

PART II. WHY A SCIENCE OF MENTAL SYSTEMS MAY BE UNATTAINABLE

In Chapter 2, I have argued that most sectors of modern psychology are travesties of serious science--not in their meager return of established principles, which needs be no stigma on quality of effort, but in their failure to make even the most elementary provisions for SLe-se-disciplined inquiry. Part II of this essay probes cognitive psychology's prospects for bringing off some real scientific achievement. Despite the increasingly dour tone that will infuse this survey, its intent is earnestly constructive: One does not overcome formidable difficulties by refusing to recognize them; and if we can secure a sufficiently acute vision of what it takes to engineer a technically accomplished science of mind, perhaps we can actually move on to some small success in this mission.

Modern cognitive psychology's estrangement from both the formalistic letter and the conceptual spirit of well-SLese science has been greatly exacerbated by large recent incursions of Comp-speak, i.e., the symbol stylings (programming languages, structure diagrams, and information-processing jargon) of computational-systems theory and artificial intelligence. (See, e.g., Norman & Rumelhart, 1974, and Newell, 1981, for examples.) There is no inherent incompatibility between SLe-se and Comp-speak. Digital computers are perfectly good causal systems whose micro-dynamics have a straightforward SLe-se description; and Comp-speak is just an instrument for their macro-manipulation which is considerably more efficient than would be the molar SLe-se account for which this is shorthand. But Comp-speak works for its intended applications precisely by exploiting the special architecture engineered into the microstructure of extant computers. These design features are so manifestly atypical of organic systems that whether instructive isomorphisms between AI-programmed computational processes and human cognition exist at any level of molar abstraction remains deeply problematic. So to couch theories of mental mechanisms in Comp-speak

is at best to beg the character of our mental mechanisms and more likely to foreclose our chances of getting these psychonomically correct. It is no longer the intent of this essay to analyze Comp-speak's formal biases in any detail. But some passing mention of these will provide helpful contrasts as we now consider what it would be like to develop a SLease-guided theory of mental phenomena.

CHAPTER 4. BASIC CONCEPTUAL OBSCURITIES OF MENTAL SCIENCE.

We may use the label 'mental science' loosely to denote any collection of endeavors to produce a scientific corpus whose primary predicates are mainly ones that are commonsensically "mental." Precisely what that category comprises is a long-standing and still imperfectly resolved philosophical problem that we can evade by declaring

Definition 3 (partial). (1) An English infinitive is a Psi-verb iff it is on, or can appropriately be added to, the following list:

Ψ : perceive, recognize, remember, know, believe, doubt, want, hope, like, fear, feel, think, imagine, experience, contemplate, speculate, wonder, intend, decide, plan, try, seek, say, propose, ask, command, [etc.].

(2) An English predicate is mental iff it is of form '___ ψ s NP' (or is some tense-or-number transformation thereof) wherein ' ψ ' is a Psi-verb and 'NP' is any complement of the verb that yields an intuitively meaningful English predicate for this particular ' ψ '. In paradigm cases 'NP' is a relative clause (e.g., '___ sees that the door is open') or objectual noun-phrase (e.g., '___ fears hairy caterpillars'); but in other instances, such as '___ asked Jim to step aside' and '___ is brooding about last night's fiasco', 'NP' may include words that expand ' ψ ' into some more complicated verb-phrase.

This Ψ -list can be greatly expanded, but the rationale of its construction is a complex appraisal firstly of how each verb in question behaves in intuitive inferences, and secondly of its "family resemblance" to others already on the list.

Note. A classic test of a verb's Ψ -status is whether it creates an "intensional context" for some of the nominals embedded in its NP-complement. Specifically, ' ψ ' creates intensional contexts iff there is some intuitively meaningful

sentence of form ' ψ s that $\beta(\underline{a})$ ', with ' $\beta(\underline{a})$ ' therein a sentence containing a nominal 'a', such that for some sentence of form 'a is a K', the conjunction

$\beta(\underline{a})$; and a is a K

intuitively entails

$\beta(\text{some } \underline{K})$,

but

 ψ s that $\beta(\underline{a})$; and a is a K

does not intuitively entail

 ψ s that $\beta(\text{some } \underline{K})$.

(The first inference demonstrates that 'a' has a referential function in ' $\beta(\underline{a})$ ' which ' ψ s-that' prefixing is then shown to disrupt.) For example, although

Columbus discovered America; and Columbus was a reckless fool

entails

Some reckless fool discovered America,

it does not follow from

Jimmy hopes that Columbus discovered America; and Columbus was a reckless fool

that

Jimmy hopes that some reckless fool discovered America.

However, as illustrated by 'entails' and 'makes probable', not all verbs that so create intensional contexts intuitively belong on the Ψ -list.

A major obstacle to delimiting the class of mental predicates is the large grammatical diversity of NP-complements variously accepted by most Psi-verbs. (Indeed, this diversity impugns the adequacy of Clause 2 in Def. 3 by suggesting that a given lexical Psi-verb may have different meanings under different forms of NP-complementation.) But relative clauses are the most fundamental of these. Specifically, let us say that a mental predicate is fully intentional iff it is

either explicitly or, by meaning equivalence, implicitly of form ' ψ s that p' wherein ' ψ ' is a Psi-verb and 'p' is a declarative sentence in our language.

This modern usage of 'intentional' to demark the special intensionality of mental predicates is the well-known legacy of Brentano. To illustrate the implicit case, ' is trying to leave' condenses ' is endeavoring that he himself leaves'; and ' wonders if the game is over' deftly paraphrases the awkward ' inquiringly speculates that the game is over'.

Prima facie, when a fully intentional mental predicate ' ψ s that p' is true of some person-stage g-at-t, the clause 'that p' therein is a nominal which designates a proposition to which g is coupled at t by a mental relation signified by ' ψ '. Philosophers have often construed this to be a mind's-hand reaching out to some ethereal entity that is neither mental nor physical. (See Ryle, 1957, for decrial of this conceit.) But without denying the existence of propositions denoted by relative clauses, it makes more sense to view ' ψ s that p' as representing a complex organismic condition (psychological attribute) having two main facets, a mode ψ and a (propositional) content that-p. Propositions and parts thereof signified by certain fragments of the relative clauses in fully intentional mental predicates are also classically known as concepts, ideas, thoughts, or (cognitive) meanings. Thus, John's-fearing-that-Mary-will-be-late includes a Mary-concept and a fearful idea as parts of John's complete propositional thought.

When ' ψ s that $\beta(\underline{a})$ ' is a fully intentional mental predicate wherein sentence ' $\beta(\underline{a})$ ' contains a nominal 'a' that in ordinary (non-intentional) contexts designates some extant entity a, the sentence 'g ψ s that $\beta(\underline{a})$ ' does not itself refer to a through its inclusion of 'a' (cf. the intensionality test Noted above)--which is to say that g's ψ ing-that- $\beta(\underline{a})$ is no relating of g to a. But insofar as we accept referential use of the concept expressed by 'a', we also take 'g ψ s that $\beta(\underline{a})$ ' to imply certain "objectual" ψ -moded mental predications that do claim a literal relation of the ψ ing subject g to real object a, namely, 'g ψ s of a that $\beta(it)$ ' and, less fully

but more idiomatically, some variant of 's is thinking ψ ingly about a', s has a ψ of a', or sometimes just 's ψ s a'. Thus if John perceives that his ashtray is full, and there really is one ashtray that in this context counts as his, say Item₂₇₃ in the office inventory, it follows also that John perceives of Item₂₇₃ that it is full, that John has a percept of Item₂₇₃, and, most simply, that John perceives Item₂₇₃, even though--and mark this well--there is no imputation by these objectual locutions that John's perceiving includes an office-inventory-item₂₇₃ concept.

Objectual ψ -predications are ones whose NP-complements contain nominals that continue to function referentially in this context, as demonstrated by the success of inferences such as

s ψ s a; therefore, since a is a K, s ψ s some K.

And some NP-complemented ψ ings are an intentional/objectual mix, as in 'John recalled of Mary that she once dated Jim'. Conjunction of this with 'Mary and Jim are Baptists' entails 'John recalled of a Baptist that she once dated Jim', but not 'John recalled of Mary that she once dated a Baptist.

The important point to be taken here is that when the content of s's ψ -wise fully intentional thinking at time t is characterized by a sentence that we think refers to some real entity a (unlike the abortive reference of the nominal in the relative clause of 's suspects that Pegasus was a clumsy flier'), we also consider s to be in fact ψ -related at t to the actual thing a which is the object of s's ψ -moded thought, even though, as the intensionality tests show, this objectual relation is neither contained in nor vouchsafed by s's ψ ing. Whereas the content of s's ψ ing-that-p is presumably an aspect of s's internal psychonomic state, its object (if any) is paradigmatically some aspect of the world external to s. This content/object (meaning/referent) distinction is utterly fundamental to the theory

of mentality, starting with the need it lays upon us to appreciate that fully intentional mental events call for explanations very different in causal character from explanations of objectual mentations.

In facile overview, the task of any mental science is (1) to demark its intended primary content by specifying a particular subset of mental predicates as its target of explanation; (2) to group these chosen predicates into conceptions of mental variables; (3) to conceive plausible or at least provocatively idealized *laws and a/t-*derivations which account for these variables; and finally, (4) to integrate these local accounts into recursive/dynamic mental *systems and micro-*reductions of mental phenomena. In future practice, we shall need to develop all four phases jointly through interactive refinements of (1) and (2) in light of preceding progress at (3) and (4), and conversely. But extant mental sciences have yet to provide any base on which to iterate. Although phase-(4) triumphs may well prove unattainable under any circumstances, even modest success at (3) must remain elusive in the absence of discriminating specifications of particular mental properties to be accounted for by particular mental *laws. Making clear why this elemental step is so much more difficult for studies of mind than for physical research, with correspondingly enhanced need for sophisticated concept management, is this chapter's main undertaking.

Problems of content specification.

Any mental science, even one that aspires ultimately to deal with all mental phenomena, needs to pick out specific subsets of mental properties to be foci of inquiry in particular research studies and targets of explanation by particular

laws or reductions. For despite our ability to conjecture infinitely many mental-output *laws simultaneously by verbalizing schemata-cum-completion-rules having (cf. p. 51ff. above), unboundedly many instantiations, no such schema can plausibly comprehend more than a moiety of the properties that are commonsensically mental. There is no one rigid way in which a mental science must specify its target selections of mental properties; but it is crucial both that some detailed specifications be made and that these be guided by sensitivity both to the analytic dependencies which commonsense intuits among mental predicates and to the everyday ambiguities that confound these meaning relations.

Item. There is evidently an analytic connection of some sort between the predicates '___ believes that p' and '___ is confident that p'; but is this an incompatibility or an entailment? In our most prevalent usage, "confidence" seems to be a restricted variety of belief, as scarlet is of red; yet occasionally, confidence-that-p is taken to contrast with (merely)-believing-that-p. Again, while conjecturing-that-p, fantasizing-that-p, envisioning-that-p, and many other things-that-p all entail thinking-that-p, is the latter disjunctively derivative from the others or is it, rather, a logical constituent of each of them? (E.g., is conjecturing-that-p a thinking-that-p with other conditions added?) Problematic analyticities such as these are relatively minor received obscurities that a mental science can afford to resolve at its own convenience. Even so, a science that elects to include these particular mental predicates in its corpus needs also to decide upon some regimentation of their definitional dependencies.

