

# RESONANCES

Alan Sondheim

ppress 1971

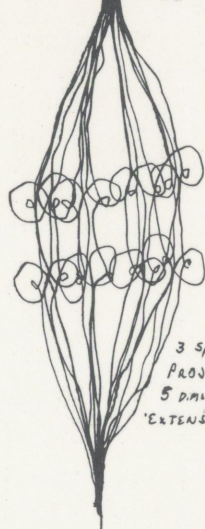


$$\cdot \pi \pi_{5N}^2 = [\ ] \rightarrow S_0.$$

$$\pi_{T^2}^2: [ ] \rightarrow S_2$$

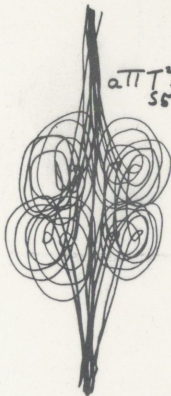


$$\text{BT}_{SS}^2 = [\ ] \rightarrow S_2$$

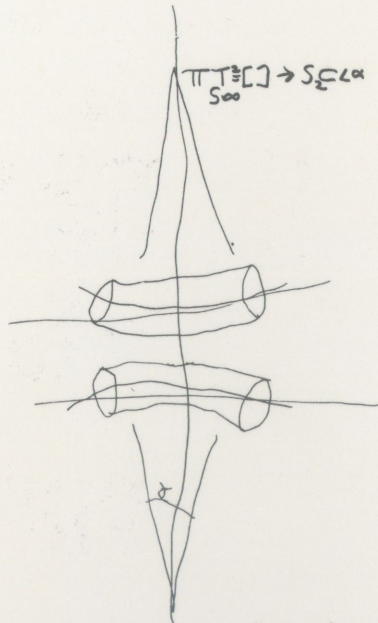


3 SPACE  
PROJECTION OF  
5 DIMENSIONAL  
'EXTENSION CORD

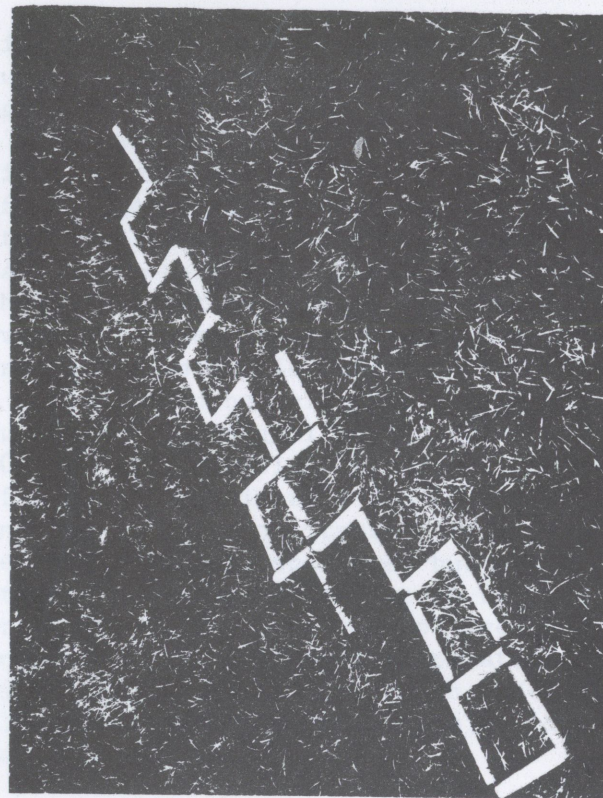
$$a\pi T_{S_2}^2 = [\ ] \rightarrow S_2$$



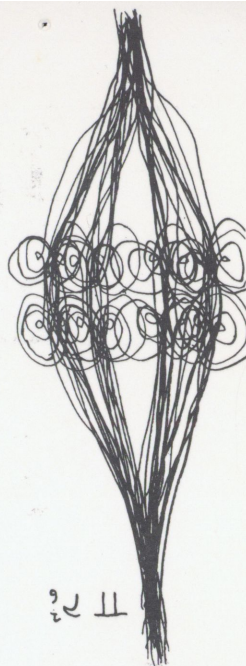
$$\pi T^{\frac{3}{2}}[\rho] \rightarrow S_2 \subset \mathbb{R}^3$$



