

14. Some implications of the nonspecific bases of language

*T. G. Bever*

Plato thought nature but a spu me that plays U pon a ghostly paradigm of things:

Solider Arislolle played lhe laws

U pon the bottom of a king of kings . . .

. . . 0 chestnul-tree, great-rooted blossomer. Are you t he leaf, the blossom or t he bole

O body swayed to music, 0 brigh tening glance. How can we k now the dancer from t he dance?

Yeats, "Among School Children"



# This essay explores some implications for the study of language acqui­ sition of the view t hat the essential formal characterist ics of language are not human i n origin. According to this interpretation they are u niversal abstract objects whose properties are u ncaused. The idea t hat linguistic universals are u ncaused "Platonic" forms, in particular. has been recentl y suggested by J . Katz (I978, 1979, 1981). who argues that some essential features of language rest on necessary tru t hs. Th is view attribu tes t he 'itruct ure of some linguist ic u niversals to factors not u niq uel y i nt rinsic to hu mans. It would remove the explanation of li nguistic u niversals from the strictl y hu man biological or historical domai n. by clai ming t hat l in­ guistic u niversals are purel y formal. Accord i ngl y, linguistics would be a nonem pi rical science, of t he same sort as classical geometry or modern logic.

It is impossible to find direct em pi rical justification for such a Platonic interpretat ion of language, just as it is im possi ble by observation to prove that geometries are, or are not. abst ract domains. We can. however. pursue t he impl ications of such ideas for t he way we study empirically related phenomena. I n t he case of language , t he empirical domai n t hat I shall consider is t he psychology of language. wit h special em phasis on how ch ild ren learn it.

The nonspecific view of the essence of language cou ld resol ve several puzzles *in* t he interpretation of language evol u t ion and psychology of

This speculative essay was stimulated in large part by discn"ions with Jerry Kat z. Terry Langendoen. and my students. The reader interested in Platonic linguistics should consult Kat z 119811. which presents the most definiti ve case lo date. I am grateful lo V. Valian. R. Gelman. *C* Carrithers. P Postal. and the editors for rnanuscript advice.

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n language. From t his view, t he stultifying conflict bet ween radical nativism

! and radical empiricism becomes purely an empirical problem for psy­ chologists. ,,ith no relation to linguist ic invest igat ions. The st ruct u re of

t he essence of language in t he ch ild is caused nei t her hy t he wa y it is in herited nor by t he wa y it is learned : I t is *discm·ered* (li ke atoms, planets, and America, or logic, geometry. and num bers). The origi n of t he essence of language in t he species is no longer necessaril y ascribed to purposeful evolutionary causation: ra t her. it could be t he result of t he emergence of sufficient complexit y (mental or ph ysical) for h uma ns to become suscep­ tible to t he relevant forms of language.

This view would also explain why certain linguisticall y possi ble lan­ guages are u nusa ble: linguistic structures do not overlap completel y with cognitive capacit ies. Certain common cognitive processes never occu r i n language: Alt hough usable by t he human mind. such cognitive pro­ cesses are not part of t he extrinsical l y determined essence of language. Correspondingl y. if t he essential features of language are real, indepen­ dent of h u mans. t hen t he y are not caused bv mechan isms of human

evolut ion or learning. -

Th\_is\_ \:iew has implications for what we should expect to find in language acqu1s1t1on. There may be special-purpose learning capacities t hat are adapted to l inguistic struct u re. However, if t hese capaci ties do not t hem­ selve cause t he structu res, we ma y find instances i n which children sys­ temat icall y generate false *kinds* of h y pot heses abou t their native language.

I 14.I. Some puzzles if linguistic structure is caused

We start by distinguishing existing languages from h uma nl y possible lan­ guages ( Postal. fort hcoming). It is clear t hat t he potential varieties of h u!11an languages are not exhau sted by the languages t hat happen to have ex1st\_e .. Each language family seems sufficient l y d ist inct to suggest t he poss1b1ht y t hat an arbit rarily large num ber of such families could exist. Th is finding req uires t ha t t he science of linguistics focus on t he form of a possi ble language. taking existing languages as empirical inst ances. Such an approach has been t he basis for the isolation of a set of universals of language (e.g.• N. Chomsk y. 1965). Each observed u niversal has two obvious possi ble sources: 11 is accidental , or it is characteristic of what a language i n humans must be.

At first consideration. i t might seem t hat all t he observed u niversal characteristics const it ute t he essence of language, t he subject matter of formal li nguist ic science. However. some of t hese u ni versal propert ies are aused by. t he wa ys in ,vhich h uman beings learn and use language: Obvious candidates are such u niversals as t he absence of languages wit h a w?rd ma.de u p. of t en stop consonants in a row: t he absence of la nguages

. havmg neit her mflections. function words, nor word-order const raints:

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t he absence of languages wit h no way of asking questions. Such linguistic lacu nae are reviewed extensively elsewhere (see Bever, 1970; Bever, Katz, & Langendoen, 1976; 0. Miller & Chomsk y , 1963; Postal, 1980). Their significance for t he present discussion is that t hey force a distinction bet ween t wo kinds of const raints on h u manl y possible languages. Certain const raints, such as t hose just ment ioned. are extrinsic to t he form of language , and are purel y h u man in origin. No special linguistic account is required of how t hese constraints are discovered by t he child - they emerge as an automatic result of the way language is used.

The child 's conformity wit h certain other universal constraints has no such obvious source: Accordingl y , t hese are interpretable as intrinsic formal const rai n ts. Examples of t his may include a d istinction bet ween fixed units (e.g., words) and compositional entities t hat relate the fixed u nits in specific ways (e.g., sentences); a distinction between inner and outer form; or a semantic interpretation of t he compositional entities t hat is a function of t he fixed u nits and t heir interrelations.

Such int rinsic const raints are characteristic of t he essence of language and provide an accou nt of what is criterially li nguistic. A correct accou nt of how t hese linguistic features emerge in each language is t y pically in­ terpreted as a psychobiological problem: Namely. what mechanisms allow huma n child ren to isolate and integra te t hese. and onl y t hese. featu res in t heir linguistic k nowledge and behavior? In other words. how does t he child extract language from t he environment?

There is a startling degree of agreement on t his question among t he authors of chapters in t his volu me. Virtuall y every chapter assumes that t he ch ild imposes a rich structure on an impoverished environment and thereby is at least a sufficient cause of t he essence of linguistic struct ures. responding to t he varied and sparse l inguistically relevant data he or she experiences. Though t here are apparent disagreements about hov.· t he child proceeds, t hese are trivial compa red wit h t he agreement on t he question of nativism. All t hese writers share t he view t hat t he essence of language is caused by h u ma ns. and each adheres to at least one of the followi ng t h ree posit ions (most appea r lo hold to t he first):

l. There is a u niq ue innate facult y of language, which sets criteria on a possi ble language and t he reby determi nes what t he child l istens for and accepts in t he surrounding language.