Item. Many commonsense mental predicates are amalgams that include ingredients far too remote from the workings of psychonomic mechanism to be plausible participants in causal processes even at a high level of molar abstraction. For example, g's-promising-that-p or g's-testifying-that-p augments g's-(mere)-stating-that-p with an impalpably rich aura of, inter alia, social norms and ethical obligations. Such aspects of this complex that are g's own beliefs/hopes/expectations/endeavors about

the ethos and ethics of his utterance belong to the causal story of g's-saying-that-p. But for a psychonomic theory of speech acts to undertake explanatory responsibility even for the social much less the moral/legal/ethical components of promising and testifying seems imprudent if not downright stupid. (Such issues clearly deserve scholarly inquiry, but not by mental science.)

An especially important instance of this excess-baggage problem is the Psi-verb 'know'. It has long been agreed by philosophers that g knows that p only if it is true that p (i.e., there is no such thing as false knowledge) and moreover g not merely believes that p but is justified in so believing. But whatever epistemic justification may be (philosophers have never quite managed to say), neither this nor veridicality of mental content has a useful role to play in theories of mental mechanism. To be sure, the match of beliefs to environment is an abstract molar correlate of goal-attainment efficiency that well merits whatever analysis^{thereof} we can extract from models of the belief processes underlying this epiphenomenon. But discovery of the psychonomic sources of believings is taxing enough without lawfully seeking antecedents that make beliefs/truthful and justified as well--which is to say that a mental science sophisticated enough to distinguish knowledge from belief will also know better than to let its core corpus speak of "knowing" at all,²² at

²²As illustrated by '___ knows how to swim' and '___ knows Paris', relative clauses are not the only commonsense NP-complements of 'know'. But for reasons evident in my commentary elsewhere (Rozeboom, 1972b, pp. 31-34) on nonpropositional forms of knowing, these too have only obfuscation to add to accounts of mental mechanism.

least not until its theory of pure (normatively unappraised) belief is well in hand. "Cognitive psychology" is a pretentious misnomer for what is now and will long remain only cogitative psychology.

Item. For most Psi-verbs ' ψ ', ordinary language employs '___ ψ s that-p' ambiguously to signify either (1) an active, episodic ψ ing-that-p which can in principle be introspected, or (2) an enduring, "latent" ψ ing-that-p which is no more introspectable than are one's habits but which disposes arousal of the real

thing by cues that would otherwise not have this effect. Thus when we say that John believes, or remembers, or hopes that his performance last night was well-received, we usually mean not so much that John is actively ψ ing this proposition right now but only that he would do so were he ^{to be} prompted by a suitable reminder. To disambiguate these two senses, we may write ' ψ^e s that p' for episodic (momentarily occurrent) ψ ing-that-p, while ' ψ^d s that p' signifies a not-necessarily-activated disposition to ψ -that-p. Even so, when I hereafter write Psi-verbs without explicit e/d-disambiguation, I intend these mainly in their episodic sense. For just as commonsense cites "fragility" and "buoyancy" (etc.) to account for otherwise unusual shatterings and floatings, so does folk psychology invoke ψ^d ings as primitive theoretical constructs to help explain interpersonal differences in ψ^e ing. Such latent ψ ings no more qualify as "mental" just because they help to bring about phenomenal ψ -events than spark plugs are solidified electricity; and any effective science of ψ -phenomena will work hard to transform received notions of ψ^d ing into more articulate, less crudely dispositional conceptions of the relatively stable state properties by virtue of which ψ -processes run off in one subject-specific way rather than another (cf. Rozeboom, 1965, pp. 340-342).

Item. A great many commonsense mental predicates are best analyzed as disjunctive abstractions over open classes of others. For example, 'John believes what Mary told him' asserts ^{essentially} that there is some proposition such that Mary told it to John and John believes it. And 'g is planning a party for tonight' means not just that g is plannishly contemplating the party-for-tonight idea but that g is entertaining in one or another conative mode a number of detailed propositional contents organized around ^{the} theme of party-giving. Even for most ordinary sentences 'p', the propositional content ψ d by g when ' ψ s that p' is true of g is not so much a meaning fully identified by the communal linguistic force of 'p' and common to all instances of ψ ing-that-p as it is a more richly determinate ^{thought} having conceptual-role properties of a that-p kind. Thus when g fears that his wife is having an affair, the

intentional content of g's fearing conjoins a highly personalized concept of g's consort with some notion of sexual misbehavior undoubtedly more distressingly detailed than conveyed by 'an affair'. And John and Mary can ^{overtly} agree that alcohol is a far greater social evil than cocaine, even when they differ greatly in their conceptions of social desirabilia and acquaintance with recreational drugs.

Up to a point, this prevailing failure of linguistic sentences to exhaust the richness of intentional contents is no different in kind from our inability to verbalize or even detect exact values on continuous physical variables. That is, 'John fears that his wife is having an affair' is inescapably imprecise in at least the way that 'John weighs about 270 lbs.' or 'John weighs 273 lbs.' rounds off John's real weight of 272.8147... lbs.', albeit the former's laxity is perhaps better likened to that of 'John is big', which leaves open whether John's extremity is in height, girth, weight, volume, social status, or some combination of these. It is, however, exceedingly important for a technical science to build into its concepts a capacity to evolve ever finer discriminations as these become salient for advances in the matter at issue, most powerfully by conceiving its basic variables whenever possible as continua, or near-continua, whose alternative values can be individuated to any chosen exactness by metric comparisons and quantitative measurement models even when extant techniques of observation and recording can only discern blur-regions of these variables' point values for particular events. In contrast, many commonsense mental predicates appear to be evolutionary dead-ends that carry few clues to how, if at all, they might be reworked into more articulate differentiations among the many-splendored diversities lumped together by everyday mind-talk.

Most obdurately indiscriminate of all mental predicates are the ones whose Psi-verbs' NP-completions are objectual. Major instances that have significantly impeded progress toward a science of cognition/cogitation are the forms '___ perceives (it)', '___ recognizes (it)', and '___ remembers (it)', wherein '(it)' names an external thing (e.g., his hole card, a table and two chairs, the display screen),

attribute (four-of-hearts, trigram pattern CEP), or event (his winning the last pot, his having been shown two successive pairings of CEP and KIZ). It seems plain that objectual ψ ings are analytic abstractions from intentional ones (together with certain extra-mental facts) in that '___ ψ s (it)' is true of g if and only if g is ψ ing a mental content (paradigmatically but perhaps not always a complete proposition) having the potential to refer to (it) while (it) not only exists but satisfies whatever conditions in relation to g's mental state allow this reference potential to be realized.²³ Even if one is not dismayed by the task of explaining

²³At first thought, introspected feelings such as feels-hungry/restless/elated/angry/curious/despondent/ambitious/apprehensive/etc. might seem to be counterexamples. But insomuch as 'hungry', 'restless', 'elated', etc. are adjectives, not nouns, it is unclear that commonsense takes such feeling-states to be about anything. Even if it does, e.g., if '___ feels hungry' is more perspicuously paraphrased as '___ feels hunger' or '___ has a feeling of hunger', one can argue from the contrast between feeling hungry/restless/etc. and being hungry/etc. that any feeling of something must embody a representation of that thing distinct from the object itself even if not entirely disjoint from it (cf. Rozeboom, 1972b, p. 72).

In another alleged confutation of the thesis that objectual mental relations supervene upon intentional states, philosophers occasionally argue for a "nonepistemic" sense of perception in which g's-perceiving-(it) is an impact of (it) upon g causally prior to whatever conceptualized percept if any may ensue in g. But the only argument for this proposal is that g's exposure to (it) may have effects on g's later behavior that seem unmediated by any propositional perceiving of (it). To hold that input reception must always be "perception" of one sort or another is psychonomically degrading: Rather than conflating the causal details of paradigmatically perceptual processes with more primitive sensory phenomena shared with us by infra-human organisms perhaps as lowly as houseflies and amoeba, perceptual theory needs to tease out what we have every reason to suspect are major differences among these. If we cannot acknowledge that flies and amoeba react to stimuli without taking this to imply some sense in which they perceive them, how are we to scoff at viewing the ringings of doorbells, or perhaps some circuit antecedents such as current surges or voltage jumps, as perceivings of button presses?

particular occurrences of Aboutness-coupling when the nature of this relation remains so obscure (cf. Rozeboom, 1979), any g's- ψ ing-(it) seems far too epiphenomenally remote from and poorly diagnostic of the g's- ψ ing-that-p upon which the former supervenes to sustain much hope that objectual ψ ings might be molar state

properties in a scientifically worthy mental system. That is, the enormous diversity of intentional contents that variously refer to the same (it) pretty well precludes that ψ ing-(it) might play a role in molar causality at any level of equivalence-class abstraction. A theory of cogitation that differentiates ψ ings only in terms of their objects without concern for their contents (e.g., Gibson, 1979, on perception; Wilcox & Katz, 1981, on memory) lies far outside of any conceptual space wherein mental-process laws might be captured.²⁴

²⁴A mixed objectual/intentional form of mental predication that often creeps into the literature is illustrated by 'John sees Mary as attractive' and 'John recalls of Mary that she is often late'. This mixed form captures much of the ψ ing's intentional content (insofar as ordinary-language relative clauses can do this), but still leaves importantly unspecified what aspect of that content is about the external object even while making the enigma of Aboutness an intrinsic ingredient of the events so denoted. Unlike most psychologists and philosophers, who employ this mixed locution in blythe ignorance of its special obscurities, Dretske (1981, Chapter 6) has recently made a valiant and clear-sighted even if (as I am prepared to argue in detail) unsuccessful attempt to legitimize it as basic to psycho-epistemology, rooted in a proffered account of its Aboutness selectivity.

Import. These Items sketch why any mental science must be carefully selective in the particular mental events it targets for explanation. But in aggregate they yield a more awkward conclusion: Scarcely any commonsense mental predicates are ideal for inclusion in a theory of mental mechanisms, and many are hopeless. No surprise in that: The core corpora of technical sciences seldom make much use of unrefined descriptive terms from ordinary language. Yet if ordinary language cannot provide an effective primary vocabulary for mental science, where do we find a superior alternative and why should we view it as "mental" at all? In particular, how can we liberate mental science from the vagaries of folk psychology's vernacular while doing Slese justice to its extraordinary grammar? For fully intentional thought ascriptions have a syntactic complexity far exceeding that of any basic predicates in the physical sciences; and commonsense would surely not have evolved speech forms so distinctively structured were there not important work for those to do.

The grammar of hard-core mentality.