RESONANCES  
ALAN SONNHEIM  
APR 1971

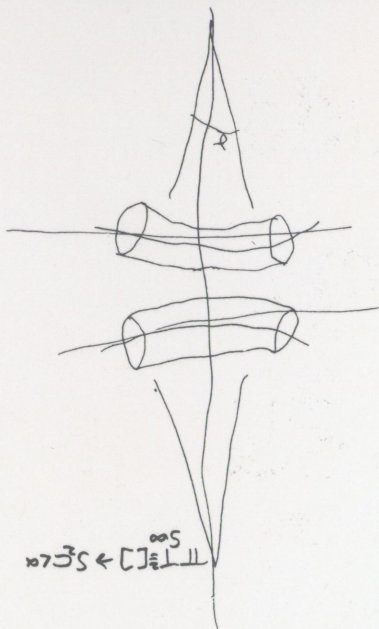




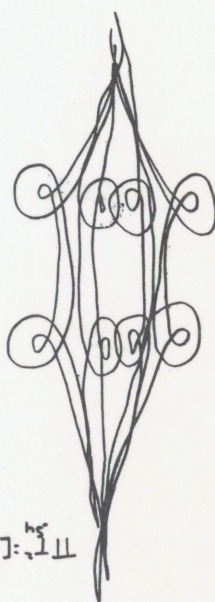


$\pi_2^2$

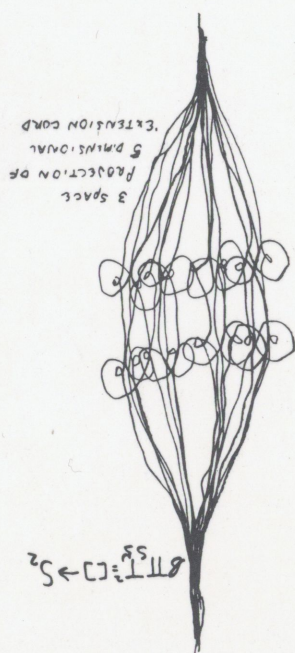
RESONANCES  
ALAN SONENSHIN  
P. 1941



$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

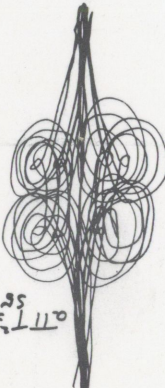


$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

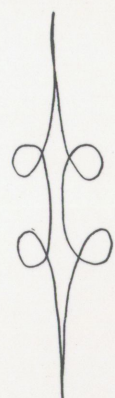


3 space  
projection of  
5 points, oval  
extension cord

$\pi_1^2 \rightarrow S_2 \rightarrow S_1$



$\pi_1^2 \rightarrow S_2 \rightarrow S_1$



$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

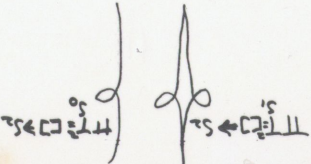
$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

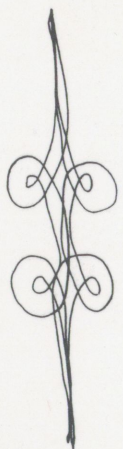
$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

$\pi_1^2 \rightarrow S_2 \rightarrow S_1$

mod = 2



$\pi_1^2 \rightarrow S_2 \rightarrow S_1$



$\pi_1^2 \rightarrow S_2 \rightarrow S_1$





some basics

"whenever you have to do with a structure-endowed entity  $\bar{E}$  try to determine its group of automorphisms." - Hermann Weyl

1. there are certain symmetries whose symmetries revert the configuration back to the ground (non-symmetrical) state. (for example: a mirror image of a mirror image.)
2. symmetry is the basis of all organization or information systems. all systems (biological or otherwise) utilize a symmetrical substructure plus a coding of originally random modules onto the substructure.
3. it is possible to create an organization or system (or treat existing ones) based on a substructure whose symmetries revert (have the capabilities of reverting) the configuration back to the ground (originally random) state.
4. applying the reverting symmetries is termed "decoding." creating a structure - such as this typewritten page - is "encoding."
5. decoding may be accomplished by: altering the symmetrical substructure. (for example, sending out a radio signal on a carrier wave, and a second symmetrical carrier wave  $180^\circ$  out of phase with the first. the result would be zero transmission, if the same machinery was used for both transmissions.) also, by altering the information itself: (for example, two stereo record players with the same input and speakers, but the speaker cords  $180^\circ$  out of phase [+ connected to ground]. if the stereo players are equal in power, no sound will be transmitted; the opposing voltages will cancel each other.)
6. the news-station presents a continuous information flow directly related to "event" in the physical world; it is a rough model of the world. the carrier frequency (wave) enables the model to be projected. it creates the structure of the world that it describes.