1. There is a u nique, innate facult y of learni ng, which forces language to be of a certain form because no ot her language is learnable (Wex­ ler, Chapter IO).
2. Ther,: is an independent l y emergent facult y of commu nicat ion. w hich lead'; the child lo const ruct language out of d ifferent cognit i ve skills in a specific wa y ( Bates & MacWhin ney, Chapter 6l. 1

Each of t hese somew hat dist inct posit ions mai n tains implicitly that t here

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is a *genie d' enfa111* t hat const rains a child t o create t he essence of language out of im poverished linguist ic experiences. The d ifference in t he positions lies prima ril y in how specialized t he *ge11ie* is. Wi llingly (positions [ I ] and 12]). or un willi ngl y (position 13]). each claim act·c pts the following syl­ logism , outlined i n various instantiations by N. Chomsk y. and reph rased by many ot hers.

To be proven: Language is innate:

I . The essence of language has propert y *P;.*

* 1. *P1* can not be learned by any ( k nown) (conceivable) t heory of learni ng.
  2. Therefore *P1* is innate.
  3. Therefore t he essence of language is innate (and caused t hereby).

The crucial assum pt ion in this proof is t he negat ive statement (2). I n most examples of t h is syllogism , some propert y *P1* of great i nt ricacy is described. renderi ng im plausi ble an y claim t hat i t is ext racted by an orderly i nd ucti ve learning mechanism. Genet ical l y t ransmitted behaviors

such as u pright wal king or et hol ogically isolated patterns cou ld be cited as examples of complex behavior patterns t hat can be transmitted ge­ netical l y. These behaviors. however, are orders of magnit ude less refined and articu late than language appea rs t o be and do not set a convincing precedent .2

Therefore. t he very in t ricacy of linguistic propert y *P;* could be t he crucial substan tive step of a relat ivel y a11tinativist argu ment.

To be pro ven: Language is learned:

I . The essence of language has property *P1•*

1. *P;* cannot be t ransmi t ted by any (known) {conceivable) genetic mechan ism.
2. Therefore *P1* is learned .
3. Therefore t he essence of language is learned (and caused by how it is learned ).

There is a dilemma. We must rel y either on as yet inconceiva bl y com­ plex genetic mechan isms of behavioral t ransmission or on an inconceiv­ ably delicate and sensi ti ve ind uct ive system of learning. As is often t he case wi t h d ilem mas. one can bl u nt its horns by not ing t hat each one presupposes an un necessa ry claim. in t his case t he same claim:

The essence of langu age has a cause.

Each of t he syllogisms offered presupposes t hat. whet her innate or acquired. t he essence of language is caused to be t he way it is either by genet ic or by social factors. by t he biology of t he h u ma n ch ild or by historical accident. To pu t it cont rastivel y. according to t he commonly accepted view, language could have essen t ial features incom patible wit h

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those currentl y proposed if humans were biologicall y different, or had a different history.

In this sense. t he essence of language is claimed to be l i ke color vision i n h u ma ns. Color vision is a richl y struct u red system , in vol ving comple­ mentary colors and focal colors. No abstract propert y or law of physics forces color vision to operate that way; indeed , many animal s are sensitive to different parts of t he light-wave spectrum , and many do not differentiate "color'' in the same way. Its essential featu res m ust be biologically caused by direct genetic transmission, or indirectl y caused by interaction of his­

torical accidents and mechanisms of learning. By ei t her interpretation , the essential features of language are em pirically, t hat is, ph ysiologically and/or historically, caused .J

Each of the views outlined previousl y i m plies that t he essence of lan­ guage, t hough biologicall y or culturally caused , is a historical accident. "Language" could have taken an arbit ra ril y large n u m ber of forms: The form taken is explained by evolutionary or social history. in combination wit h any relevant ph ysical laws governing complex systems such as t he h u man brain. Th is bri ngs us to t he se.cond em pirical problem of linguistic nativism: t he awesome precision of an accidental evolution of t he essence of language. If t he essence of language emerged gradually , w hat enlight­ ened and ever-constant millennial entelec h y could have gu id ed it ? If it emerged in a single cluster of developments. w hat mysterious instanta­ neous entelech y d id the dirt y deed?

If the essence of language is t he way it is by vi rt ue of factors ext rinsic to h umans, t here is no need to explain its structure by reference to his­ torical, social, or evolu tionary facts t hat are t rue only of h u ma ns. If t he essence of language is an abst ract form , t hen its particu la r mastery by humans is not t he cause of t he form indeed , the form has no cause. The nat u re of t hat lingu ist ic st ruct u re wou ld not have to be accou n ted for by human brai ns, history, or behavior. This would bl u nt t he poignancy of t he evolutionary dilemma. The cont roversy would no longer concern the explanation of what causes language lo be t he way i t is. since its natu re is uncaused.

Of course, how h umans d iscover such basic forms ma y in vol ve phe­ nomena of a va riety of kinds {biological. formal . ph ysical ). Bu t t he child 's discovery proced u re wou ld not be an explanat ion of t he st ruct u re of what is discovered . Neit her evolu t ion nor empiricism wou ld be requ ired lo explain wh y language is t he way it is; one has only to explain how language is discovered by i ndivid uals. That question is surely a totall y em pirical one, roughly on a par wit h such quest ions as how hu mans learn about integers or karn to wal k. I n vestigations of t h is sort are im porta nt. es­ pecially for the hu man psychologist and physiologist. but t hey should not be confused wit h t he view t hat we cause w hat we learn.

There is a t hird problem raised by t he t heory t ha t language is caused

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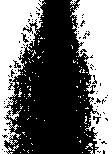
by h umans: the mental segregation of linguistic processes within the mind. There are formally possi ble linguistic rules t hat do not occur in any known

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strange picture of one piece of the mind's inchoately "knowing" some­ thing eternally private (all the potential languages) that cannot be used

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language. and t here are cognit ivel y possible processes t hat do not occur in any known language. That is, t he mat rix shown here is completel y insta ntiated t notice t ha t t his mat rix is t he u niversal analogue of t he dis­ tinction bet ween "grammaticalit y" and "usability" in individual gram­ mars: see Bever. Carrol. & Hurtig. 1975: Bever & Langendoen , 1973):



Natu ral U n nat ural

cogniti ve process cognit i ve process

by any other piece of t he mind.

Even more telling is t he fact that certai n mentally nat ural rules do not appear in any language. The ability lo process symmet rical refiections as a special int uiti ve category of experience is such an exam ple. No language has a rule that allows an y arbit rary sequence of consti t uents to be reversed (e.g., changing *The boy ate the sandwich* into *Sandwich the ate bov the).* Yet general symmet ries are frequent in hu man behavior. ra ngi ng from visual sensation to abst ract music. Wh y are t here no producti ve sym­ met rical rules in language? (cf. N. Chomsky . 1965. for a different d is­

Linguistic process Nonlinguistic process

copying (I)

symmetry (Ill)

scrambling (II) h y perbolic function (IV )

cussion of the significance of symmet ries). If language is biologically or historicall y caused by an organism t hat is t horoughl y capa ble of sym­ metrical processes. wh y do t hey not appear i n language? At a formal

It is triviall y true that t here are types of rules of which we are linguis­ tically and nonlinguistically capable (type Iin the matri x), and also rules which are un natural in behavior, both within and outside language (type IV ). I have alread y noted that there are cases of rules that t he essence of language wou ld appear to allow, bu t that do not occu r in any k nown language (type II). An example might be a total "scrambling" rule that reorders constit uents freel y ( see Bever. 1970, 1975; Bever & Langendoen, 1973, for discussions of such cases). There seems to be no obvious in­ trinsic const raint agai nst any such rule (within a transformational frame­ work ): yet it could lead to an u nusable language. because every sentence would be profou nd l y ambiguous. Hence it may be a linguistically possible process bu t be nonexistent in hu mans for nonlinguistic mental reasons.