Under presumption that what an advancing science of mind has strongest reason to retain from its folk-psychological origins are the grammatical forms distinctive of intentionality, let us provisionally stipulate, as a working directive, that the primary predicates of any effective mental science are to be generated by schemata broadly of para-mental form ' ρ_h s $F_j(a_k)$ ' which subsume commonsense mental predicates as special cases without being required to take their instances from any human language now in use. Generic form ' ρ_h s $F_j(a_k)$ ' seeks to liberalize the fully intentional ' ρ_h s that-p' schema of folk psychology as follows: (1) 'a_k' is a placeholder for a tuple of theoretical terms whose referents are paradigmatically concepts expressible by ordinary-language locutions but are more generally aspects of internal processes that are concept-like regardless of whether they play a role in any social communication system. When 'F_j(a_k)' is a psycholinguistic explication of some natural-language sentence S, the components of 'a_k' presumably include all terms or phrases in the reconstructed S that have individual entries in this language's lexicon, adjectives and other descriptive predicatives as well as nominals. Whether 'a_k' might also list logical operators and connectives such as 'some', 'all', 'and', 'or', 'not', and 'if/then', or indeed what a "lexicon" might be here in the first place, remain for negotiation. (2) 'F_j' demarks some adjustable "form" or "compositional structure" (Rozeboom, 1969), paradigmatically but not necessarily of the sort by which ordinary language combines the meanings of words/phrases into the meanings of sentences, under which 'F_j(a_k)' is a noun phrase which prima facie designates a proposition-like F_j-structured complex of concepts respectively designated by the components of 'a_k'. Any para-logical operators and connectives in F_j(a_k) that cannot be formalized as components of a_k are treated as aspects of F_j. E.g., it may seem preferable to parse ' believes that John is a clod but his sister is gorgeous' as a credence-moded embedding of <John-concept, clodhood-categorizer, John-concept again, female-sibling-descriptor, gorgeousness-qualifier> in the form ' is a but 's is ' than

to put the but-notion on the concept list while making a gap for it in the form. (In practice, however, we should not expect our technical form/concept compounds to resemble surface English at all this closely.) (3) Finally, ' ϕ_h ' is a verb-phrase placeholder whose paradigm instantiations address modes of para-mental operation more or less of a kind with the targets of ordinary-language Psi-verbs.

Just what it means to characterize the predicates of a mental science Σ_μ by conditions (1)-(3) is a foundational issue of Σ_μ 's metatheory that cannot be clarified apart from specific *laws in which these predicates are conjectured to participate. Suffice it to note (a) that the metatheory of Hullian Habits vs. Tolmanian Means-ends-readinesses overviewed in Rozeboom, 1970 pp. 103ff., exhibits at a much simpler level of complexity the role of a psychonomic predicate's formal structure, and (b) that one important feature of this predicate complexity is that the various modes/structures/content-elements individually admitted by Σ_μ into specific instances of this three-faceted schema recombine under certain constraints into other primary Σ_μ -predicates also subsumed by this schema. The "constraints" envisioned here largely concern which alternatives for concept tuple a_k can be admissibly structured by a given F_j , since $F_j(_, \dots, _)$ presumably puts conditions on how its blanks can intelligibly be filled. In contrast, there is no evident reason why all admissible para-modes $\{\phi_h\}$ should not admissibly combine with all admissible para-cognitive contents $\{F_j(a_k)\}$.²⁵

²⁵Some commonsense modings of some ordinary-language propositions seem bizarre. E.g., although we can believe or disbelieve that 7-times-9-equals-63, and in arithmetic practice can hope or fear this as well, no one in his right mind would endeavor that 7-times-9-equals-63. But the latter's oddity arguably lies not in any conceptual incoherence but only in our conviction that arithmetic states-of-affairs are impervious to our actions. Whether trying-to-bring-it-about-that-p seems impossible only to a thinker who deems himself powerless to succeed, or whether it is a logical requirement on endeavoring that one have some notion of how to begin, are concept-analytic delicacies with which mental science needs not be unduly exercised.

For an array of predicates satisfying conditions (1)-(3) to qualify as "mental," a fourth condition may also seem needed, namely, that from the psychonomic functioning of the properties these signify some "representational" relation should emerge by

analytic abstraction between Σ_{μ} 's para-propositions and other things/attributes/events by virtue of which, under favorable supporting circumstances, some $\phi_{h \text{ing}} - F_j(a_k)$ s are about the $\phi_{h \text{er}}$'s world in a manner akin to whatever commonsense intuitions when speaking of linguistic/conceptual signification. But to impose this Aboutness requirement on Σ_{μ} 's primary predicates at the outset is strongly counterproductive; for not until we have achieved considerable understanding of the psychonomics of para-cogitating without any appeal to representation/aboutness/signification will we be in position to develop some decent explication of paradigmatically human intentionality and its para-representational counterparts. ²⁶

²⁶ Even with Representation added to conditions (1)-(3), it is still moot whether these suffice to demark properties $\{ _ \phi_{h \text{s}} F_j(a_k) \}$ as "mental," or whether some detachable "raw feel" quality of inner experience is also required. (See Shoemaker, 1981, and others on "absent qualia.") But this issue, too, is premature for mental science. First we need to detail para-cognitive mechanisms that may or may not also be representational and raw-feely; only then can we profitably inquire into what in the latter may have been overlooked by the former.

For simplicity, I shall usually omit the 'para-' prefix when speaking of the para-mental, and will treat propositions supposedly expressed by ordinary-language sentences as paradigm instances of (para)-cognitive contents even though, for reasons already noted, what is common to the various everyday applications of a particular intentional Psi-verb complement is better viewed as a similarities disjunction or cogitative "role" (i.e., functional equivalence class) than as one specific embodiment of that role. But for serious development of any mental science, it is imperative that its conceptions of (para)-propositions and their structure/concept ingredients not be restricted to 'that'-nominalizations of the sentences by which we ourselves make assertions. To deal comprehensively with the mentation even of 20th Century adult Anglophone humans, much less with that of our maturational/cultural/genetic inferiors, mental science needs be able to study (para)-concepts that are not the meanings of any expressions in our own language, and (para)-syntactical structures that have no close counterparts in our own grammar--or at least should not preclude the very possibility of these by how we conceive of mentality.

Problems of dimensionalization:

It is relatively easy for an aspirant science to verbalize some finite subset of the primary predicates for which it desires to account. The really big step toward SLease proficiency, the main divide between amateur dabbling and serious science, is sorting these predicates into contrast sets identifying variables fit for participation in inductively accessible functional laws.

Because predicates can be contraries on many grounds other than being parallel nomic alternatives, dimensionalizing the logical space roughed in by some given predicate array is neither routine nor without risk of blunder. And the intricacy of intentional predicates makes definition of cognitive variables vastly more treacherous than is typical of physical science. To keep discussion manageable, I shall focus upon what emerges most naturally from folk psychology uncorrupted by Comp-speak; but this treatment should be viewed only as a benchmark against which to contemplate the merits of whatever alternatives can be made to seem at all plausible.

Let ' ϕ s F(a)' be some scientifically worthy mental predicate, say for determinateness ' believes^o that penguins are vipiparous', or ' hopes^o that the whales will be saved', or ' is trying not to yawn'. If this is to signify some value of a mental variable, what might be some other value of this same variable? To be manifestly parallel to the former, the latter wants predication as ' ϕ^* s F^*(a^*)' in which at least one of ' ϕ^* ', 'F^*', or 'a^*' differs from ' ϕ ', 'F', or 'a', respectively.²⁷ And for these to

²⁷Presumption that the contrastive values of a cognitive variable all manifest moded-content form is stronger than it may seem. For example, whether it allows ' believes that p' to signify the on-value of a default-binary depends on whether 'It is not the case that believes that p' can be equated either with ' believes that not-p' (which commonsense rejects) or with ' nonbelieves that p' with nonbelieving taken to be a cognitive mode independent of disbelieving.

be suitably contrastive, ϕ ing-F(a)-while- ϕ^* ing-F^*(a^*) must be impossible.
i.e., given F^* = F and a^* = a,
With cognitive content held constant, commonsense acknowledges at least two independent ways in which ϕ^* ing-F(a) can be disjointly alternative to ϕ ing-F(a).
One is illustrated by degrees of belief/disbelief. Although ordinary language

distinguishes these only by fuzzy categories, e.g., feels-certain, is-fairly-confident, believes, suspects, is-uncertain, doubts, is-rather-sceptical, utterly-disbelieves, etc., we also find it natural to ask how strongly a believes or disbelieves that-p, thereby envisioning a fine ordering of belief strengths which philosophical confirmation theory idealizes as a continuum of "subjective probabilities." Similarly, intuition does not dispute that ordinary-language modes of desire (yearning, hoping, wanting, indiffering, disliking, fearing, dreading, etc.) span subranges on a bipolar metric of optative valuations. But any grade of belief^e-that-p is compatible with any of desire^e-that-p.

A quite different way in which $\beta^*\text{ing-}\underline{F}(\underline{a})$ can contrast with $\beta\text{ing-}\underline{F}(\underline{a})$ is intensity of activation. Although introspection is vague on this point (as it is about most things), phenomenal experience assures me that I can believe^e that penguins are viviparous, or hope^e that the whales will be saved, in the same grade of credence or desire throughout a period of time during which the liveliness/vibrancy/vigor of this particular cogitation's arousal in me varies from moment to moment, sometimes commanding the foreground of my attention but more often fading to a wispy blur at the fringe of my awareness or vanishing from it altogether. There is a close parallel here to the quality and loudness features of aural experience: Entertaining a particular cognitive content in a particular graded mode is like hearing a tone of specific pitch and timbre, whereas the intensity of a moded content's activation is counterpart to tonal loudness.

Before regimenting these mode-and-activation contrasts, we should also consider whether a same-dimension alternative to $\beta\text{ing-}\underline{F}(\underline{a})$ might be some $\beta\text{ing-}\underline{F}^*(\underline{a}^*)$ with the same specific mode β but a content $\underline{F}^*(\underline{a}^*)$ different from $\underline{F}(\underline{a})$. Two prospects deserve consideration here. One is that $\beta\text{ing-}\underline{F}(\underline{a})$ and $\beta\text{ing-}\underline{F}^*(\underline{a}^*)$ might be contraries if contents $\underline{F}(\underline{a})$ and $\underline{F}^*(\underline{a}^*)$ clash in some salient para-logical way. For example, it does not seem right that I could simultaneously believe^e, or hope^e, both that the whales will be saved and that they will not be. But clearly this is not true of all graded modes even for the most antagonistic contents; e.g., I can easily be

unsure^e, or uncaring^e, both that p and that not- p . Although standards of rationality urge constraints on the respective degrees to which I simultaneously believe^e, or desire^e, the various propositions in a set of logical contraries (e.g., my simultaneous subjective probabilities that- p and that-not- p ought to total unity), this is only a normative ideal which presumably requires special supporting conditions to bring off even approximately. So we have no strong reason to think that (para)-logical conflict between $\underline{F}(\underline{a})$ and $\underline{F}^*(\underline{a}^*)$ ever suffices for ϕ ing- $\underline{F}^*(\underline{a}^*)$ to be a parallel nomic alternative to ϕ ing- $\underline{F}(\underline{a})$.

Still, the possibility remains that when $\underline{F}^*(\underline{a}^*) \neq \underline{F}(\underline{a})$, ϕ ing- $\underline{F}^*(\underline{a}^*)$ might preclude ϕ ing- $\underline{F}(\underline{a})$ simply because no more than one (para)-cogitation, or at least only one ϕ ing, can be episodically active in the same subject at the same moment. (This is the prospect that would ^{justify Comp-speak} \wedge treatment of mental contents as alternative states of a mental register.) Despite what appear to be severe limits on coincident awarenesses ("attention span"), however, these are not so stringent as to preclude simultaneous ϕ ing- $\underline{F}^*(\underline{a}^*)$ and ϕ ing- $\underline{F}(\underline{a})$ with the rigidity required for these to be contrastive values of the same variable, not even when ϕ is a high-arousal awareness. Pending an advance of mental science far beyond introspective first-approximations, therefore, we want the alternative values of any one mental variable to differ only in details of mode and arousal, not in content. Attention-span phenomena remain a major target of explanation; but these need to be pursued in the fashion of accounting for patterns of synchronic covariation (more on this below), not swept away by an unrealistic idealization of cognitive dimensionality.