$\zeta \rightarrow \zeta \rightarrow \zeta$

parallel

$\zeta \rightarrow \zeta$

antiparallel

$\zeta \rightarrow \zeta$

$\zeta \rightarrow \zeta \rightarrow \zeta$

symmetrical

$\zeta \rightarrow \zeta \rightarrow \zeta$

symmetrical



ground: a symmetrical substructure devoid of information (other than its existence). this page without writing, but with lines and spaces, is a ground. we postulate a "theta operator" T to perform symmetry transformations onto the ground. we process the information to be mapped into the form C: a chain of symbols. this chain is mapped onto the ground through four symmetries: parallel, antiparallel, symmetry one, symmetry two. T then is the action of mapping.

notation:

p = parallel      a = antiparallel      s = symmetry one      s' = symmetry two  
ground = []      mapped ground = [m]

then: CT[] = [m]      further: [m]T = C. the code reverts to ground.

(we may also write, then:

$$T^2 = [] .)$$

we consider the content of C unimportant; it is necessary to create (establish) T. [] may be any 2 or 3 space assigned coordinates. an ordering system is necessary to assign each element (atom, molecule, individual) within that space a unique number. (creation of a substructure). each element may then, in turn, be transformed according to one of the four symmetries. (we cannot utilize the 90°-270° symmetries for reasons to be considered later. basically, with them,

$$T^2 = -[] = a[] .)$$

this creates a quadric system. 3 elements of the system possess  $4 \times 4 \times 4 = 64$  possibilities. english (a-z) plus numbers (0-9) plus space ( ) (abbreviated \*) plus metalinguistic marks ( { } ) may be assigned possibilities.

[for an example of use of the above marks, consider the sentence "He said, 'Hello.'" this would be rewritten:

" {capital\*h}e\*said{comma}\*{quote\*mark}hello{period\*quote\*mark} "

the possibilities might be assigned:

a through z: 1 through 26

\*: 27

0 through 9: 28 through 37

{ and }: 38 and 39.

this still leaves 25 unused possibilities.))

then 3 elements code 1 symbol in 2 or 3 space through symmetry transformation.

C onto space [] is coded according to T. T applied to [m] transforms it back into the original state.

mapping occurs at time t; retransformation at t'. (t/t'). the application of  $T^2$  (if absolutely possible) would create an object identity between object at t and at t'. according to this, any "marking time" would be impossible. the object even if animate ("sentient being") would retain no memory of [m].

indeterminacy postulates (the postulation of indeterminacy determines that) the above operations remain theoretical. most grounds are not totally ordered even for an arbitrarily small segment, except on a macroscopic (gross) level; the position of electrons, for example, within the individual atom is "determined" only through a probability function. [an exception to this might be found in quark theory, which utilizes exact but possibly "approximate" symmetry in determining and classifying states, resonances, etc. of the fundamental particles. in fact, to some extent, 'particle theory has become symmetry theory.'"]



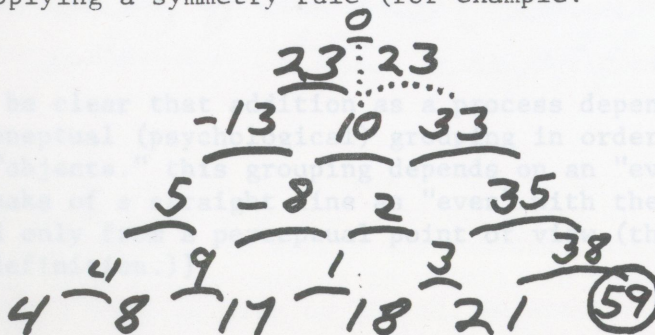
necessary information: thermodynamic irreversible processes depend on entropic situation (are irreversible because of entropy increase). T applied even to a single element must be a multi-function operator. (T depends on "influential space environment surrounding object"; this may lead to consideration of entire force potential of universe.