Such cases are problematic for an interpretat ion of lingu ist ics as a discipl ine about actual h uman knowledge. If t here are poten tial languages allowed by u niversal linguist ic t heory t hat cannot be learned. what is the mental or ph ysiological im plicat ion of u niversal linguistic theory? If some well-formed grammars cannot be learned by humans, linguistic theory is not abou t the h uman mi nd. We must accept the impl icat ion of t his ar­ gu ment abou t specific rule processes for t he claim t hat t here are lin­ guistically possi ble languages that are cognitivel y impossible. That is, a language just like English except for a word-order scrambling rule is a possible "real" l anguage, bu t not a possible human language (see J . Katz, 1980: Postal. 1980. for further discussion).

The distinction between possible mental process and possible li nguistic rule leaves us with a notion of a men tally isolated *Festung Sprache* t hat is bot h of t he mi nd and not of i t. What could be meant is puzzling even at a ph ysiological or mod ular level of interpretation. A possible model is t hat one "part" of the mi nd can learn language (regard less of usage onst raints li ke those just discussed) while another "part" of t he mind imposes usage constraints. By this view, we would have to accept the

level , symmet ries are ext remel y easy to describe. wit h a simple context­ free phrase-structure grammar - hence t heir absence cannot be a result of their formal com plexit y in languagel i ke systems ( see Bever. Fodor.

& Weksel. 1965b). In a transformationa l grammar framework one can

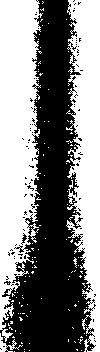
"explain" t heir absence by noting t hat sym met rical rules are proh i bi ti vely

complex to state with t ransformations over seq uences of arbit ra n lem.!lh. and that transformations would have t he effect of dest roying;n y s;·m­ metries generated by t he base struct u re.

This explanation, however. is parochiall y formal. and begs t he question concern i ng t he causation of the rules. The q uestion is not \\ hv transfor­ mational grammar, in particular, blocks symmet rical ru les, bu.I whv lan­ guage of t he symmet ry-free form is descri bable by t ra nsformational gram· mar. If language is an "organ" of a m i nd t ha t characterist ica ll y infects every intellect ual advent u re wi t h symmet ry. wh y is language i tself im­ mune? One can not argue t hat a symmet rical rule would serve no com­ mu nicati ve pu rpose. First , t here are n u merous propert ies of language t hat do.not serve any obviou s communicati ve pu rpose. Second . t here is ample evidence t hat other variations in word order serve ma n y l inguistic and commu nicative pu rposes. One cannot argue t hat symmetrie<; alread v exi;,;t in language, as exemplified by t he canonical CVC form of svl lables. or passi ve syntactic forms: These struct u res are not symmet rle,: rather. they converge onto symmet rical form wi t h no systemal ic basis for it. One cannot argue t hat t he abili t y to deal wit h svmmet ries wou ld break down for long strings, because there are man y g;am mat ical const ructions t hat exceed behavioral capacities in complex or long const ruct ions. I n short. t here are no obvious potential beha vioral expla nations for t he absence of symmet1 i\:S in language alone. Symmet r y si m pl y is not a propert y of language.

The moral to be drawn from t he fact t hat t he mat rix presented previ­ ously is full y instantiated is t hat t he essence of la nguage is independent

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from cognition as a whole the essence of language makes possi ble certain languages t hat cannot be used by t he mind, and t he mind makes possible certain kinds of rules t hat are not used in any language. It is not a literal cont radiction to mai ntain. despite these facts. t hat t he essence of language is caused by an organ of t he mind. But it does present a pict ure of language as resulting from a capacit y t hat is mentall y isolated in sporadic ways. That is. ma n y aspects of cognition as a whole are reflected in language use and struct u re; wh y are the specific exclusions the way t hey are?

None of t hese puzzles raised by t he theory t hat h umans cause language is a logical contradiction, but each is an otherwise u nmotivated puzzle. There has been a conflation of t he reasonable claim t hat h u mans must have some special capacit y or history t hat makes it possible for t hem to transmit language and the further claim t hat t he mechanisms of learning and t ransmission cause t he structu re to be t he wa y it is.

Suppose one stipulated t hat the essence of language is not caused bv humans. This would free psychology of t he problems just reviewed . Fro t his perspect ive. first , t he essence of language is caused neit her by t he wa y its learnabilit y is t ransmitted geneticall y nor by t he wa y t hat it might be learned by general mechanisms (if such exist). The essential features are instead t he result of extrinsic factors. Second , language itself d id not evolve wit h hu ma ns: rat her, hu ma ns evolved to a point of complexit y at whic h l earning language became relevant. Finall y, t he absence i n language of an otherwise pervasive cognitive form is explai ned by its absence from language proper. rat her t han by its u niq ue absence from a particular part of t he mind.

The view that t he essence of linguistic structure is non h uman is con­ sistent wit h al l t he facts t hat have been tradi tionally taken to indicate the opposite conclusion , t hat language must be a proper result of evolution (see Lenneberg. 1967). First. t he occasion of an ext rinsical l y structured language could still be species-specific. simply by virt ue of t he fact t hat only in h umans has t he req uired level of complexit y been reached for language to be discovered. There might al so be a u niq ue. innate mech­ anism in human infant s for t he discovery of certain parts of language, bot h t he essential and the peri pheral. There could be general patterns in t he order of language acquisit ion. paced eit her by a language-specific learni ng mechanism or by nonlinguistic developme nts. There could be "typical .. patterns of brai n representation , based on t he most natural organization of t he beha vioral featu res of language use. Finall y, language learning could be largel y inde pendent of normal variations in i ntelligence; a person wi t h a manifest IQ of 60 may al read y have a brain t hat is complex enough in relevant wa ys.

I n brief. t he view of language as an u ncaused struct u re is entirel y consistent wit h all t he usual biopsychological facts pertaining to it s human

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uniq ueness. We now turn to t he stud y of how such extrinsic structures might be discovered.

* 1. **The** discovery **or** extrinsic structu res

It is obvious (to a nonskeptic) that certain struct u res have a real it y outside human k nowledge of t hem: For exam ple, t he fact t hat t here are planets revol ving around t he sun ( if this is a fact) is not caused by human cognition or astronom y. I mention such a noncont roversial banalit y to set t he scene for a less obvious claim: The fact t hat triangles have angles totaling 180 degrees is not t he result of h uman cognition; for example. just as Martians can k now about planets, t hey can k now about t riangles. Fu rt hermore, planets would exist and t he properties of tria ngles would exist wit hout any k nowledge of t hem. Clearl y , t he fact that we know t hat triangles exist is attributable to h uman cognition ; indeed , cent u ries of ( i ncorrect) ac­ ceptance that Euclidean geomet ry is the on l y possi ble nat ural geometry might be att ributed to propert ies of t he h uma n sensori motor system. But

t hat system does not cause t he properties to exist . even if i t can provide a partial explanation for t he order in which we discover t hem.

