggests that output from the language processor is restricted to the grammatical/logical form (determined up to ambiguity). Further inferences to best explanation – like whether a statement is ironical or not – are left to the central processor. The determination of the grammatical form requires only in turn phonetic and acoustic data, so this is a candidate for an encapsulated analyser. Context isn’t relevant to the form of an utterance, though it may be to its content.

- Speech-act potential is only recovered by the input module it’s implicit in the form (eg. word order). Nothing richer than form could be recovered by an
informationally encapsulated processor, and form ("type / token relations") is required before sentence comprehension can proceed further. What is meant involves a lot more indeterminability than what’s said.

- Since the input processor must deliver the logical type of an utterance, it must be able to determine its lexical components.
- Fodor considers whether the input module could deliver *definitional* information (such as that “bachelor” means “unmarried man”) – a matter of comprehension rather than inference. If so, this would need to be mandatory and fast. Alternatively, “bachelor” and “unmarried man” could be given different representations in the output from the language processor and subsequent identification would be a task for central systems. Fodor thinks experimental evidence supports the latter view, and that output from the language processor is at the morphemic or syntactic level.
- Fodor stresses that the output from the modules must form a natural kind, and be useful for further cognition. Morphemic constituency, syntactic structure and logical form seems to do this. Fodor rejects an alternative view whereby sentence processing grades off insensibly into inference, context appreciation and general cognition.
- Similarly, the output from the visual processor should be shallow, but a non-arbitrary level of representation. Fodor thinks that Marr’s “primal”, “2.5 D” and “3 D” sketch outputs are two shallow, because this would take object recognition out of the province of the visual processor, when one would have thought it fundamental. Hence, Marr’s sketches, which only give geometrical information, must be representations internal to the input module.
- Fodor considers object hierarchies; eg. poodle → dog → mammal → animal → physical object → thing. Fodor thinks that salience (to recognition) is at the middle level – ie. dog rather than poodle or thing. These basic words in the hierarchy (a) feature more frequently in vocabulary counts, (b) are learned earlier, (c) are at the level below which compounding starts (armchair → chair → furniture), (d) the natural level for first ostensive definition, (e) encode the most new information as we go down the hierarchy from the most abstract, (f) the level used for describing things cateris paribus, (g) are the most abstract members of their hierarchies that are similar in appearance.
- Since input systems are informationally encapsulated, object identification must be on the basis of properties that the visual transducers can detect – ie. shape, colour, local motion etc. Hence, basic categorisations are the most abstract members of their hierarchies that could be determined with reasonable accuracy purely visually. Since they give maximum information value (see (e)), they are the likely outputs from the visual input system which delivers dogs, but not protons.

3.7 Input Systems are Associated with Fixed Neural Architectures

- Whereas all that’s been discussed is functional rather than physical, the fact that there are localised areas of the brain that deal with what the input modules do (and much else) is significant.
- Fodor suggests that areas with a content-specific function are restricted to the input modules for language and perception. A clear association between neural hardwiring and modularity is what we’d expect on the basis of encapsulation, as it
facilitates information-flow, providing quicker access to some information than other.

3.8 **Input Systems Exhibit Characteristic and Specific Breakdown Patterns**

- Agnosias and aphasias constitute patterned failures of functioning, rather than mere quantitative degradation of horizontal capacities. This is what we’d expect given localised hardwiring. This contrasts with central processing which has no characteristic breakdown patterns.
- Fodor admits that any functionally distinct psychological process can be selectively impaired. So, memory might be selectively impaired. This pulls us in the direction of mixed models, insisting, contra Gall, on the reality of horizontal as well as vertical faculties.

3.9 **The Ontogeny of Input Systems Exhibits a Characteristic Pace and Sequencing**

- Fodor puts this forward as a hypothesis rather than as a fact. There’s lots of evidence about the sequencing of language acquisition, and some on the very early visual capacities of infants. This is consistent with a great deal of the developmental course of input systems is endogenously determined.
- Infants’ capacities for visual categorisation exceeds what empiricists have thought. Language development develops in an orderly way that’s sensitive to the child’s level of maturation, but insensitive to environmental factors. Language development respects many aspects of adult grammatical organisation at early stages. Attempts to explain this in terms of general intelligence and problem solving abilities and are half-hearted and unconvincing.
- All this is consistent with hardwiring and innate specification (and no evidence contradicts such suggestions).
4 Central Systems

- The question now arises whether the mind is totally composed of vertical faculties, as Gall supposed, whether only the input processes are modular and, if not, whether there are non-modular features.
- Since vertical faculties are domain-specific by definition and modular by hypothesis, are there psychological processes that plausibly cut across cognitive domains? If so, are they subserved by nonmodular, unencapsulated mechanisms?