Our simplest provisional format for mental variables thus envisions a tuple $\underline{\Phi} = \langle \phi_1, \dots, \phi_r \rangle$ of "open" modes, each of which is a dimension of grade alternatives, and a set \underline{C} of cognitive contents such that for each $\underline{F}(\underline{a})$ in \underline{C} and each component ϕ_i of $\underline{\Phi}$, there is a mental variable $[\phi_i \underline{F}(\underline{a})]$ whose value for each subject-stage \underline{g} -at- \underline{t} in its domain is a 2-tuple $\langle \underline{d}, \underline{y} \rangle$ such that \underline{g} -at- \underline{t} is ϕ_i ing $\underline{F}(\underline{a})$ in \wedge (i.e. grade) \underline{d} at arousal level (i.e. vigor) \underline{y} . (I shall use the terms 'open mode' and 'mode dimension' more or less interchangeably; while in correspondence to the ambiguity of Psi-verbs

in everyday usage, 'mode' without qualification will denote either an open mode or a particular grade thereof depending on context.) The open modes collected in Φ will be more than just some reconstruction of believing^e and desiring^e; there should also be versions of, inter alia, intending^e, endeavoring^e, and an assortment of more subtle components hinted at by fictive "imagining" and passive "wishing." (How perceiving and remembering may figure in Φ we shall contemplate later.) But even though commonsense Psi-verbs should demark fuzzy regions of Φ -space, the latter's primary axes need not correspond closely to open modes already well discriminated by ordinary language. For example, it seems entirely possible that what the philosophy of credence idealizes as a linear ordering of belief-strengths may in fact be a metric space of higher dimensionality; and the same is even more likely for desire and endeavor.

Given that each content $F(a)$ in C combines admissibly with each open mode ϕ_i in Φ , the array $\{[\phi_i F(a)]: i = 1, \dots, r\}$ of cognitive dimensions with the same content $F(a)$ can be expressed as a compound variable $[\Phi F(a)]$ whose value for any g -at- t in its domain is an r -tuple of degree/vigor 2-tuples $\langle d_1, y_1; \dots; d_r, y_r \rangle$.^{27a} Formally, this compounding is trivial; yet it makes evident a psychonomically important alternative for how arousal may interact with mode. This is the prospect that for each g -at- t , the arousal of $[\phi_i F(a)](g$ -at- $t)$ for fixed content $F(a)$ in the i th mode is necessarily the same, given a suitable choice^m of arousal scales, for each $i = 1, \dots, r$. if that is so, each value $\langle d_1, y_1; \dots; d_r, y_r \rangle$ of compound variable $[\Phi F(a)]$ can be reformulated as the $(r+1)$ -tuple $\langle d_1, \dots, d_r; y \rangle$ ($y = y_1 = \dots = y_r$), so that $'[\Phi F(a)](g$ -at- $t) = \langle d_1, \dots, d_r; y \rangle'$ asserts that g -at- t is d_1 -degree- ϕ_1 -ing-and-...-and- d_r -degree- ϕ_r -ing $F(a)$ at arousal level y . This latter formulation portrays each g -at- t as entertaining the $F(a)$ idea in far more unitized fashion than does the former--a single arousal of this content in one complex integrated mode vs. many concurrent arousals of $F(a)$ in separated simpler modes--and suggests models of mental dynamics rather different from what comes naturally to the other. Still another prospect is that only proper subsets of $\langle [\phi_1 F(a)], \dots, [\phi_r F(a)] \rangle$ are unitized in this way, with the mode groupings possibly

27a Present notation ' $\phi_i F(a)$ ' and ' $\Phi F(a)$ ' for cognitive variables departs from the typeface convention for variables otherwise followed throughout this essay. You will tolerate this inconsistency cheerfully if you contemplate the notation required to avoid it.

conditional on details of $F(a)$. Introspection seems helpless for adjudicating among these alternatives, and an epistemically responsible science of cogitation needs to give them all a fair hearing rather than allowing Comp-speak or some other metaphor predilection to beg the question.

The numerosity of cognitive variables.

The commonsense intuition, that any a who believes^e, hopes^e, or endeavors^e that- p to some particular degree d at a given moment cannot also do so to some other degree, is captured for each cognitive content $F(a)$ by formalizing mode gradations as (part of) the contrastive values of the variables in compound $[\Phi F(a)]$. Although there is reason to suspect, commonsense notwithstanding, that these exclusions may be premature, e.g., that quite possibly a subject can in fact believe^e/hope^e/endeavor^e that- p to more than one degree simultaneously (see below), there remains hope that any such multiplexing of commonsense cogitations can be handled within the $\{[\Phi F(a)]: F(a) \in C\}$ dimensionalization of mental variables by finer distinctions among open modes that do not vastly increase the number r of components in Φ . But that still leaves us with a mentation space of enormous dimensionality; namely, one that includes a different r^* -dimensional subspace (where r^* is between $2r$ and $r+1$, dependent on how modes are integrated by arousal) for each different content $F(a)$ in C . This is more than a practical problem of large-inventory bookkeeping; rather, it confronts us with a dimensional unboundedness whose management requires a style of theorizing alien to Comp-speak.

Unbounded ^{dimensionality} \wedge becomes an issue when a mental science Σ_μ whose primary cognitive variables are $\{[\Phi F(a)]: F(a) \in C\}$ of its intended content undertakes to individuate the elements \wedge set C . The problem is evaded if Σ_μ verbalizes a finite content list and declares either that this exhausts C or that any effects of modings of unlisted contents are absorbed into the undifferentiated input residuals of Σ_μ 's *laws. But that evasion would be an admission of incompetence: Any mental science worthy of the name needs a conception of cognitive contents at least as articulate as the one proffered by folk psychology. According to the latter, every proposition expressible by some

sentence in an acknowledged language, English or otherwise, is an admissible content of
--i.e., equivalence class--
graded belief/desire/etc. (or is a role-type / thereof) even if its ease of arousal
may be a decreasing function of propositional complexity. If Σ_{μ} 's own technical
language is to be adequate to its task, it must include a procedure for generating
unboundedly many specifications of \underline{C} -instances, some but far from all of which
should be roughly in many-one correspondence with the various sentences of English
(many-one to provide for multiple role embodiments as needed). Though details of
this production are metatheoretically important, it suffices here to mention only
that many contents in \underline{C} will undoubtedly need description by Σ_{μ} in terms of their
metricizable relations to other \underline{C} -instances identified previously, just as we dis-
tinguish an infinitude of stimulus lengths, shapes, hues, intensities, etc. by
numerical comparisons to standard stimuli of the relevant kinds. This has the Comp-
speak confuting implication that for many contents $\underline{F}(\underline{a})$ in \underline{C} , there may well be
arbitrarily many other contents $\underline{F}'(\underline{a}')$ in \underline{C} within any given nomic-similarity
distance of $\underline{F}(\underline{a})$ in the way, e.g., that sensory qualities can differ by arbitrarily
small degrees.

The essential point here is that Σ_{μ} must view the mental state of any given
subject at any particular moment as a simultaneous infinity of moded contents, even
if the vast preponderance of these are at null arousal. And to model the dynamics
of this mental system, Σ_{μ} must conjecture how \underline{g} 's value on each of these infinitely
many mental dimensions is brought about at time $t+\Delta$ by \underline{g} 's total mental/nonmental
infinite-dimensional system state and input at t . In principle, this task is far
from insurmountable; indeed, through use of *law schemata it might even be relatively
straightforward. (Hullian principles of learning as reviewed in Rozeboom, 1970 pp.
109-118, are a good example despite their imperfections of detail.) But it makes
a pervasive "parallel processing" formulation of mental dynamics not just operat-
ionally expedient but theoretically mandatory.

Further expansion of the system dimensions admitted by mental science Σ_{μ}
arises from its need for mental-reactivity factors. When \underline{g} \neq \underline{g}_1 's $\underline{F}(\underline{a})$ in degree/vigor

$\langle \underline{d}, \underline{v} \rangle$ at a given moment $\underline{t} + \Delta$, this is due not merely to external stimuli and internal cogitations active in \underline{g} at \underline{t} , but also to more stable properties of \underline{g} at \underline{t} that explain why \underline{g} 's $[\underline{\rho}_1 \underline{F}(\underline{a})]$ -wise response to this passing input/ideational antecedent is specifically $\langle \underline{d}, \underline{v} \rangle$ rather than what it would be in some other subject or at some other time in \underline{g} 's own history. Almost certainly Σ_u will have to pass through, and perhaps never wholly abandon, a stage of theorizing that envisions, for each mental or nonmental momentary-process variable $x_{\lambda h}$ that helps elicit cognitive variable $[\underline{\rho}_1 \underline{F}(\underline{a})]$, another variable $[x_{\lambda h} \rightarrow \underline{\rho}_1 \underline{F}(\underline{a})]$, less episodic than $x_{\lambda h}$ but having dynamics of its own, whose graded value for \underline{g} at \underline{t} is a local parameter in the momentary-process law under which event $[x_{\lambda h}; \underline{g}\text{-at-}\underline{t}]$ works to bring about event $[[\underline{\rho}_1 \underline{F}(\underline{a})]; \underline{g}\text{-at-}\underline{t}]$. That is, $[x_{\lambda h} \rightarrow \underline{\rho}_1 \underline{F}(\underline{a})](\underline{g}\text{-at-}\underline{t})$ is \underline{g} 's idiosyncratic propensity (disposition) for reaction to on levels of $x_{\lambda h}$ at \underline{t} by one specific $[\underline{\rho}_1 \underline{F}(\underline{a})]$ -value rather than another.²⁸ These

²⁸This sketch of cognitive propensities is extremely crude, but to say more would require expansion first upon Rozeboom, 1965 pp. 340-342, and then upon the advanced complexities in Rozeboom, 1978 p. 519f. Meanwhile, note that some major psychonomic examples are (a1) classical associations of ideas, (a2) Pavlovian reflexes, and (a3) Hullian Habits, all of whose strengths profess to explain subject-specific tendencies for some stimulus or antecedent idea to arouse a particular response or consequent idea, and (b) Tolmanian Means-ends-readinesses $\{S_1 R_j S_k\}$ which determine the subject-specific tendency of response R_j to be activated by stimulus S_1 's perceptual arousal together with the incentive value of stimulus S_k (cf. MacCorquodale & Meehl, 1954).

propensity-to-cogitate variables, which are the first-step technical replacements for commonsense "latent" Psi-verbings, not merely abound qua dimensions as transfinitely as do the dimensions of episodic cogitation which they help to explain, but the number of these on which any given $\underline{g}\text{-at-}\underline{t}$ has appreciably non-null values appears likewise to be transfinite. That is, there is no evident counterpart of attention span for synchronic possession of mental dispositions.