One can argue t hat geomet ry does have an i n itial ph ysical instantiation and t hat h umans learn abstract geomet ry from t hat starting point. Whet her ex planatorily adequate or not , this line of reasoning cannot be extended to other domains of h uman k nowledge. notabl y logic. Most h umans mast er a degraded version of logic that t he y use for everyda y reasoni ng. Bu i t hey usuall y fail to master certain princi ples of any formal system wit hout special t raini ng, for example, t hat anyt hing fol lows from a contrad iction or that in certai n logics disjunct ion is best interpreted inclusi vely. The formal logical pri nciples t hat h uman do and do not i nt ui tivel y master are not ph ysicall y instantiated in any wa y yet t he formal properties are necessary and would exist (insofar as t hey exist at all) wit h or without any specific k nowl edge of t hem by any species. I n t his sense logic is a necessary abst ract form (see H usserl , 1970).

* 1. **Implications** for the psychology of language

Even if language were u ncaused , we stil l would have to find out how adults use it and how ch ild ren master it. Does it make anv d ifference to researchers on language behavior li ke us what t he "true·: source of t he essence of language is *'!f,*

The first answer to t h is q uery is dogmat ic: The t ru t h shall set ye free. We sometim.::, simpl y do not know how our stud ies are skewed bv mis­ taken assum ptions, u ntil t hose assu m ptions are correct ed. So if it. is. or could be, true t hat the essence of language is u ncaused. t he n we should consider t his possi bil it y and see where it leads. The formal anal ysis of

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# language structu re is a practical and logical prereq uisite to a science of language use. If t he essence of language is not caused by humans, we must be awa re of what its t rue non huma n structu re is i n order to stud y how huma ns master it. Consider t he following exa mple of wha t t he stud y of number psychology migh t be like if it was practiced wit hout an inde­ pendent theory of t he nat ure of numbers.

Suppose t hat a psychologist. Dr. P, was stud ying t he nat ure of discrete qua nt it y terms as used in a primitive cu l t u re wit hout expl icit ma thema t ics, and suppose t ha t he was hi mself a me mhcr of t he cultu re and u nawa re of any independent t heory of integers tt he example u nder discussion is also t ypical of children bet ween t he ages of 3 and 5: see Decrol y, 1932: Descoeud res. 1916: Gelman & Gallistel. 1978). Dr. P might note that t here are four quantit ies for which his subjects have d ifferent names, *A.B.C.D.* By experiment ing with manipu lations of t hese quanti ties (or referring to his own intuitions as a mem ber of t he cult u re), he would find that t he combi na torial facts of discretel y quantified groups of object s are as out­ l ined here. The fol lowi ng combi nations of t he qua ntit ies alwa ys obtain:

*A* ± *A ,B,C,D A ,B,C,D*

# (i .e. , adding or removing *A* changes not hing)

*B + B = C*

*D* + *A ,B,C ,/J* = *D*

# ( i.e., anyt hing added to /J resul ts i n *D)*

The followi ng combinations sometimes are t rue:

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# explain t he properties of *A ,B,C,D.* He might then claim t hat integers t hemsel ves are "innate." How else, he would ask, can we account for t he acquisition of such abstract entities? But he would then be the victim of his cult u re-specific m yopia. Lack ing an abstract , or non human, theory of integers, he finds it plausible to assume t hat t hey must be human in nature and origi n. This claim confuses t he manifest capacity of his sub­ jects, which may well have innate components, with t he correct structure of what his subjects actuall y have learned (regardless of the definition of *learned ).*

Suppose integers arc real. Then Dr. P's subjects are in t he position of having discovered a quantity system t hat reflects certain propert ies of real entities. But that discovery does not prove t hat those entities are the way they are because t hey are innate. Quite t he contrary: They are they way they are because they are real. 7

Of course, Dr. P should be credited with an important d iscovery - namely, t hat his subjects' behavior is systematicall y related to a mappi ng of his i nvention "the integers." I n fact, his invention would ma ke it possible to stud y what is innate about d iscrete quantit ies. He could now contrast t he regularit ies of t he way q uantit ies develop in child ren wit h their formal anal ysis. For exampl e. he cou ld ask what psychological mechanisms give a specia l stat us to t he differences between O and I . I and 2, and 6 and 7, but not to any ot her one-step difference. I n t his way. the formal theory of integers would be a critical scientific tool in stud ying the psychology of quantities in his subjects.

*B + C = D C - B = C D B + C = C C + C D D C - B = B D C D D*

*c c*

*C B*

*B = C*

# I t hin k we must entertain the possibility t hat we have all been acting

like Dr. P in our studies of language acquisition. We may have confused the fact that language acquisition proves t hat something is innate wit h t he claim that what is innate must be the u nderl ying theory , or a pred isposition

The most baffling propert y of these facts is t he presence of inconsist­ encies. For example, if *C* + *D D.* how can *D C* ever equal anyt hing other t ha n *D?* Despite such problems. Dr. P could arrive a t some con­ clusions: *A.* is t he smallest qua ntit y: *D is* t he largest. But what more could he conclude? Wou ld he arrive a t any internal theory of t he quantity relations? Would he not reasonabl y concl ude that relat i ve quantities in hu man s are i nnate i n origin and nat u re? Tha t is. t he array of partiall y inconsistent facts above has no ext rn hu ma n grou nds t hat Dr. P can see, is l earned wit h l itt le or no inst ruction , and so on. Of course, we can not k now for sure t ha t Dr. P wou ld come lo such a limited conclusion. He migh t h ypot he'iize an abst ract concept , "in teger," and discover t he t rue state of affai rs u nderlyi ng his informant s' quant it y behavior. Suppose he "in vent ed " t he positive i ntege rs and showed how t he mappi ng functions onto t he i ntegers,

*A* = 0: *B* = I : *C* = 2-6: *D 1* +

# which always leads to that theory. Like Dr. P's subjects. t he child may master a "language" t hat is mapped onto a formal t heory of language i n certain ways. Bui t his mastery does not impl y t hat t he formal entities themsel ves are innate. only t hat somet hi ng is in nate which allows t he child to behave i n conformit y wi t h some of the laws those formal enti ties entail. Like Dr. P we need t he formal t heory. for it gives us an anal ysis of what t he child might lea rn to contrast wit h what he or she act uall y lea rns. Indeed , a theory can clarify what migh t be i nna te to t he learni ng mechanism by giving us a clear picture of what does not have to be i nnate in the formal struct u re. Like t he structural t heory of integers. linguist ic theory provides the psychologist wit h t he pot ential disti nct ions. It is t he psychologisl's task to stud y how and wh y t hese distincl ions are mastered

i n some cases and systematica lly ignored i n others.