4.1 Why Central Systems are Unencapsulated and Non-Modular

- The representations that the input systems deliver have to interface somewhere, with ipso facto access to information from more than one cognitive domain. The reasons are:
  1. Fodor has distinguished what the input systems compute from what the organism believes. This is because the encapsulated input systems compute representations of the distal layout using less information than the organism has. These representations require correction in the light of the organism’s beliefs (memory) and inputs from other channels to give the best hypothesis about the state of the world. The belief-fixation mechanisms that perform this synthesis cannot therefore be domain-specific.
  2. Language is used to communicate our beliefs about how the world is. The process requires full information. Since these processes interface between vertical faculties, they cannot themselves be domain-specific (or must at least be less DS).
  3. Part of the reason for encapsulation was to ensure veridicality of perception (rather than perceiving what’s wanted). However, this information must be linked to the general utilities if we are to decide how to act. Wishful seeing is avoided by having this integration occur after rather than during perceptual integration. SO, again there has to be something that crosses the domains of the input systems.
- So, there must be non-DS systems to exploit the information provided by the input systems. These central systems are those involved in thought and problem-solving. The question is whether the central systems are non-modular in other respects.
- Fodor thinks that it’s been encapsulation that’s driven the other modular features. Hence, central systems can’t reasonably be considered modular.
- As a point of logic, there’s no necessary connection between domain-specificity (which restricts the range of inputs for which analyses are provided) and encapsulation (which restricts the information the processor has access to). So, it’s an interesting truth that only DS-systems are encapsulated.

4.2 Analogy with scientific reasoning

- Fodor admits there is little evidence for or against the modularity of central systems. There is some gross evidence of the segregation of linguistic versus mathematical/spatial abilities, but this may merely be a spin-off from the vericality of the corresponding input systems.
• Instead, Fodor argues from analogies. Central systems fix belief by non-demonstrative inference, using memory and the outputs from the input systems. Fodor makes an analogy between this unconscious process and scientific reasoning, about which we know more, and which is unencapsulated.

• Confirmation in science has two different but related properties which Fodor names isotropic (everything the scientist knows is relevant, both as a sociological fact and a normative principle, because the world is a connected causal system and we don’t know how the connections are arranged, particularly in scientific discovery, where interdisciplinary analogies are made) and Quinean (confirmation of any hypothesis is sensitive to the whole belief-system; choice between theories is sensitive not only to confirmation but to global constraints like simplicity, plausibility and conservatism).

• The more “intelligent” the process, and the less routine, the more isotropic it is and the less well understood it is. Fodor stresses the analogy. Psychological central processes, being examples of non-demonstrative inference, are isotropic and Quinean. The level of acceptance of a belief is sensitive both to the level of acceptance of any other and to global properties of beliefs collectively.

• Fodor now needs to show both that this viewpoint is incompatible with the modularity of central systems, and that it is plausible independently of the analogy with scientific reasoning.

• Firstly, the incompatibility of encapsulated modules and maximally open isotropic/Quinean systems is obvious and uncontroversial. It is interesting that (H & T) should be a simpler theory than (¬H & T), but only where T is one’s complete background theory, not where it’s some arbitrary subset within a module. Consequently, to the extent that a system is Quinean and isotropic, it is nonmodular.

• Fodor gives a contingently coextensive 3-fold taxonomy of cognitive processes:
  2. By Subject Matter: domain-specific versus Domain-neutral.

4.3 The Frame Problem

• Fodor admits there’s little evidence for what goes on in the central processes of thought and problem-solving, but claims the difficulty of this area of psychology is what we’d expect if it is isotropic/Quinean. We can’t expect fixation of belief to take place in computations over bounded, local information structures.

• This is what’s known in AI as the FRAME PROBLEM, i.e. the problem of putting a frame around the set of beliefs that may need to be revised in the light of new information.

• Fodor gives an example: a robot being requested to dial someone’s number, and doing so after looking it up. During the process of dialling the number, various things happen that the robot may need to update its belief-set in the light of (e.g. the phone becomes inaccessible to incoming calls). The question is, which, and which beliefs can it assume remain invariant? The example is that if it thinks the number to dial might change, and keeps stopping to look it up again, it’ll never dial the number. It’s a hard problem because no local solution will do. Fodor take the following truths to be self-evident:
1. Which beliefs should be updated in the light of an action is very context-sensitive. There are some actions after which it would be sensible to re-check a phone number.
2. New beliefs aren’t tagged with their implications – these are often surprising.
3. There’s no way of picking out which beliefs should be re-examined in the light of new ones (ie. it’s not just the most recently acquired).
   - Cognitive processes other than input analyses have a common property; they involve Quineian/isotropic computations that are sensitive to the entire belief-system. The frame problem is paradigmatic.
   - Another example. In carrying out a task, a robot has to plan how to do it, keeping in mind various scenarios, but also keep track of the way its actions will change or have changed the world. The consequential book-keeping problem of keeping track of these possible worlds reflects the frame problem. Both demonstrative and (harder) non-demonstrative consequences have to be kept track of.
   - The assumption in AI is that the frame problem can be solved heuristically. While nondemonstrative confirmation and the psychology of belief-fixation is isotropic and Quineian in principle, in practice we can heuristically restrict the range of possible impacts on one’s beliefs in any particular event. It is true that potentially relevant considerations are often ignored, so maybe a suitably integrated bundle of localised heuristics would make the robot as Quineian and isotropic as human beings (even practising scientists) actually succeed in being.
   - Some in AI think that the notion of placing a frame around a problem goes some way towards solving it. Fodor is unimpressed. It seems arbitrary (wanting a worked out solution) what should belong in which frame. Also, the frames would seem to cross-reference to one another, so that there would be a graph from any point to any other. This reintroduces the frame problem in the guise of which paths should actually be traversed in the course of solving a particular problem. Changing the problem from one of the logic of confirmation to one in the theory of executive control is not necessarily a change for the better.