To be sure, the patterns of covariation across this infinitude of cognitive propensity variables should be strong enough for the latter in turn to be replaced or at least explained by a much smaller, with luck finite, array of common causal source-variables or abstraction bases. But in the natural course of theory development, a science of ρ ings pretty well has to acknowledge and account for individualistic

dispositions to ϕ before it can figure out how to supercede them.

Problems of domain.

What things have mental properties? E.g., what are the entities of which '___ believes that penguins are viviparous', or '___ hopes that the whales will be saved', or '___ is trying not to yawn' might be true? The vacuous commonsense answer, "intelligent beings at particular times," does not even hint at the issues; and neither is it my intent to address these comprehensively here. In particular, I shall ignore the domain problem that has been most prominent in recent philosophical psychology (cf. Block, 1980), namely, whether mental predicates properly apply--and if so, how--to reactive systems functionally isomorphic to you and me at the level of commonsense molar abstractions even when their micro-embodiments of that functionality is very different from ours. (Pp. 113-123, above, has already done its share for this issue's foundations by airing the rationale of colligating molar variables over micro-structurally diverse species.) But the question of where mental events are really located has considerable psychonomic salience.

Ordinary language's attribution of believing^e/hoping^e/etc.-that- ϕ to John-now need not be construed as insistence that now is an interval of zero duration or that the entirety of John's being throughout this moment (e.g., not merely his brain but also inter alia his viscera and toenails) participates essentially in this occurrence. Indeed, commonsense psychological subject terms are not only referentially obscure but perhaps systematically ambiguous.²⁹ So one aspect of defining a cognitive

²⁹For example, does the first-person singular have common reference throughout the assertions 'I wish I were better looking' and 'I weigh more than I think I should'? Or is there a mind/body distinction suppressed here that should be unpacked as 'My mind (or self, or persona, or ?) wishes that my face were more attractive' and 'My body weighs more than my mind thinks it should'. Personally, I consider opposition to the equation My-self = I = My-body to be a vestige of spiritualism that well merits all the neglect which modern psychology has given it. Even so, there are subtleties here that still need explication.

variable [$\phi_1 F(a)$] is deciding upon the spatio-temporal boundaries of the objects taken to compose its domain. Now as observed in Chapter 1, Slese translocation

formalisms give us great flexibility in our choice of manifest domains for our variables. So presume for ease convenience and congruence with ordinary language that our official domain of cognitive variables $\{\{\underline{F}(\underline{a})\}: \underline{F}(\underline{a}) \in \underline{C}\}$ is some set \underline{D}_i of instantaneous stages of the corporeal entirety of certain cognizant organisms, whatever that might mean. We are then positioned to ask what are the "real" variables of which these are translocations. For example, when Mary hopes^e at 3:36 p.m. today that the whales will be saved, what is the true region of spacetime (if that is what causal loci most fundamentally are) from whose properties this hoping^e is an abstraction?

T-cores: The undoing of translocations.

The notion of an event's "true" location evidently needs clarification. For any variables z_λ and z_λ^* (or compounds Z_λ and Z_λ^*), mental or otherwise, say that z_λ^* is a t-reduction of z_λ iff (a) $z_\lambda = [z_\lambda^* \underline{f}]$ for some translocation function \underline{f} , while moreover (b) each z_λ -event is analytically due (superveniently, by t-derivation) to the corresponding z_λ^* -event.

For example, h_λ : Height is a t-reduction of $h_{\lambda\sigma}$: Father's-height-at-birth; while both of these are t-reductions of $h_{\lambda\sigma\phi}$: Maternal-grandfather's-height-at-mother's-birth. Why this definition's second clause may not be redundant with its first is explained in Note 3, p. 84a.

We can then stipulate that z_λ^* is the t-core of z_λ iff z_λ^* is a t-reduction of z_λ that has no further t-reduction of its own. (This does not preclude a t-core variable z_λ^* 's supervening on still other variables; it only implies that there is no a/t-analysis $z_\lambda^* = [g_\lambda^* \underline{f}]$ of z_λ^* , with g_λ^* supervenient upon X_λ , in which \underline{f} is not an Identity function.) Take on faith that this definition suffices for any t-reducible variable to have just one t-core. Finally, when z_λ^* in $z_\lambda = [z_\lambda^* \underline{f}]$ is a t-reduction (or t-core) of z_λ , with \underline{D} the domain of z_λ , say that $\underline{D}^* =_{\text{def}} \underline{f}\underline{D}$ is a t-reduced (or t-core) domain of z_λ (i.e., \underline{D}^* comprises all \underline{q}^* such that $\underline{q}^* = \underline{f}(\underline{q})$ for some \underline{q} in \underline{D}), while for any \underline{q} in \underline{D} the event $[z_\lambda^*; \underline{f}(\underline{q})]$

is a t-reduction (or the t-core) of event $[z; \rho]$ ($= [z^*f; \rho]$). Then for any event we have initially conceived as ρ 's having value $z(\rho)$ of variable z , establishing that $[z; \rho]$ has t-reduction or t-core $[z^*; f(\rho)]$ gets closer to the underlying nature of $[z; \rho]$ in the way, e.g., that the inner reality of Spratt's having a fat wife is Mrs. Spratt's being fat. And if $[z^*; f(\rho)]$ is the t-core of $[z; \rho]$, $f(\rho)$ is the true locus of $[z; \rho]$ even though $f(\rho)$ may still be a compound object from whose parts' properties and relations $[z^*; f(\rho)]$ is abstracted.

When z^* is the t-core of some given t-derivative variable $z = [z^*f]$, we can say roughly that for any ρ in z 's domain, the causal issue of event $[z; \rho]$, i.e. of $[z^*f; \rho]$, is just the yield of $[z^*; f(\rho)]$. Thus, what comes of Spratt's having a fat wife results foremostly from Mrs. Spratt's being fat. But $[z; \rho]$'s force may also go beyond that. For, ρ 's-having-property- $[zf](\rho)$ combines $f(\rho)$'s-having-property- $z^*(f(\rho))$ with $f(\rho)$'s also satisfying the conditions needed for it to be ρ 's f -relatum; and the latter may well include or be diagnostic of other events that are preconditions for or supplemental influences on the effects for which $[z^*; f(\rho)]$ shares lawful responsibility. Thus when an object a , which happens to be John's left elbow, is swollen, the t-derivative event of John's-having-the-property-that-his-left-elbow-is-swollen enriches a 's being swollen by a 's being elbowish in character while standing in certain structural relations to other parts of a macro-object so organized that the left-elbow-of translocator can map it into a .

To appreciate the prospective structural import of a t-reducible variable's translocation constituent, observe that $[zf; \rho]$ might be all or part of a t-derivative event $[X_{\mu_k}; \rho]$ wherein ρ is a complex object of a kind \underline{C} structurally analyzable in accord with Def. 2 (p. 105) while translocator μ_k is a module selector on \underline{C} that maps ρ into some part $\mu_k(\rho)$ of ρ that satisfies the preconditions \underline{D}_k of a law \underline{L}_k in the micro-causal structure of \underline{C} -kind objects. Then macro-system event $[X_{\mu_k}; \rho]$ gives rise to a macro-system effect $[y_{\mu_k}; \rho]$ by virtue of the former's having a local-event t-core (or at least t-reduction)

$[\underline{X}_k; \mu_k(\underline{Q})]$ whose local effect under micro-law L_k is $[\underline{y}_k; \mu_k(\underline{Q})]$. But that effect would not have been forthcoming from $[\underline{X}_k; \mu_k; \underline{Q}]$'s t-core, or at least would not be predictable from \underline{Q} 's being of kind \underline{C} , were not the modules selected from kind- \underline{C} objects by translocator μ_k of micro-causal kind \underline{D}_k .

Even so, when \underline{z}^* is the t-core of $\underline{z} = [\underline{z}^*; \underline{f}]$, the locus whose properties genuinely matter for molar event $[\underline{z}; \underline{Q}]$'s having its supervenience-accredited causes/effects is just $\underline{f}(\underline{Q})$; and that remains true even when $\underline{f}(\underline{Q})$'s being the \underline{f} -relatum of \underline{Q} supplements $\underline{z}^*(\underline{f}(\underline{Q}))$ by additional features of $\underline{f}(\underline{Q})$ salient to the causal context within which $[\underline{z}^*; \underline{f}(\underline{Q})]$ is operating. Moreover, as illustrated by the translocators that pick individual objects out of statistical samples, much of $\underline{f}(\underline{Q})$'s \underline{f} -connection with \underline{Q} may well have no causal significance whatever.

The summary point to be taken here is that although the translocational ingredients in a t-derivative variable $\underline{z} = [\underline{z}^*; \underline{f}]$ may well have a causal import which enhances that of \underline{z} 's t-core \underline{z}^* , the nature of \underline{f} 's contribution to \underline{z} 's molar force is generally quite different from that of \underline{z}^* , reflecting the contrast between a micro-law's locus structure or domain preconditions on one hand and its variables on the other. So when our original conception of molar variable \underline{z} does not make plain its a/t-derivational makeup, an important part of our learning how \underline{z} works in systems that include it is teasing apart what is at \underline{z} 's t-core from where, in terms of assembly structure keyed to \underline{z} 's translocator, this t-core is positioned within the system.

How might cogitations be localized?

Returning specifically to the variables of mental science, we can be confident that cognitive variables defined over the domain \underline{D}_μ of ~~cognizant organisms'~~ complete instantaneous stages are t-reducible. For if \underline{f}_{ns} is the translocator that maps each \underline{g} -at- \underline{t} in \underline{D}_μ into the totality just of \underline{g} 's neural and sensimotor tissue at \underline{t} , surely $\underline{f}_{ns}\underline{D}_\mu$ is a t-reduced domain of most cognitive variables over \underline{D}_μ . But what are the

t-cores and t-core domains of the latter? Evidently this is for future research to decide. But its adjudication needs guidance by a panoptic view of its possibilities.

For one, if D_{ijk}^* is the t-core domain of cognitive variable $[\phi_j F_j(a_k)]$, in all likelihood the loci in D_{ijk}^* have temporal widths of appreciable duration---perhaps no more than seconds or even milliseconds, but far from negligible in comparison to the pacing of neurophysiological events. Thus, the t-core of John's-believing^e/hoping^e/endeavoring^e-at-t-that-p may well be a-derivative from a sequence of micro-events whose temporal patterning is partly constitutive of this mentation. And for all we know, the t-core durations of mental events may vary enormously with details both of their modes and their contents. It may, for example, take inherently longer to endeavor^e-that-p than to wish^e-that-p. And whereas it seems that one can perceive that the window is broken almost instantaneously, perceiving that the fuel truck spun on the ice and rolled over twice before exploding may take as long as the process observed. Or then again it may not: Possibly the percept builds up gradually, but culminates in an instantaneous apprehending of the whole. Be this as it may, the more severely objects in one t-core domain differ in their temporal span and other micro-assembly features from objects in another, the poorer are our chances that laws governing mental events having t-core loci in the first are inductively informative about laws governing events with t-core loci in the second. For this reason, a mental science Σ_μ that seeks to formulate open classes of mental laws (which is the only way to account for an infinitude of mental variables) can expect its *law-schemata to succeed only if they impose rather specific assembly-structure preconditions on their t-core domains---except, of course, Σ_μ will not know at the outset what constraints are needed, but will find instead that its inductive generalizations seem to apply only to restricted subsets of the cognitive variables originally intended for study, and only later, with luck, will develop perspicacity into how this breakdown of generality derives from t-core inhomogeneities of cognitive assembly structure. Meanwhile, it behooves Σ_μ to learn all

that it can about the spatio-temporal layout of those organism-parts that are the t-core loci of its chosen mental events. For these details are bound to figure importantly both in what sorts of systemacies Σ_{μ} can work out for these events, and in what may or may not be plausible reductions of Σ_{μ} 's basic cognitive variables to variables conceived by neurophysiology or other worthy theories of psychonomic mechanism less molar than Σ_{μ} .