This view has a nu mber of pract ical implications for the stud y of lan­ guage acquisition. First , it clarifies by cont rast t hat we have not taken seriously enough the implications of t he strong na tivist position. For

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example. if language is caused to be t he way it is by human biology , we should find radically different kinds of languages appearing as mutants or as t he resu lt of organic developmental disorders; we might expect slight st ruct ural variat ions in language structure to ru n i n families; we might expect familiall y herit able patterns of acquisition ; we might expect identical t wins to have l anguage structures more similar in det ail t han fraternal t wins: we might ex pect a correlation bet ween certain linguistic features and ot herwise defined racial grou ps: we migh t expect h ighl y specific localization in t he brain: and so on. Such phenomena are t y pical of genet ical l y t ransmitted and caused st ruct ures: Why are they not t y pical of language'? The absence of such phenomena might just be a failure of observation. But i t might be t hat t he y do not exist because t he essence of language is not biologicall y caused .

A second implication for t he psychologist is t hat i t clarifies t he distinction between *co111pete11ce* and *performance* ( see J. Katz, 1978, i n part icu lar). The common use of the term *competence* refers to what t he speaker/ hea rer "knows" about his or her language. If t his competence is also claimed to include an i nd ivid ual embodi ment of t he complete un iversal grammar. t hen we face t he concept ual puzzles alread y rev iewed. How­ ever. t here is no such difficu lt y if an individual's competence refers only lo his or her personal embod iment of t he struct ures inherent in t he par­ ticular language.

Th i, personal k nowledge system com bi nes aspects of t he history of t he specific language. usage const raints. and u ncaused essent ial s of language. In order to min imize confusion wi t h prev ious uses of t he term *cumpe­ te11ce.* I use t he terms *human language* and *psychogrammar* lo refer lo an attested language and t he individ ual mental represen tat ion of personal

l ingu ist ic k nowledge. I use *real language* and *real grammar* to refer to an u ncaused possible language and it s correct descript ion.

The dist i nct ion bet ween psychogra mmars and real grammars raises an int rigui ng possi bi l it y about h uman languages: Some (or all) of t he latter ma y not be well formed or complete real languages. This possibilit y would be analogous t o t he possi bilit y t hat t he hu ma n apprehension of space, logic. and n umbers ma y not reflect a complete, or even consistent , formal system. For example. t he concepts of t he square root of a negative nu mber or of an infi nit el y small nonzero quantity are not nat ural concepts in any ind igenous n umber system. Wit h respect to such ki nds or k nowledge, "there is no particul ar reason to suppose t hat . . . t he mat hematical abil­ ities {of h umans) permit t hem to conceive or t heories approximati ng t rut h in every f or an y ) [sic] domain" (N. Chomsk y , 1980, p. 252). That is, every h u ma nl y accessible t heory of n um bers ma y be wrong. J ust so for language.

A t hird im pl ication of viewi ng language as extrinsically determi ned is t he u nification of t he acquisition of language wit h t he acquisition of other



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abstract formal skills. It is a startling fact t hat researchers in language acquisition, as generall y represented in t h is hand book, take for granted t hat language learning (if it exists at all ) is sui generis. It follows principles that are completel y u niq ue. So long as we adhered to t he empiricist presum ption t hat the h uman child must eit her cause l inguistic structures or learn t hem , t here was no alternat ive. However, if we now stipulate t he l ingu ist ic essent ials as uncaused , we can refer to a model of acquisi tion for other u ncaused structu res.

One class of models for t he acquisition of such struct u res involves representat ional conflict resol ut ion. For example, i n Piaget's i nterpre­ tat ion, formal st ruct u res arc d iscovered by t he child as resol utions of cont radictions prod uced by emerging everyday habits of behavior. If lan­ guage is an uncaused structure, t hen we can interpret its acq uisition in t he same wa y as t he d iscovery of t he int ui tive concepts of n umber. ge­ omet ry , or logic. Consider first a simple exam ple of cogn iti ve develop­ ment as mental conflict resol ut ion.9

We can start by i nvest igat ing how t he child categorizes small numbers: t hat is, we first play t he experi mental role of Dr. P. wit h ch i ld ren as our subjects. Various researchers have done t his (see Decrol y . 1932) and have found t hat 3-year-old child ren have roughl y t he same grou ping of nu mbers as t hat outlined on p. 438. This gives us some insight into ch ild ren's categorization of q ua nt it ies. but it does not bear directly on t heir concept of nu m ber or qua nt it y relat ions. To stud y t his concept. one must ask child ren quest ions about t he q ua ntit y relat ionships bet wee n one array and anot her, about how t hey change u nder various kinds of t ransfor­ mations. A child can be i nter preted as having mastered an int uitive con­ cept of certain propert ies of n umerical q uanti ties when he or she recog­ nizes t hat it is invariant u nder all t ra nsformations except t hose t hat change t he act ual n um ber of objects i n an array. The 3-year-old. for example. may t h in k t hat a row of dolls has more dolls i n it after t hey are spread ou t. At t he same t ime, t he ch ild will vol u nteer t hat a row has less if one of t he dolls is taken away from it. Such simple cases i ll ust rate different systems of representation of q uantit y one percept ual. t he other active. The child has a perce pt ual ru le "Jf it looks bigger. it has more·· - and an action ru le - "If you ta ke some away it has less."

What does t he child bel ieve ha ppens to a row if you bot h remove one element and spread t he others out (see Bever, Fodor. & Garrett. 1968: Meh ler & Bever, 1967). This tactic places t he child in internal conflict: One processing system informs him t hat t he row has more. t he ot her t ha t it has less. lt is t he ultimate d iscovery of t he concept ual inva riance of n u m ber t hat resol ves such conflicts i n beha \'ioral systems. That is. t he mot ivat ion for t he d iscovery of n u m ber is to resol ve t hese conflicts: t he motivat ional role of t he discovery of number is to resolve a conflict in mental representations or q ua nt it ies. It is import ant to note t hat t he child does not have to give u p one of t he behavioral systems he has developed .

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For example, even in adults, num ber estimation can be based on array size u nder certai n circumstances. An important fact abou t the discovery of int uiti ve formal systems is t hat t hey allow t he conflicts in t he behavioral systems lo contin ue. bu t provide an u nderlying system for reconcili ng t hose conflicts when necessary. (The kinds of conflicts are by no means exhausted by t hese cases; other examples would be t he conflict bet ween relying on densit y and relying on overall area in judging n u merosit y , and t he inconsistencies among t he results of combining t he four basic "quan­ tities" out l ined at t he beginni ng of t his sect ion.)

In general. formal int uit i ve knowledge. such as t he int uit ive conce pts

of nu m ber, space. and logic, are arrived at as internal solutions to such conflicts in d ifferent behavior systems. That is. t hey are a set of "internal languages" t hat map one beha vioral system onto another. and t hereby detoxify t he negative force of the superficial conflicts bet ween t hose systems.

We can use such a model to explain wh y a child learns a psychogrammar at all. Several common explanations are implicit in most of t he li terat u re on language acq u isition:

He or she can not help it (e.g., it is i n nate).

It is a by-prod uct of t he u rge to comm u nicate.