4.4 Summary

- This leaves us in the position that we should expect central processes, if they are Quinian and isotropic, to result in problems associated with non-local computational mechanisms when we try to simulate them. However, if they are modular, we should not expect that. This seems to mirror AI research: progress with encapsulated input modules that are stimulus-driven and insensitive to overall beliefs; lack of progress when we get to fixation of belief and non-locality of information.
- Additionally, neural structure seems to respect the global nature of central processes. It is to be expected that biases in information requirements (as for modules) should show up in neural architecture. However, where the totality of information is required, we shouldn’t expect this but a rather diffuse neuro-anatomy; a web with everything connected to everything else. This seems to be what we find in the “association cortex”.
- Nothing is known about the neuropsychology of thought because there’s nothing to be known. There’s a form/function correspondence for the modular processes, but for the central processes you get an approximation to universal connectivity.
5 **Caveats and Conclusions**

- So, Fodor is recommending a modified modularity theory of cognitive processes. Gall was right to believe in vertical faculties – these are the (input) modules with the various architectural properties given above. However there are also horizontal faculties that the nonmodular central processes use in belief-fixation.

5.1 **Epistemic Boundenness**

- If the mind were a collection of vertical faculties, there would be some purposes for which the mind wouldn’t fit. There would be some problems for which the mind didn’t have the appropriate computational resources. The mind would be epistemically bounded, leading to epistemic despair. This is, however, irrelevant as the central services aren’t modular, so we can revert to epistemic optimism. A complete theory of science may be beyond us for exogenous reasons (no access to all the data) but not for endogenous reasons (our minds aren’t built that way).

- Assuming that all systems that perform non-demonstrative inferences, modules or otherwise, are hypothesis projecting / confirming devices, they each need access to:
  1. Hypotheses.
  2. A database.
  3. A metric to compute the confirmation level of a hypothesis against the database.

- How might such a device go wrong and fail to select the right hypothesis? There are boring reasons (the computation would take too long, run out of memory, the correct hypothesis is too complex to be parsed, or the confirming data is too complex to represent, etc). These quantitative restrictions lead to an acceptable epistemic boundedness that is as compatible with the view that intelligence is general (ie. non-modular) as with its denial.

- Otherwise, the class of hypotheses or the data to evaluate them might be restricted. The latter restriction – encapsulation – is specific to modules. So, is a system that is non-modular thereby epistemically unbounded? Fodor thinks not, for epistemic unboundedness is more to do with domain-specificity than encapsulation – intelligence should not be biased towards some problems at the expense of others. There should be no endogenous constraints on the kids of problems accessible to intelligent problem-solving. So, to assure unboundedness we need to be sure that whatever the structure of the universe turns out to be, that we’re capable of entertaining the hypothesis that specifies its structure. Consequently, it’s fallacious to argue that since modularity implies boundedness, the way to get unboundedness is to deny modularity.

- In fact, non-modular theorists (such as Hume) have placed much greater bounds on what can be known than has any modularity theorist, but have escaped the adverse consequence of their doctrines by claiming that anything unknowable is meaningless.

- Any psychology must have some endogenous structure, and therefore most likely some constraints on the class of beliefs the mind can entertain. This is irrelevant to the modularity thesis.
5.2 The Prospects for Cognitive Science if the Modularity Thesis is True

- The limits of modularity will also be the limits of our understanding of the mind.
- The focus has moved from building an intelligent machine to the simulation of relatively encapsulated processes associated with perception and language.
- Attempts at simulating problem solving have removed the holism by supplying DS information and heuristics.
- A lot is known about the transformations of representations that get information into a form suitable for central processing, but thereafter virtually nothing.
- A modified modularity makes these successes and failures intelligible. Central processors are bad candidates for scientific study.
- An analogy between neuro-anatomy and computers – the more specialised the machine, the more its physical architecture will mirror its computations. There would be no neuropsychology if the brain were a realised Turing machine. The account of central processes as Quineian and isotropic tends in this direction.
- A condition for successful science is that nature should have joints to carve it at. We need relatively simple systems that can be modelled much as they operate in situ. Modules satisfy this constraint, but central processes don’t.
- Localness is a prime characteristic of the sort of computations we know how to think about. Fodor compares the success of (the formalisation of) deductive logic with the lack of success in confirmation theory. Deductive logic deals with validity, which is a local property of sentences. Confirmation is highly sensitive to the global properties of belief systems.
- Similarly, no-one could answer a challenge why a digital computer is a plausible mechanism for simulating global cognitive processes.