Location differences in credal style: Some heuristic speculations.

The foregone certainty that the t-core of any cognitive event

$\Gamma[\rho_{ij}F_j(a_k)];g-at-t]$ is an event $\Gamma[y_{ijk}^*;f_{ijk}(g-at-t)]$ whose locus $f_{ijk}(g-at-t)$ is just a smallish part of g during some interval t^* circa t raises the prospect that there may well be a plurality of g -during- t^* parts, additional to $f_{ijk}(g-at-t)$, that are likewise in the domain of this same t-core variable y_{ijk}^* and are hence the loci of events which, at core, are of the same kind as $\Gamma[\rho_{ij}F_j(a_k)];g-at-t]$. It is best to be specific on this point by considering how it may help to explain the differences among, inter alia, perceiving, remembering, and believing. We shall require some preliminaries before this location conjecture can be brought forth; but the perceiving-vs.-remembering-vs.-believing issue is of considerable psychonomic importance regardless of how speculative may be its resolution in terms of localization.

Upon reflection, perceiving-that-p, remembering-that-p, and believing-that-p seem so similar in their containment of doxastic assent that the larger puzzle is what folk psychology finds to distinguish in them. We can call their differences a contrast in "credal style," and illustrate it further by hearing vs. smelling vs. seeing vs. recognizing vs. deducing vs. intuiting, etc. Evidently, commonsense treats these style differences as aspects of cognitive mode. But how best to regiment and account for them within the mode/content dimensionalization of a Slesse-reconstructed space of mental-state alternatives remains unclear. Three prospects arise, all of which in various mixtures are plausibly the discriminanda of ordinary-language verbs of credence.

Firstly, for belief in the generic sense that is not restricted just to its variant cued to verbal expression (see below), '___ perceives that p' and '___ remembers that p' can both be understood to entail '___ believes that p' in either of two becauseal directions. One, that generic believing might be a supervenient disjunction of, inter alia, perceiving, remembering, and verbal credencing with nothing genuinely common to these specific modes, seems too far off the mark to warrant further attention here. More plausible is that perceiving-that-p, remembering-that-p, and other species of credencing-that-p are all believing-that-p variously conjoined with differentia, notably, activation by some species-distinctive sort of causal antecedent. Commonsense does indeed seem inclined to count a credencing-that-p as a "perceiving" only if it has been evoked by stimulation from something referred to by the that-p proposition, or as a "remembering" only if its arousal has been potentiated by an enduring residue of some prior believing^e-that-p; and concern for origins also seems prominent in many other ordinary-language verbs of credence (e.g., deducing vs. intuiting). If this were all that distinguishes perceivings and rememberings from other ~~believings~~, however, the former's addenda would be irrelevant to the psychonomic import of perceivings^e vs. rememberings^e vs. nonsensuous believings^e once these are aroused, contrary to our intuition that perception and perhaps memory drive consequent mentation with an urgency much fiercer than the gentler promptings of intellectualized belief. Source differences alone seem insufficient to explain our introspective discriminations among credal styles. Even with causal origins discounted, perceivings and many instances of remembering appear to contain distinctive bases--call them perceivings^b and rememberings^b--that contrast with the credal style--call it believing^v--more or less common to verbal beliefs, i.e., to believings-that-p evoked by linguistic stimuli which express that-p.

Secondly, origins aside, perceiving^b-that-p, remembering^b-that-p, and believing^v-that-p may differ in how their contents embody the that-p cognitive role. Phenomenally, percepts have a brightly sensuous quality (further divided among sensory submodalities)

that the contents of believings^v conspicuously lack, while mnemonic contents seem spread between those extremes. Let us speak metaphorically of mental "material" which can be shaped like putty into many different cognitive contents, and conjecture that there are diverse kinds of this material, some sensuous while others are more colorlessly ideational. We can then envision that classification of cognitive contents by material cuts across their classification by cognitive "role" in such fashion that perceiving^b/remembering^b/believing^v-that-p analyze as a common credencing of different contents which all share the that-p role but are composed of sensory-stuff vs. memory-stuff vs. verbal-idea-stuff. (This suggestion is absurd if taken too literally, since whatever cognitive contents may be they are surely not formed from substances. But stripped of its metaphor, the proposal is merely that there may be some introspectively salient contrast among cognitive contents that cross-classifies with role.)

Finally, it is entirely possible that some or all of g-circa-t's perceiving^b-that-p, remembering^b-that-p, and believing^v-that-p are different locusings of values on the same local credence-that-p variable. Roughly speaking, the idea is that different parts of g may simultaneously entertain that-p in grades of credence that may or may not be the same for all. But to put this properly requires a bit of care. Let ρ_g be an open mode that reconstructs commonsense degrees of perceptual assurance (or better, some particular sensory submodality thereof), while ρ_m and ρ_v do the same for degrees of memory and verbal belief, respectively.³⁰ Then for any

³⁰Acknowledging degrees of credence within style prompts the observation that whereas my perceiving that-p or remembering-that-p can come in various grades of confidence, I do not seem able to disperceive or disremember that-p in the way that I can disbelieve that-p. But I can perceive or remember that-not-p, which may or may not be tantamount to the other. Is disbelieving-that-p essentially the same as believing-that-not-p? (I think not, but am willing to be persuaded otherwise.) Or is ordinary language correct to hold that grades of belief are bipolar in a way that grades of perceiving and remembering are not? I suspect that insight into this matter may importantly illuminate the machinery that runs our cogitations. At the very least it reinforces my suggestion elsewhere (Rozeboom, 1972b, p. 46) that linguistic control of ideation separates determination of mode and content in a way that cannot occur, or at least generally does not occur, in nonlinguistic cognitive arousal.

content $\underline{F}(\underline{a})$, it is possible that (a) variables $[\rho_{\underline{g}}\underline{F}(\underline{a})]$, $[\rho_{\underline{m}}\underline{F}(\underline{a})]$, and $[\rho_{\underline{v}}\underline{F}(\underline{a})]$ all have a common t-core y^* whose domain includes many different parts of \underline{g} -circa- \underline{t} for each \underline{g} -at- \underline{t} in \underline{D}_{μ} , while (b) the translocators $\underline{f}_{\underline{g}}$, $\underline{f}_{\underline{m}}$, and $\underline{f}_{\underline{v}}$ under which perceiving^b, remembering^b, and believing^v are respectively t-derivative from y^* pick out distinctively different parts of \underline{g} -circa- \underline{t} wherein y^* -events occur. Thus, y^* might be a local-credencing ξ of content $\underline{F}(\underline{a})$ --i.e., $y^* = [\xi\underline{F}(\underline{a})]$ --such that each local object \underline{g}^* -during- \underline{t}^* which ξ s $\underline{F}(\underline{a})$ to some particular degree and arousal is not an entire \underline{g} -during- \underline{t}^* but any part thereof having the requisite local assembly structure. For example, parts of \underline{g} whose stages all have their own individual values of $\underline{F}(\underline{a})$ -credencing might be different brain regions or cortical layers of the sort to which neuro-anatomy texts give names; they might be Hebbian cell-assemblies; they might be not-necessarily-disjoint collections of \underline{g} 's molecules and inter-molecular spaces quite unlike anything heretofore conceived by any molar science; or they might even be entities having no spatio-temporal or micro-physical properties at all, just so long as translocation functions can pick them out in relation to \underline{g} -at- \underline{t} somehow. Whatever the nature of these t-core loci, it is then possible that $[\rho_{\underline{i}}\underline{F}(\underline{a})] = [[\xi\underline{F}(\underline{a})]\underline{f}_{\underline{i}}]$ for each $\underline{i} = \underline{g}, \underline{m}, \underline{v}$. That is, my perceiving^b that- \underline{p} , rather than remembering^b or believing^v it, might consist of my credencing that- \underline{p} in the perceptive part of my brain rather than in its mnemonic or verbal-belief part.

This hypothesis, that location may be what distinguishes one credal style from another, shades easily into the even simpler conjecture that the only thing common to the t-cores of perceiving^b/remembering^b/believing^v-that- \underline{p} is mode-free propositional content. That is, perhaps the t-derivational analysis of these credal styles should be simply $[\rho_{\underline{i}}\underline{F}(\underline{a})] = [[\underline{F}(\underline{a})]\underline{f}_{\underline{i}}]$ for $\underline{i} = \underline{g}, \underline{m}, \underline{v}$. Evidently this latter model can be extended to include any other open mode $\rho_{\underline{i}}$ as well--which is to say that the difference between cogitating a given content $\underline{F}(\underline{a})$ in one mode rather than in another might be simply where, among one's parts, the $\underline{F}(\underline{a})$ -concept is aroused. In either version, regardless of whether the t-cores of cognitive events are entirely

amodal, the translocational model of credal style makes plausible that g -at- t might actively credence that- p to one degree in one style while credencing it to a very different degree in another. Thus when I inspect the classic illusion of two horizontal lines on a radiating field, with cognitive results that ordinary language puts euphemistically as the h -lines appearing bowed to me despite my knowing otherwise, perhaps I should acknowledge more forthrightly that I (falsely) perceive^b that the h -lines are bowed even while I also disbelieve^v that this is so. (Or should we define away such intrapersonal doxastic inconsistencies by stipulating that my global episodic degree-of-belief-that- p is an arousal-weighted average of all my variously sited local credences-that- p , in the way we might assign a consensual degree-of-belief-that- p to an interpersonal epistemic community?)

T-reduction of cognitive variables over ^{whole-cognizer} domain D_u may also account for the phenomenal qualities that seem to distinguish, e.g., contents of perception from contents of verbal belief. If the t -cores of perceiving^b-that- p events are located in a different part of the organism than are the t -cores of believing^v-that- p , cognitive contents that embody the that- p role in the perceptive part of g -circa- t may easily have a specific character different from that- p contents in the part of g -circa- t that does believing^v. That is, if mental materials cut across cognitive role, location differences may cash out the "materials" metaphor. That still leaves "role" as a metatheoretic premise calling for fulfillment. But cognitive role should be largely some combination of isomorphic functional properties and causal coordinations (i.e., what affects what) that will be relatively straightforward to explicate whenever enough of the theory setting out those regularities is in hand.

(I should add that I have emphasized this suggestion, that differences among credal styles or even perhaps among all cognitive modes may analyze as differences in the locusings of mental events, only because its adjudication is an important challenge to cognitive theory, not because I personally find it attractive. Even so, it is not nearly so implausible as certain alternative hypotheses about cognitive t -cores that also merit consideration, such as that the

a/t-analysis of $[\underline{p}_1 \underline{F}_j(\underline{a}_k)]$ should have a form $[\underline{p}_1 \underline{f}_{jk}]$ treating each different content $\underline{F}_j(\underline{a}_k)$ as the address of a particular site within the thinker at which a tuple of modes is to be found. It may well turn out that location has little to do with cognitive mode--but if so, what else might be the nature of this crucial facet of mentation?)