It simpl ifies what m ust be memorized.

Ord i naril y we try not to make oursel ves responsi ble for explaining why language is learned: we suggest only t hat it lies in t he murk of infantile motivation or circular fu nctionalism. Certainl y t he answers suggested here have t hese wea k nesses. Each states in a somewhat different way t hat a gramma r is learned because infants like to learn it.

The conflict-resol u t ion model just outlined prov.ides a t heoretical ra­ tionale to explain 1rhy child ren learn t he concept of number: It resol ves representational conflicts among otherwise powerful and useful systems of quanti t y behavior. I t hin k i t is nat ural to extend t he applica tion of such a model to language: The psychogrammar is a l evel of representat ion t hat resol ves conflicts bet ween t he represen ta tional powers of t he system of speech percept ion and prod uct ion. Of course, a specia l biological mech­ anism mig ht be req ui red for t he discover y of such a formal system, but it m ight not necessa ril y be li mi ted t o t he d iscovery of an y particular system . such as language ( see Bever, 1981, where such a model is pre­ sented more fully).

* 1. Implications for the study of language acquisition

The resol ut ion model of language learning needs empirical support. The kind of data req uired - i n particular, systematic comparisons of devel­ opments in t he prod uction rules, percept ual strategies, and other systems

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of language use are almost totall y lacking. Cross-psycholinguistic stud­ ies of language behavior systems in t he adult and child are also of grat importa nce to t he verificat ion and expansion of t h is model *( cf.* Slobm. Chapter 5). M y mai n poi nt is to show t hat viewing t he essen\_ce of language as nonhu man i n origin has real consequences for what (I t hmk ) we should

do i n our practical resea rch. . . .

One might object t hat t he conflict-resol u tion models of t he acqms1tion

of int uiti ve formal structures like number and language are inadequate. because t hey do not explain why t he part icular struct u res are t he ones t hat arc d iscovered . That argument . however. still presu pposes t hat the psychologist must explain why the struct ures are the way t hey are\_. If t he struct ures are nonhu man and real , t hen t he problem of how we d1<;cover t hem is an instance of t he problem of how we d iscover real it y. To say t hat there must be some i n nate mechan isms t hat partici pate i n this process is not tenden tious. To say t hat t he i n nate mechanisms t hemsel ves cause t he structure of realit y is to leap i nto the vat of skept icism.

According to t he t heory t hat t he essence of language is caused ?Y hu mans, t he specificat ion of t he essential u niversals is exact l y a dscnp­ tion of wha t every child is prepared to learn . Accordi ngl y. u niversal gram mar exact l y describes t he set of possi ble theories of lag\_u?ge ac­ quisition. Accord ing to t his view , t he stud y of language acqms.1t1on and gramma r are closely linked. This linkage is frequen tl y reflected m Cho\_m­ sky's obser vation t hat t he stud y of grammar reveals what t he learning psychologist must explain.

The complementary line of investigation has been developed by Wex.ler

and his co-workers (see Chapter 10). They explore t he exten t to wh ich a t heory of learni ng constrains whal cou ld be a possi ble gram mar. This is a d irect ret urn to t he beha viorist dict u m t hat what is k nown is caused to be that way by how it was learned. Though t he y are not const rained to operational met hodology, nor lo t rad i t ional empi ricism. they em?race the view t hat t he essence of language has a cause and t he cause 1s t he language-learn ing children. (lf. however. one exami nes t he constrai nts t hey im pose on possi ble grammars, one realizes t hat t hey also re present a ret u rn to grammars t hat make deep-st ruct ural patterns availa ble in t heir surface organ ization certainly a move compati ble wit h empirici'im.)

The linguist ic realist is not committed lo t his position . because to hi m or her the essence of language has no cause. The child 's problem is to apply general intelligence or special capacities to const ruct a represen­ tation of language sufficient to serve h u man pu rposes.

It is possi ble t hat child ren never acquire a real la nguage at all, just as

t hey do not acquire a consistent logical system. But just as everyda y hu man reason proceeds well enough wit h fau lt y logic . h u ma n com m u· nicut ion could proceed wi t h a fau l t y language. It is al so li kel y t hat t h, range of learnable languages is smaller t han t he set of real languages

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Short-term memory limits alone would account for a restriction in t he range of man y structu ral processes.

It might seem that t he ontological status of t he essence of language is not at issue when we are stud yi ng how child ren acqu ire it. I n pri nciple

t his may be true. But in our practice it makes an enormous difference in what we look for if a propert y of human language has an u ncaused struc­ tu re. What is at issue i s t he ki nds of h ypot heses t he child t ries out as he or she masters language. If t he essence of language is caused by t he h u man brain. it would be very odd if t he child ever developed a gram­ matical hypot hesis t hat contrad icted some essential propert y. The nativist argument t hat t he child acq uires t he right kind of gramma r in t he face of rarified data is incompatible wit h format ion of impossi ble h y pot heses; how would t he impoverished data ever "correct " such hy pot heses. once t hey were formed ? I ndeed . if t he data were sufficient to correct false kinds of hy pot heses. t hen t he case for a language-specific innate acqui­ sition device wou ld be much weaker.

Yet t he ch ild does appear to come to t he wrong kinds of hypot heses abou t such u ncaused struct ures as nu m ber - for exam ple, that integral operations are not reversi ble and t hat relations are not necessaril y t ran­ sitive, as im plicit in t he patterns in t he preced i ng section. It is not clear how such false ki nds of h ypot heses would be generated if t here were a specificall y innate device for t he acquisition of num ber t hat also caused integers to have t he properties that they do. How could t h is device ever generate h y pot heses t hat contrad ict essent ial properties of n u mbers?

If t he essential properties of integers are u ncaused , t hen t his at least opens u p the opport u nit y for fu rt her experience wi th nu mbers to provide crucial information t hat will lead to correcting t he false hy pot heses. It is totally m ysterious how such correction takes place. just as i t is m ysterious how we incorporate any aspect of t he world. But. at least if n u mbers are real. \Ve do not have to in voke nu m ber-specific learning mechanisms to accou nt for t heir real propert ies.

The same migh t be t rue of language. We might find t hat t he child develops incorrect ki nds of h y pot heses about t he na ture of language. I am referri ng not lo t he possi bilit y t hat t he child might generate incorrect rules of a correct form. bu t rat her t o t he possi bilit y t hat he or she might generate hypot heses incompat ible wit h an essential propert y of language. Consider t he following example. J. Katz (1981) suggests t hat one of t he u ncaused propert ies of language is "effabilit y," t he princi ple t hat every sense has (at least) one sentence t hat corresponds to it. That is, a "lan­ guage" t hat could not express some sense would not be a real language. He d raws t he conclusion from t his t hat languages are recu rsive, a con­ clusion t hat is necessary if every sense is to be re presented by a single sentence.