1. we note briefly that "object" itself depends on perception. consider a lens: (lens of eye): this processes information from the environment, in order to create a "picture" of the environment that enables us to manipulate it to a certain extent. this picture is artificial however, since it is processed. (a "more real" picture might be seen by viewing the surroundings through a flat piece of ground glass; the "image" on the glass being simply the total radiation falling on it. even here, the glass itself is "imaged" by our eyes, and radiation beyond the visual spectrum is eliminated.) we do not process sound, to the same extent, but we isolate information: thus, listening to a symphony, the violins may be isolated, the piccolo, etc. on the other hand, we do not "perceive" cosmic rays, since we have no means (could have no means) to manipulate them; they appear (for us) randomly. perception in nature appears to occur only when there is reason (survival reason) for it. perception = information processing. see my "precis," which considers mathematical processes as an attribute of perception.)

2. there are two means of organizing information utilizing a symmetrical substructure. in the one under consideration, the substructure modules themselves are altered or oriented according to the various symmetries. in another, occasionally considered, the modules are filled with a finite number of symbols, but often more than four. this typewriter, for example, possesses 86 symbols. on the other hand, a "language" consisting of an infinite number of symbols would be unreadable. the 86 typewriter symbols could be transformed into a module-oriented chain by using four modules for each typewriter symbol (four modules giving 256 possibilities).)

all systems and organization depend on symmetry. C = C depends on parallelism.

a line on a piece of paper depends on parallel darkness-lightness contours. action-reaction laws utilize antiparallelism. real number system enumeration (1,2,3,4,5...) relies on 1-difference for consistency. if we postulate inconsistent enumeration (for example 4, 8, 17, 18, 21...) the next element may be determined only by applying a symmetry rule (for example:



the 4th order subtraction yields 23-23. the next digit is 59.)

symmetry is "ideal;" 2&2 always = 4, no matter what objects. yet in actuality, excluding particle physics, it is practically impossible to create identical ("congruent or parallel") objects. [note: can objects be identical without being congruent?]



[

an absolute sculpture would postulate a chain plus mapping sequence. any information as to form and function can then be directly mapped. the organism need not live.

(the sculpture would be completely described by a coded object in 2 or 3 space. nothing else visible need be given.)

[

an example is given in the enclosed photograph

the number of symmetries  $T^2 = []$  increases from 4 to 8 in 3 space; therefore, more compact coding is possible in three dimensions.

3 entities are constantly present: the emptied ground state [], the chain C, the coded state [m]. in the photograph, the chain 7 elements long is []; the other, [m]. an application of T to [m] results in either a duplication or congruence of the 7-element chain.

the state [] in the photograph provides a structure for [m]. (a template.) the state [] itself has not been changed. nevertheless mapping in most cases indicates a transformation through T of the original elements.

[

instead of the alphabet coding already described, a binary system with a module of 6 bits or less could be used.

[

any (arbitrary) operator T may result in an (arbitrary) chain of symbols.

[

it is possible to order grounds entirely on a macroscopic level. for example, a group of individuals in a field could be coded to preserve certain information provided they remain indefinitely in their new positions. (but in order to read the coded information, their original ground state [] would also have to be known.)

[

it should be clear that addition as a process dependent on perception requires some form of conceptual (psychological) grouping in order to "deal with" - i.e. count - existent "objects." this grouping depends on an "even" ground ( in the same sense that Euclid speaks of a straight line as "even" with the points on itself.) ["even" here considered only from a perceptual point of view (thus avoiding the fallacy in Euclid's definition.)]

[

any group of arbitrary objects (sentient or otherwise) may be considered an encoding of any specified symbol chain C. T would then be determined from the actual positions of the arbitrary objects, which could then be "returned" to their uncoded-ground state [].

--this (last) section may be a "play on objects."



[

as example: all the buildings in a small town may be decoded through a suitable operator T so that they no longer map the phrase "amor vincit omnia." 51 buildings are necessary. (on the other hand, in their new arrangement, they actually do code the phrase. [a play on objects again].) they would then face one of four directions, not necessarily the street...