There is little psychonomic novelty in the present t-reduction conjectures. Search for brain localization of mental functions is as old as psychology; and modern proposals of multiple "codes"--visual, auditory, or whatever--for the same "information" are tantamount to a location/role cross-classification of ideas. It is, however, important to be clear that localization needs not be confinement to some part of the organism that skillful surgery can excise, and to appreciate not merely that the system character of any variable z over whole organism stages may factor as $z = [z^* \underline{f}]$ between t-core and translocator, but also that z 's t-core z^* may be instantiated far more pervasively throughout each g-circa-t than at just the particular sites picked out by z 's translocator \underline{f} . In the latter case, if the psychonomic import of z within the global system is due primarily to context-independent effects of z^* , z will be an undistinguished member of an ensemble $\{[z^* \underline{f}_1]\}$ of functionally similar system variables having this same t-core. But if the particular loci of z^* -events selected by \underline{f} satisfy special subdomain constraints under which z^* has causal consequences it generally lacks elsewhere (cf. p. 102ff. on module selection and assembly laws), z will have a force within the global system picked out by its translocational constituent that cannot be ascertained just by study of z^* over its full regular domain. Either way, the significance of system variable z 's factoring into t-core and translocator is thoroughgoingly functional, and becomes an issue for theories of this system long before there is any point to concern for what may be the ontological nature of z 's t-core domain.

Coda: Why care?

It is one thing to overview mental science's conceptual problems in rarefied abstractions, but something else again to show profit from this at the level of substantive specifics. To be sure, writings no less grandly distanced than we have been from determinate mental phenomena have increasingly flooded the philosophy-of-mind and cognitive-science literature, so there must be an audience out there that finds such high-level metacognitive ruminations intrinsically rewarding. But I have insisted that present considerations aim at an applied payoff. How might that come about?

Ideally, we should now turn to some real-world mentations and demonstrate how the preparations above unfold into a well-Slesed account of these. But that furtherance would remain no less arduous and unassured than would pushing high-speed roadways through a virgin jungle in light of its aerial photographs. In either case the preparatory survey instructs us where to begin, which directions to favor, and what special obstacles to anticipate; but it can little expedite much less bypass the in-situ slogging that gets the job done, nor is it practical to accompany the survey report with samples of the actual construction. (Chapter 6 will in fact endeavor a small start on the Slesing of perception; but you will not be awed by our achievements there.) Nevertheless, it may be worth some repetition to conclude this Chapter by sketching how the Problems inventoried here obtrude in any honest effort to explain mentation, the implied lesson being that learning to recognize and cope with these when they arise makes progress in a science of mind somewhat less likely than otherwise to break down into unSlesed fibrillations.

Suppose that you are undertaking scientific study of why people think the way they do at particular times, with your interest directed especially at thoughts of a certain restricted kind that you will want to rough in at the outset by voicing category labels from folk psychology. (We have no entry to anything that intuits as "mental" save through the commonsense mind-talk that first calls it to our attention.)

Let us say, then, that you name "desires" as your chosen explananda (which you might further restrict by appending adjectival qualifiers whose illustration would serve no point here). Whatever your initial categorizing, this is just warm-up to your first SLeSe step in study of this topic, namely, writing down some paradigm examples of the commonsense predicates that in first-approximation, pending emendations that these will inevitably require, describe specific instances of the mental attributes you have targeted for study. Thus you might accept that one determinate thinking within the purview of Desire science is

___ hopes that the whales will be saved.

On the other hand, you may demur that this particular predicate was forced upon you earlier in this Chapter just to be an easy illustration without concern for whether it describes any desire that ever occurs in real life. And anyway, you need to contemplate a decent plurality of determinate desire-descriptions before you can grapple effectively with their dimensionalization. So suppose that by monitoring your real-world discourse you collect a list of sentences that you have actually used to express passing desires, say inter alia

I want the lime sherbert

and

I wish they would get on with it .

And now the Problems commence. Do these predicates as recorded really seem suitable to describe the output of one or another scientific law of desire? Are you willing to put any serious effort into fleshing out the placeholders in schematic law-fragments

$$\left. \begin{array}{l} \underline{LF}_e : \\ \underline{LF}_g : \end{array} \right\} \text{ For any cognizant subject } \underline{s} \text{ at any time } \underline{t}, \text{ if } \underline{s} \text{ satisfies back-} \\ \text{ground preconditions } \mathcal{P} \text{ at time } \underline{t}, \text{ and } \underline{s} \text{ has state } \underline{X} \text{ at } \underline{t} \\ \text{of desire-determinants } \underline{X}, \text{ then (probably) } \underline{s}'\text{s value of desire-} \\ \text{variable } \left\{ \begin{array}{l} \underline{y}_e \\ \underline{y}_g \end{array} \right\} \text{ at } \underline{t} \text{ is } \left\{ \begin{array}{l} \underline{\text{wanting the lime sherbert}} \\ \underline{\text{wishing they would get on with it}} \end{array} \right\} .$$

(where 'e' and 'g' are mnemonic for 'eat' and 'get', respectively), and proposing a transducer from X -states to values of y_e or y_g that maps X into the property Wanting-the-lime-sherbert for LF_e or Wishing-they-would-get-on-with-it for LF_g ? (I call LF_e/LF_g "law-fragments" to contrast them with functional law schemata that include transducer placeholders, as in canonical law-form (8), p. 33.) Surely these particular predicates are idiomatic ellipses that a successful science of desire would need to replace by more articulately precise NP-completions of these ψ -verbs.

But what should those explications be? We can easily conjecture possibilities, such as replacing the two pronouns in LF_g by 'the Dean's Advisory Council' and 'revising our faculty's Ph.D. requirements', respectively, and expanding the content-nominal in LF_e to 'that I be served lime sherbert for dessert'. But which of these prospective explications properly describes the desire you might actually have had when you (hypothetically) recorded this real-life event? Indeed, does any ordinary-language NP-complement articulating of a determinate wanting/wishing seem at all adequate for LF_e or LF_g so clarified to schematize a *law-fragment which Desire-science can conjecture with a straight face? Consider in particular the pronouns and demonstratives that your attempted detailing of these cognitive contents never quite manages to eliminate. (Issues of such indexicals will loom large in Chapter 6.) And increasing the NP-complement's commonsensically verbalized detail may not even be the proper direction of explication, inasmuch as we have good reason to suspect that real-life cognitive contents are prevailingly vague in respects that are not necessarily close correspondents to the contours of ambiguity/ellipsis/imprecision in overt speech.

Easy heuristic examples can take us no farther on your NP-specification problem. To progress on this for real, you must construct a theoretical vocabulary of desire-ascriptions having syntactic properties such as sketched on p. 139f., above, which you then give meaning by the SLese models you propose in those terms for the behavior of mental systems. And what might justify our taking any one such model seriously, or demark some modelling approaches as more prospectively fruitful

than others, is a giant issue in scientific epistemology that I have carefully skirted in this essay.^{30a} But your theoretical vocabulary won't begin to shape up until you

^{30a} Elsewhere, I have developed a rather strong position on the epistemically proper way to create and nourish theoretical constructs, namely, through explanatory interpretation of parameters in empirical data patterns. (See especially Rozeboom, 1961, 1972a.) For research on mentation, however, we have yet to identify any empirical phenomena that give us even a loose explanatory-inductive grip on individuated mental attributes--which is one especially large reason why mental "science" is still largely sham. But this does not show that determinate thoughts must remain forever elusive to hard science; it merely points out where we had better stop faking it and get on with honest work.

try on some options for size; and the best, perhaps only, way to get your study of Desire underway is to pretend that some selected array of ordinary-language desire descriptions do indeed adequately characterize a subset of your targeted explananda, and then commence spelling out models in which these locutions--these specific predicates with whatever regimenting modifications are forced upon you at the outset--are outputs of your models' *laws. Do inquire, in short, into how schemata LF_e and LF_g, either as stated above or with their outputs' NP-completions replaced by some more detailed English clauses that you actually write down, can be completed into fragments of verbalized functional *laws that are not flagrantly silly even if plausible only as the roughest of preliminary approximations.

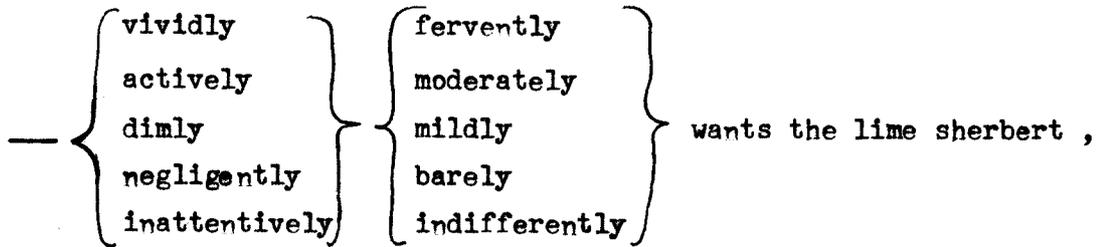
Once you have listed a few specific Desire-predicates that you are provisionally willing to take seriously--and not until then have you given your aspirant science of Desire any genuine content--you are ready for their conversion into SLeSe identification of variables. Suppose that your list includes, inter alia,

- | | |
|--|--|
| ___ wants the lime sherbert, | ___ wishes they would get on with it, |
| ___ would like the lime sherbert, | ___ yearns for them to get on with it, |
| ___ craves the lime sherbert, | ___ hopes that they will get on with it, |
| ___ is indifferent to the lime sherbert, | ___ is apprehensive that they will get on with it, |
| ___ dreads the lime sherbert, | ___ would rather that they get on with it, |
| ___ wants the pecan pie, | ___ fears that they will get on with it, |
| ___ cares little for the pecan pie, | ___ is disgusted that they will get on with it. |

To work these into a science of Desire, you must also articulate locutions for their contrastive alternatives. And simply treating each listed predicate as signifying the on-value of a binary variable whose off-contrast is described by this predicate's negation, e.g., taking the range of y_e in schema \underline{LF}_e above to be <Wants-the-lime-sherbert, Doesn't-want-the-lime-sherbert> (with the second alternative sharply distinguished from Wants-not-to-have-the-lime-sherbert) is duffer science; for even folk psychology is discerning enough to expand, by adverbial modification, each of these desires as stated into a multiplicity of contrasts--mildly wanting the lime sherbert vs. strongly wanting it, wanting it attentively vs. negligently, etc. In fact, just for the predicates already listed, mentalistic intuition urges that some of these are incompatible with others. But which pairs are jointly realizable and which are not? On the face of it, for example, Wanting-the-lime-sherbert precludes Being-indifferent-to-the-lime-sherbert but can combine with also Wanting-the-pecan-pie while Wishing-the-Dean's-Council-would-get-on-with-revising-our-Ph.D.-requirements. But first impressions may not be reliable on this: Presuming that the objects to which these predicates properly apply are thinkers' instantaneous temporal stages -- and deciding whether that is so is one of your technical responsibilities in Slesing your inquiry's language--should you allow that someone can actively want-the-lime-sherbert and want-the-pecan-pie at the very same instant, or might these cohabit at most as near-simultaneous arousals oscillating between first the one and then the other? And does the range of more finely graded intensities of affect encompassed by Wanting-the lime-sherbert include Craving-the-lime-sherbert, or might someone actively crave this even while not strictly wanting it, thereby indicating that Wanting-the-lime-sherbert and Craving-the-lime-sherbert are on distinct Desire dimensions with wanting perhaps infused with some conative commitment not present in craving?