Su ppose it is true t hat for every sense t here is a sentence. If t his

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properly is int rinsic to t he way hu mans organize languages, then the child shou ld never conclude t hat some senses are not expressi ble i n sentences. At least some child , for at least some sense, would never experience any data to falsify such a conclusion. Yet it seems possi ble that child ren (and perhaps ad ults) do believe t hat t here are some senses wit hout a sentence. (Remem ber t hat I am now pursuing t he implications of effabil it y for t he stud y of language acquisition, wit hout commenting on its correct ness.) This can be t he case only if effabil it y is eit her false or an u ncaused propert y of language. Surely t h is makes important t he st ud y of effabilit y in child ren.

There arc also false hypot heses t hat t he child might entertain just be­

cause t hey are com patible wit h unca used essentials of grammar, even t hough t hey are incom pati ble wit h any h u man language. H u man bei ngs come to every situat ion wit h extreme limits on t heir serial memory. This factor might exclude t hem entirely from capital izing on t he recursi ve character of real languages. because embed ding complete sentences in others would quickly multi pl y t he lengt h of sequences. G. Miller and Chomsk y (1963) suggest t hat t he functional role of t ransformations is in fact to compress t he information in a complexly em bedded struct ure i nto a compact and linear form. That is. actual hu man languages retlect t he recu rsi ve character of language by utilizing meaning-bearing proposit ions that are not sentences t hemsel ves and t hat are charactcrist icallv shorter (i.e., phrases). .

This suggest s anot her false kind of hy pot hesis t hat t he child might entertain: Every proposition-bearing sequence is a sen te nce. This is def­ initely not t rue of any attested human language. since phrases can often be proposi tion-bearing sequences. I t hin k that t here are certain prima facie indications t hat ch ildren do pass t h rough such a period . as evidenced in t heir so-called telegra phic uttera nces. Here too t he status of such be­ ha vior is u nclear, bu t i t would be wort h a great deal to k now whet her t he child assigns such sequences a derivational history as a sentence. or goes t hrough a phase of t reati ng a m u ltiphrasc sent ence as a ''discourse."

* 1. Conclusion

I have out lined a num ber of problems li n ked to t he assum pt ion t hat t he essence of language is caused by hu man bei ngs. These problems wou ld be resolved if one accepted t he view t hat t he essence of language is not caused.

What remai ns are t wo empirical q uest ions: Wha t is i n nate t hat makes the discovery of language necessary'? Wha t is i n nate t hat makes it pos­ sible'' I have suggested t hat language struct ure is d isc,ivered bv t he child as a reconcil iat ion of behavioral conflicts t hat arise among. emerc.ing separate systems of com numication. By t hi s view. t he d isco:ery ,if Ian

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guage is made necessary by t he existence of disti nct behavioral systems t hat mani pu late sequences of symbols. Accordingl y , t he abili t y to develop those inde pendent systems must be innate. Such abilities are astou nding, but not u n precedented in t he animal ki ngdom. There a re ot her species t hat comm u nicate a va riety of messages or rituals, somet imes wit h com­ plex sequences.

We m ust also accou nt for what makes t he discovery of language pos­ sible. The crucial question is whet her t his capacit y is an isolated and psychobiologicall y u niq ue one, or whet her it is an appl ication of a general abi li t y. This part of our i nvest igat ion will depend cruciall y on a better u nderstandi ng of wha t la nguage is, i ndependent of t he su bset of languages t ha t hu mans are abl e to discover. l poi nt ed out t hat Dr. P's invest igat ion of t he i n nate basis for t he "numbers" *A ,B.C.D* would be greatl y aided by his d iscover y of how t hose nu m bers ma p onto rea l i nt egers. We depend in t he sa me way on u nderst anding how t he u ni versal "psychogram ma r" maps onto a real essence of gramma r. If t his resea rch program is correct, we will find that certai n features of the real grammar are not part of u ni versal psychogrammar, and t hat certain features of psychogrammar are not part of t he real gram mar. These mismatches between t he two systems wil l highl ight what t he nat u re of t he learning mechanism must be. A t heory of t hat mechanism will t hen be req u i red to explai n why hu mans fail to acqui re real grammar as part of t hei r i nt ui ti ve formal k now ledge. and i t will become an empi rical quest ion if t he mechanism of d iscoveri ng language structure is l ike t he mechanisms for t he d iscovery of ot her u ncaused struct ures.

Of course. we k now very little about t he properties of "real grammar." But we also k now very li ttle about u niversal biological properties t hat might accou nt for man y aspects of hu ma n languages. Certai n formal con­ st rai nt s t hat seem u niq ue to language actuall y may be t he l i nguistic expres­ sion of gene ral const ra i n ts on rul e-governed serial behavior. For example, t he "A over A" ' pri nciple i n syntax (and it s i nheri tors) and "the longest environmen t fi rst " pri nciple in phonology might bot h be l i nguistic i n­ stances of a beha \·ioral princi ple: Appl y a process at t he most general level possible. We do not need to speculate bli nd l y about such a possi­ bil it y. For exam ple. we ca n search experimentally for a princi ple of t his sort i n t he ru le-governed seria l be ha vior of non hu ma n anima ls (see Bever, St ra u b. Terrace, & Tov.:nsend . 1980). Such invest igations i ncrease our arsenal of possi ble sources of propert ies of huma n la nguages. We t hen

i nterpret eac h l i nguistic u ni versal as havi ng one of t hese origins:

I. It i s biologicall y based i n all rul e-governed organ ized behavi or.

.,

2. It is psychologicall y based in how t he human mind goes about dis­

' coveri ng and usi ng language.

3. It is a necessary feat ure of real grammar.

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The hy pot hesis t hat t he essence of language is u ncaused by humans allows for a logicall y possible world i n which we can make relatively modest claims about what evolved in t he human species and is i n born to each child :

t. Mechanisms of prod uctive and perceptual use of symbol s

1. Mechanisms for processing sequences of symbols (e.g., large short­ term memory)
2. Mechanisms for t he d iscovery of real formal struct ures (e.g., num­

ber, logic, language) to resol ve representational conflicts wi t hi n do­ mains l ike (I) and (2).

Accord i ng to t his i nterpretation t he acqu isi tion of language by a chi ld rests on t h ree presu med mechanisms, none of which is u nique to language; t here is no special i n nate language-learni ng mechanism , t hough t here may well be an i n nate system t hat makes possi ble t he d iscovery of a variet y of formal structures.

The correspond ing accou nt of t he biological basis of language can now

be u nified wit h t hat of t he evolution of ot her capacit ies. The biological basis for each of the postul ated mechanisms must be prod igiousl y com­ plex , but t he first two capaci ties are not wi t hou t preceden t. Indeed , if we differ at all from certai n ani mals i n t hese ca pacit ies, i t ma y be only qua n­ titat ivel y. The abil it y to discover and i nt u i tivel y u t i l i ze forma l st ruct u res has less clear biological precedents. 10

But t here is no reason to be categorical about t he capaci t y of our

non l i nguist ic bret h ren. Whatever t he backgrou nd for mechanism *( 3 ).* i ts presence in h umans is *ex hypothesi* a general abil it y. not one limi ted to language alone. This does not make its psychobiological basis t ri vial or u ni nteresti ng. But it does mean t hat t he psychobiological basis of t he abilit y to d iscover language may not i nvol ve t he evol ut ion of an isolated capacit y , focused only on language.