[

note that, for ordering buildings or individuals in a field, it is necessary to use only rotational symmetries.

(or, using mirrors:

p: object remains unmoved.

a: object faces its former position.

s: mirror in front of object.

s': mirror on side of object.)

coding might be employed:

p: 0° rotation


a: 180° rotation

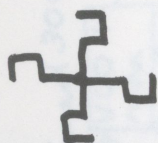
s: 90° rotation

s': 270° rotation.

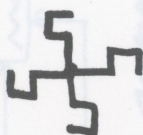
(we remember, however, that with 90° and 270°,  $T^2 = a[.]$ .)

[

given  we note the following:

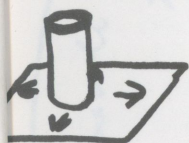


left hand



right hand

*in 2 space*



*with rotation, the buildings or individuals in a field are considered only from the (ideal) 2 space ground plane; this simplifies manipulation.*

[

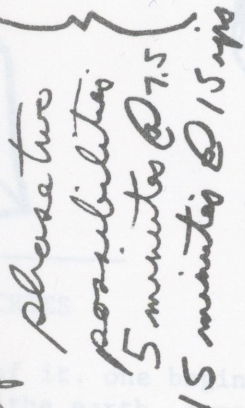
an arbitrary postulation: all human beings at any given time on earth represent the encoding of these pages over and over according to the given 39 element enumeration. the beings are ordered (to create the substructure for coding) according to height. in the event of a tie, according to weight. in event of a tie, according to width. in event of a tie, according to length. in event of a tie, according to longitude. in event of a tie, according to latitude. since symmetry one and symmetry two cannot practically be applied to the entire human population without an inordinate number of mirrors, the secondary code resulting in rotation (see above) is utilized. --piece: ALL HUMAN BEINGS SHOULD BE RETURNED TO THEIR UNCODED GROUND STATE [].

the information on these pages will then be eliminated from the environment.