We could continue in this vein at great length without intuitive resolution. But you, if you are to do science with these predicates or their modifications, must

work out some multidimensional space of desires such that each of your exemplar predicates is taken to signify a point or region in a determinately identified subspace thereof. Still calling upon ordinary language for inspiration, let us suppose that you surmise from the array



that variable y_e in \underline{LF}_e should be a two-dimensional subspace of Desire verbalizable as

y_e : — wants the lime sherbert in extremity \underline{d} with activation vigor \underline{y} ,

wherein ' \underline{d} ' and ' \underline{y} ' are placeholders for numerical ratings that you hypothesize to be refinements of the coarse adverbial qualifiers afforded by everyday English, and whose specific contrastive values--say all real numbers in the range 0 to 1 (null to maximal arousal) for \underline{y} , and from -1 to +1 (maximal aversion to maximal attraction) for \underline{d} --are to acquire meaning from the *laws you conjecture for y_e . (To be sure, you are under no obligation to adopt this particular two-dimensional ordering of the Wanting-the-lime-sherbert contrasts; but if you favor some other arrangement, SLease honesty obliges you to spell out what it is.) Assuming that you make similar contrast-set conversions of all your exemplary desires, giving you inter alia

— craves the lime sherbert in extremity \underline{d} with vigor \underline{y}

and

— hopes, in extremity \underline{d} with vigor \underline{y} , that they will get on with it ,

you must now decide whether to treat each of these as a 2-space over the full domain of cognizer stages distinguishable from all the others, or whether instead, with

modal extremity taken to range over both positive and negative polarities, some of these can be run together as merely different commonsense perspectives on the very same bipolar dimension. Thus perhaps the various intensities/vigors of craving/wanting/indiffering/dreading-the-lime-sherbert are all adequately subsumed either by y_e as already worded or, if the connotation of 'want' is felt to be overly narrow, by replacement of its verb with some technical contrivance like 'cathects'. Similarly, all extremities and vigors of hoping/wishing/fearing/apprehending/etc.-that-they-will-get-on-with-it might be construed to lie within the span of

___ cathects, to extremity d with vigor y , that they will get on with it .

On the other hand, perhaps intuition should be heeded when it urges that for any fixed cognitive content $F(a)$, the dimensionality of $F(a)$ -desirings is rather more complex than captured just by one linear ordering on affective tone and another on arousal. You can no more cogently settle this question at your inquiry's outset than you can pre-determine what theoretical vocabulary is best for reconstructing ordinary-language descriptions of cognitive contents. Even so, the only way to make educated progress in this matter is to experiment with some provisional determinate choices long enough to develop evidential grounds for their revision.

What I have described so far is the early work in creating a science of desire that you can actually do, not just dissemble. It is a demanding chore, and my passing allusions to the temporal widths of Desire-variables' domain objects, and numerical scale values for extremity and vigor, have slighted its trickier details. Nevertheless, its accomplishment is relatively straightforward if you are resolute of will. And you need this output specificity in several incomplete *laws such as

L_e : For any cognizant organism-stage ρ that is \mathcal{P} ish, if ρ 's X_1 -state is \underline{X} , then ρ 's intensity/vigor of Wanting-the-lime-sherbert is the 2-tuple $\Phi_e(\underline{X}) (= \langle \phi_{e,d}(\underline{X}), \phi_{e,v}(\underline{X}) \rangle)$

before your attempts to fill their gaps can reveal to you the technical demands of even speculating much less making credible any SLeSe-respectable *laws of Desire. (You will also want to contemplate *laws wherein Wanting-the-lime-sherbert is an input variable, notably, under a lag-displacement, as a component of X_{λ} in L_e itself. But L_e as just stated suffices here.) Thus if, for heuristic guidance with indifference to veridicality, you convert L_e into a semantically proper assertion by putting phrases of suitable types and specificity into placeholders ' γ ', ' X_{λ} ', and ' Φ_e ', can you do this under a rationale that prompts somewhat different completions when 'Wanting-the-lime-sherbert' is replaced by some other determinate content phrase such as 'Wishing-the-Dean's-Council-would-get-on-with-revising-our-Ph.D.-requirements'?

Despite the evident cogency of this program, I venture that in practice you will resist making even a token effort to do as I have urged. Given that you are in fact highly motivated to make professional contributions to cognitive science, not content to let others do the technical work whose detail you feel no need to understand, why should you be so recalcitrant?

I suggest that a major reason why you cannot bring yourself to act on the challenge of L_e and its counterparts for other determinately verbalized axes of Desire, or of cognition-space more generally, is simply that the mind-boggling infinitude of thoughts you could examine makes preoccupation with any selected few seem pointless. What good would it do to propose *laws for the ebb and flow in intensity/vigor of Wanting-to-have-lime-sherbert-for-dessert and Wishing-that-the-Dean's-Council-would-get-on-with-revising-our-Ph.D.-requirements, when real-world thinkers scarcely ever have non-null activations (i.e., above-zero vigors) of these precise desirings?

Note. I shall presume that every g -at- t in our poorly defined cognizer-stage domain D_{μ} has some regular value on each cognitive variable we recognize, even though in the overwhelming majority of instances that thought's arousal is

virtually null. (What modal intensities accompany null arousals needs concern us here only enough to posit that unactivated thoughts of any modal intensity are causally ineffectual.) Yet it can also be proposed that some cognitive variables are regular only over certain restricted subsets of \underline{D}_μ , so that their extension to all of \underline{D}_μ requires augmenting their regular ranges by anomalous values that thwart these variables' having inductively accessible laws over \underline{D}_μ 's entirety. Although I cannot myself envision any useful distinction between anomalous values of cognitive variables and their regular states at the lower limit of arousal, its theoretical prospect needs acknowledgment.

Even if you did know all the missing details in \underline{L}_e , this appears utterly useless in that \underline{L}_e 's output variable has vanishingly low probability of non-null arousal, whence a law predicting/explaining activated intensities of Wanting-the-lime-sherbert is nearly vacuous in its practicality. Or put it this way: For any particular thinker s whose desirings you wish to predict or explain over some time period \underline{T} ,^{no matter how industrious your advance preparation,} there is virtually no chance that any desire having appreciably non-null vigor in s at some moment in \underline{T} lies in any subspace spanned by variables for which you have written even individuating descriptions much less tenable *laws.

If this is why you can't bring yourself to sweat out provisional identifications of determinate cognitive variables, however, your understandable aversion to futility is misdirected. As contemplated more closely in Chapter 5, there are indeed major obstacles to cognitive science in the unbounded numerosity of its basic variables; but the seeming uselessness of any one determinate law like the completed \underline{L}_e is not among them. For we have every reason to anticipate that were we actually to spell out details for \underline{L}_e and a smallish number of its counterparts with other determinate Desire outputs, we could discern patterns of metanomic generality by which the laws governing y_e , say, can be transformed into comparable laws governing any other specified Desire variable suitably parallel to y_e . For example, it would surely be evident how to convert \underline{L}_e , once fully completed, into a law governing the intensity/

vigor of Wanting-the-orange-sherbert or even Wanting-the-pecan-pie. Whether we could similarly generalize from the completed \underline{L}_e to a counterpart law for Wishing-the-Dean's-Council-would-get-on-with-revising-our-Ph.D.-requirements or for Craving-the-lime-sherbert (if craving is not altogether the same open mode as wanting) is less certain. Yet the overriding principle remains: From a finite array of honestly Slesed laws with determinate cognitive outputs, we may well see how to generate any law in a certain transfinite class thereof once we verbalize the chosen law's variables with the requisite specificity. Ideally, then, if we can but identify the particular cognitive variables on which a given thinker \underline{g} has non-null arousal in the vicinity of time \underline{t} , we can account for \underline{g} 's mental activity circa \underline{t} under laws cobbled together specifically for the case at hand by metanomic extrapolation from the finite array of laws we have previously written for other determinate cognitive variables. There is no other way.

Or so I claim. Nevertheless, Comp-speak hints otherwise. For this supposes that there are just finitely many main kinds $\{\underline{K}\}$ of mentation, one of which let us say is Desire, while moreover (a) any thinker \underline{g} can have only a finite number of distinct, appreciably non-null thoughts of kind \underline{K} at any one moment \underline{t} , while (b) each possible totality of non-null \underline{K} -thoughts, or at least some sufficiently close approximation thereto, is finitely describable. Then instead of requiring an infinite-dimensional space to locate \underline{g} 's total state of Desire at time \underline{t} , we can get by with just one Desire variable whose values are adequately individuated by descriptions we can in principle actually write down. I put it to you that any such structuring of Desire-space would be hopelessly incomprehensible; and that even were it not, no law governing this Total-desire variable would yield a wisp of inductive accessibility. But don't take my word on this. Write down a fragment or two of Comp-speak Desire theory, or its counterpart for any other cognition kind \underline{K} , and we'll re-open the bidding. Only remember: Unless your cards include some determinate mental predicates describing \underline{K} -kind property complexes that you deem incapable of further non-null \underline{K} -kind enrichments, you're not even in the game.

Of course, this Comp-speak model of mental registers is not the only conceivable competitor to the unboundedly dimensional moded-contents formalization of Mentation space which I have been touting. I have not myself examined any third approach, but that is only because I have no idea which ones may be worth the effort. And here is where it becomes important to re-emphasize that ordinary-language thought descriptions are only first approximations to how a mature science of mind will SLease its basic predicates. We can look forward with glee to corrupting folk-psychology's views on mentality; our only scientific responsibility to this humanist-cherished heritage is insuring that our affronts to it are technically well-motivated.

And powerful promptings to re-think not merely particular content terms but the contrasts layout and even the grammar of mind-talk will indeed emerge, especially from speculations about the reductive constitution of mentality. For ^{any} surmise about the a/t-derivation of a commonsensically conceived cognition ψ ing-F(a) cannot help but favor some prospects over others for its nomically parallel alternatives; and in particular, any feature of this thought that is conjectured not to be part of its t-core should be common to all values of the technical SLease variable on which ψ ing-F(a) is regimented to be a point or region. For example, if we think that the difference between Hoping-that-it-will-rain and Fearing-that-it-will-rain may lie in which of several disjoint brain sectors contains that-it-will-rain activation, formalizing Hoping-F(a) and Fearing-F(a) as opposed ends of one bipolar-intensity variable, Cathecting-F(a), would be flagrantly inappropriate unless we also hypothesize inviolably strong controls on what can happen simultaneously in these separate brain parts. But for effective use of a/t-derivational speculations to shape its dimensionalizing of Cognition-space, a science of mind first needs some determinate models of mental function, even if only crude ones, upon which to exert the shaping.

Meanwhile, the SLease logic of a/t-derivations has a more globally ominous admonition for the scientific aspirations of cognition theories. For macro-systems whose variables are as richly holistic in their supervenience on micro-constituents as we have reason to suspect of mentation should be generically disposed to resist SLease domestication. That is the Problem to be examined next.