Notes

I am gi v i ng Bates and MacWhi n ney t he benefit of t he dou bt: The y may wish to claim t hat a distinguisha ble facult y of language ne ver emerges - onl y com­ m u n ica t ion ratterns t hat ( benighted ) linguist call "language.'" I n t hat case. t hey ma y hold a u niq ue rosition - t hat language has no real existence. neit her in t he child nor in ph ysics nor among t he set of u ni versal forms - a curious kind of linguist ically localized skept icism.

2 Certai n i n nate bod y mechanisms appea r to exhibit languageli ke i nt ricacy and nex i bi l it y. The most notable exam rlc is t he immu ne y tem. once ofte n cited by biologists as an cxcrnrla r of envi ron111cnt -scnsit i1e "behavior·· t hat is genet icall y t ra nsmitted. Chomsky (1980) discusses t his as an examrle of how biologicall y t ransmi tted behavi or can a r rear t o be crcati rcl y "inst ruct i ve·· while act uall y bei ng "select ive." The basic r henomenon is t hat t he immu ne

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system provides a different antibod y for all distinguishable pat hogens, in­ cluding t hose t hat i t has not yet encou n tered . This would seem to indicate eit her forek nowledge of all "possible .. pat hogens. or a kind of "grammar" t hat const ructs each an tibod y when needed . Howe ver. the now com monl y accepted ,·iew of this process is t hat t he immu ne system generates a random "library·· of antibodies shortly after birt h. and periodically du ring l ife. If a pathogen happens to enter the system for which there is no antibody alread y in the library. t he orga nism is not capable of generating specifically the needed

antibod y. Fu rt hermore. the met hod by which t he library is originally created is by random recombination of genetic material. H is hard to see how such random mechanistic phenomena provide m uch comfort for t he, lingu istic na­ tivist. The linguistic analogy wou ld he t ha t elementary mental com ponents recombi ne random l y u nti l an aggregate of them fits t he envininmental la n­ guage. Bu t because. by hy pot hesis. t he environment greatly u ndenlctermincs t he grammar. t he recombinations cannot be ra ndom i n the sense t hat t hcv arc i n the formation of antige ns. If t hey arc. t hen the argu ment t hat language learning is based on highl y const rained mechanisms would not hold.

1. Note t hat t here could. however, be a non biological physical basis for t he mecha nisms t hat u nderlie t he knowledge of language. If t he essence of la n­ guage is t he result of a ph ysical law t hat becomes relevan t only when t here are com plex livi ng systems like hu man brains, then t he esse ntial nature of language would be li teral l y a law of t he u niverse, not a law of the human brain or human history.

Lest t he physical interpretation be sloughed off, consider an exam ple of how a ph ysical law might emerge only in human behavior, bu t not be caused to have its essential properties by t hat be ha vior. Consider upright wal ki ng in hu mans. Suppose t here were no other examples (on earth) of self-propelled entities t hat rel y on t he mixt ure of gravit y. forward momentum. and bala nce t hat wal ki ng requi res. We could use t he study of wal ki ng as an em pi rical territorv

to explore t he in teraction of t hese ph ysical laws and relations. We could st ipulate as \\'ell t hat ,,·alking in h umans is "innate": It is learned wi t h little specific trai ning and involves (already partially known ) innate brain mecha­ nisms. Bu t one would not conclude t ha t t he ph ysical la ws wit h which t he brai n mechanisms interact are also caused bv t hose mechanisms. Rat her, it would be argued t hat t he physical laws have t h i r particular properties because of t he basic nature of matter. not because of t he human brain. The hu man bod y and !'>rain would be cited as organs of suflicient com plexit y for t he ph ysical laws to bec<>me relevan t constraints. I n t his sense. the ph ysical prop­ erties are disco\'ered t,y virtue of t hei r application to hu ma n \\'al ki ng.

One could make t he parallel argu ment abou t t he ph ysical basis of language

- t he h u man brain may be ph ysiologically adapted to learn language, but if language is the effec t of ph ysical la ws, t hen the structure or behavior of t he brai n cannot explain w h y language is the way it is. Similar arguments apply to t he claim t hat the essence of la nguage is a non ph ysical form. The brain ma y accou n t for how and w h y h uma ns discover that form, bu t the natu re of t he form itself is not caused by t he brain to ha ve t he particular form it does.

1. Strange as this view now seems to me, it is exactl y t he view I once held (see Bever. 1970): it seemed (and seems) to me lo be t he onl y wa y to resolve t he

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contradictions raised by t he com bination of t he competencc-petformance "distinction." t he claim t hat "competence" is psychological. and the exis­ tence of u nlearnablc (i.e., unpsychological) well-formed rules. Of cou rse, if "universal competence" (i.e., t he esse nce of language) is not psychobiological

i n origin, t hen t he con t radiction disappears and the stra nge mental model of

*Fe.Wmg Sprache* is not req uired.

1. The only evidence of neu rological specialization for language i n vol ves t he claim t haf i t is usually localized i n areas of t he left hemisphere. However. even t he force of t his is mitigated by t he fact t hat t here is a large variabilit y of lhal locai ion from individ ual to i ndi vidual. It i, al,o not clear that t he localization - such as it is - does not result from a general difference i n comput at ional power hct ween the hemispheres, ra t her tha n a la nguagc-,pe­ cil'ic predisposi tion of t he left hemisphere. See Be ver (1980) for a discussion of t his.
2. I n fact one could maintai n t hat special -purpose causal mechanisms must exist that "harmonize., wit h t he nonh u man linguistic essences. t hat is, that t he esse nce of la nguage is a synt hetic *a priori.* But t he view that language is an *a priori* of any ki nd makes possible nonsynt hetic interpretations we can also consider.
3. I am aware t hat even t he struct u re of integers may be argued t>y some to be caused by human cognition, i n t he so-called in tuitionist interpretation of mat h­ ematical objects and relations. l ntuitionism can be in terpreted as a claim that mat hematical entities and properties all start wit h t hose t hat are intuitivel y clear to hu mans. This places the burden on a constructi \'ist mat hematics to show t hat all of mat hematics can be demonstrated . starting with just t hose intuitions. Notice. howe ver. that even if const ruct ivism can succeed as an i n vestiga ti ve met hod in mathematics, its success would not support any par­ ticular ontological claim about what mat hematical entit ie, i n fact are. l nt ui­ tionism would remain an u nsu pported doct ri ne.
4. See n. 5.
5. The literat ure on t he acquisition of number is very large. My· allempt here is lo give a program m atic description of how such a phenomenon is interpreted on t he men tal conllict resol ution model. The reader shou ld consult Gelman and Gallislel *(* 1979) for reviews of research paradigms and results in t his area. I ha ve also been greatly informed on t his topic by t he wri tings of Jonas Langer.

IO Notice t hat ii makes no difference if the evol utionary enlelech y is biological, ph ysical, or cult ural. Thal is, an y suggestion t hat t he complex brain beca me capable of creating h uman language because of the evolutionary operation of an as yet u n known "physical law" sim pl y changes t he m ystery from one of biology to one of ph ysics. Similaril y, discovery by vi rt ue of a "cultural " law presents an ant hropological mystery.