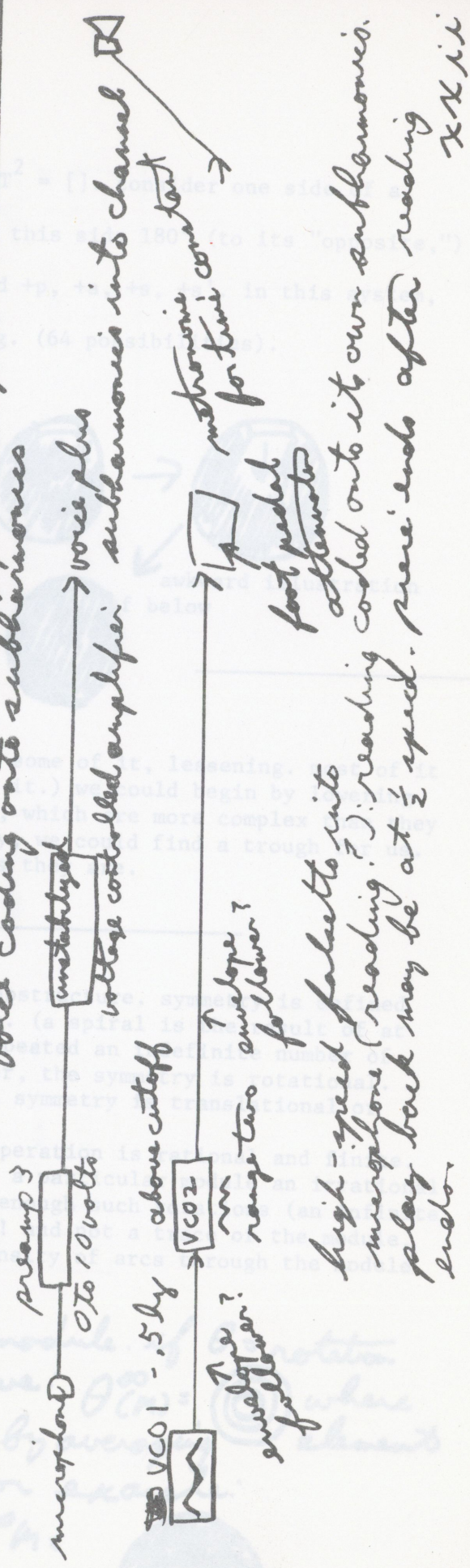


15 July

mic

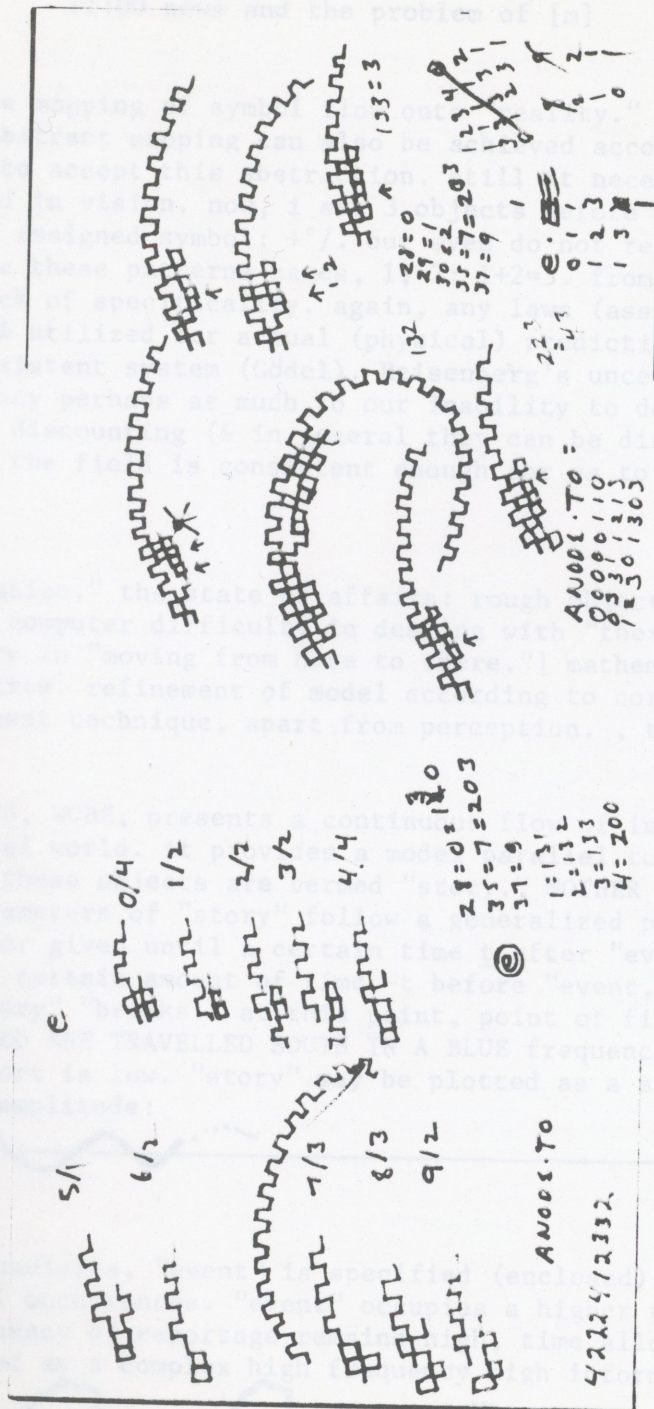


voice coding by means of  
asymmetrical time expansion process  
voice coding onto subharmonics



high-speed falsetto into  
microphone (reading?). reading  
play back may be at  $\frac{1}{2}$  speed. Here ends after reading  
ends. XXii







11:00 news and the problem of [m]

technical:

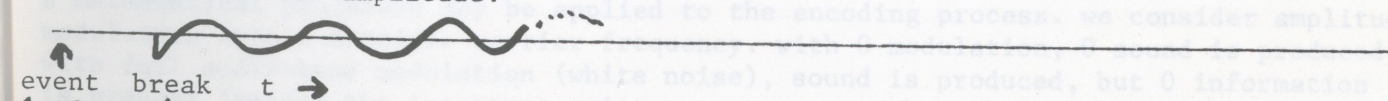
[m] representing the mapping of symbol flow onto "reality." the problem becomes one of perception. an abstract mapping can also be achieved according to higher mathematics. we incline to accept this abstraction. still it necessarily flows through the same inputs used in vision. now, i see 3 objects before me. situation of pure space. objects each assigned symbol:  $+^\circ/$ . our eyes do not rest; the muscles trace z.b.  $[+][^\circ/]$ . we may give these patterns names, 1, 2:  $1+2=3$ . from a mathematical standpoint, this possesses a lack of specificity. again, any laws (assumptions) drawn from perceptual experience & utilized for actual (physical) prediction ("speaking-before") complete only an inconsistent system (Gödel). Heisenberg's uncertainty principle does not refer to indeterminacy perhaps as much to our inability to determine. : we are "given" a perceptual field. discounting (& in general they can be discounted) optical illusions, trick mirrors, etc. the field is consistent enough for us to rely on perceptual validity.

some:

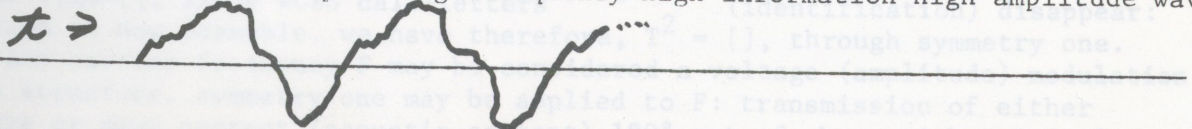
"assessing the situation." the state of affairs: rough objects "there." bright & dark line spectra. [note computer difficulty in dealing with "there." the number of assumptions necessary in "moving from here to there."] mathematical overlay paralleling, resulting in prediction. refinement of model according to corresponding refinement of physical measurement technique, apart from perception. , the news station.

radio:

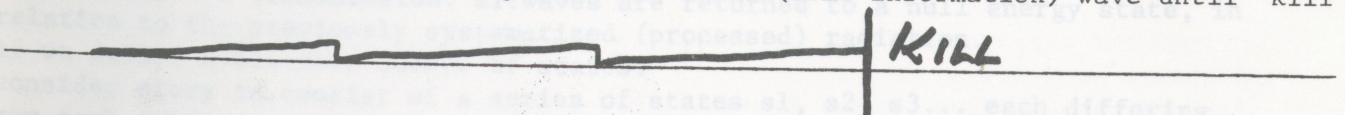
the news station WINS, WCBS, presents a continuous flow of information directly related to "event" in physical world. it provides a model parallel to rough objects. gross changes relating to these objects are termed "story." MOTHER OF THREE OBJECT OF STATE-WIDE SEARCH. the parameters of "story" follow a generalized path. no information on "story" is reported or given until a certain time  $t$  after "event" occurs. (a "predictive" story may be given a certain amount of time  $-t$  before "event," but this is not news, it is "assay.") the "story" "breaks." at this point, point of first break, information is limited IT IS BELIEVED SHE TRAVELLED SOUTH IN A BLUE frequency of reportage is high, time allotted per report is low. "story" may be plotted as a sine wave of high frequency low information low amplitude:



more information accumulates, "event" is specified (enclosed); "story" possesses smaller set of actual occurrences. "event" occupies a higher probability of existence within "story." frequency of reportage remains high, time allotted per report is high. "story" may be plotted as a complex high frequency high information high amplitude wave:



"story" begins to "die" after a period of time, somewhat dependent on "importance." frequency of reportage decreases, time allotted per report is low. more information is given, however, than after "break," "event" is summarized," the waveform may now be treated as a low frequency low amplitude sawtooth (some information) wave until "kill":





"story" interval is subset of airing interval. airing interval may be specified by station name as ground for "story" mapping: [WCBS]. any news item ("story") specifies a unique event which implies an increase of entropy. the news station [WCBS] creates a coding (mapping) upon that event; the event is "regularized." later, historical processing will further organize the initial occurrence. (subjective decrease in entropy. life process).

[WCBS] is an investigation of unique events; abstract formulation in higher mathematics is an investigation of parallel or predictive events. [WCBS] provides a continual linguistic description of the world based on principles close to the synchronistic hypothesis of Jung. a complete situation assessment requires the preservation of a segment of information flow from [WCBS]; for example, a four hour tape of continual reportage. the tape may be played after "story" is "killed" on airtime; it becomes historical process which totally parallels reportage process.

reportage process is based on analysis through perceptual field of "rough objects 'there'". "there" is not "here" within us [later note: "problem of proof"]; news is interpretive. news plotted according to abstract mapping would concern itself with falling objects and states of oscillation of air molecules. (thru coordinates?)

a playback of [WCBS] is an interpretation of [WCBS] and hence an interpretation of [m], mapping, and the ground state []. there are 2 ground states, the carrier frequency of WCBS, and the empty (acoustic) perceptual field. this field fills with "events," the gross changes of objects in relation to one another. it does not specify existence of objects; it is the relationships that are mapped. [nothing exists except relation.]

A MOTHER OF THREE LIVES may be an existence-statement but would not be "event" (as mapped on [WCBS]). A MOTHER OF THREE LIVES TO NAME ASSAILANT is "event;" it implies activity but not a priori existence. (rather, it is "story," with a probabilistic relationship to "event.")

by coding entropy we absolve it. by coding entropy we create a passionate statement of the regularity of our existence. we constantly order the world anew. any portion of the energy spectrum may be utilized as [] for coding. perhaps it is time to decode, reverse our symmetric transformations, return chaos to chaos. at least realize the device and ensnarement of our encoding, listen less to it.

#### informalism:

a mathematical procedure may be applied to the encoding process. we consider amplitude modulation with a specific carrier frequency. with 0 modulation, 0 sound is produced; with full audio-band modulation (white noise), sound is produced, but 0 information is present (except the important existence statement that white noise is being transmitted). we utilize a symmetry one transformation by application of a continuous theta operator beginning at  $t$  and moving simultaneously and parallel to radio release of information. the encoding of "story" is mapping on mapping through particular interval:  $T_{t_1, t_2}([WCBS]) = [m]$ . then  $T[m] = [WCBS]$ . we may rewrite the second equation as  $T[m] = []$ , since WCBS call-letters (identification) disappear: 0 information is now possible. we have therefore,  $T^2 = []$ , through symmetry one.

note that any carrier frequency  $F$  may be considered a voltage (amplitude) modulation of antenna structure. symmetry one may be applied to  $F$ : transmission of either carrier wave or news content (acoustic content)  $180^\circ$  out of phase with original signal produces 0 information. this occurs through summation. voice transmission to the transmitter combined (summed) with -voice transmission = carrier wave minus information; carrier wave in transmitter combined (summed) with -carrier wave in transmitter = 0 transmission. airwaves are returned to a null energy state, in relation to the previously systematized (processed) radiation.

if we desire a discrete number of states: consider story to consist of a series of states  $s_1, s_2, s_3 \dots$  each differing from each other in amplitude such that  $\lim(s_2 - s_1) = 0$ , and the duration of  $s_1, s_2$ , etc.



being an integral time  $t$  with  $\lim(t)=0$ . as in integral calculus (in other words), the waveform is broken up into a great number of segments ( $\lim = \text{infinity}$ ), with amplitudes, that, by choosing a suitable coordinate system, may be represented by integers. these segments may then be enumerated in order by their integers; for example: 14, 15, 17, 18, 25... each segment is the property of a specific theta operator; these may be likewise designated by the identical integers. thus we can consider the above series to have been produced from its negative using symmetry one transformation through the series of theta operators T14, T15, T17, T18, T25... squaring these operators in the encoded order returns us to the negative state. the positive and negative states cancel each other out, if combined (summed).

a more consistent means of approach, that also arrives at  $T^2 = 0$  without summation, is to consider  $Tn = 1/2sn$  (where  $n$  is the state number). application of  $T$  then results in  $2(1/2sn) = sn$ . Reverse mapping swings  $sn$  through  $1/2sn$  to  $sn = 0$ .  $T^2 = [] = 0$ .

[  
by the decoding of [WCBS], [WINS], and other reportage "story" media, two things are achieved: the elimination of "story" so that "event" may be considered part of natural flux, and the de-systematization of the broadcast electromagnetic spectrum, so that natural flux may be heard and recorded in a pure state.

[  
A FOUR HOUR TAPE OF [WCBS] WAS PRODUCED AND ERASED.

[  
it is important that the natural flux be restored.

[  
while i retyped this, a house burned down a block away. it had been built in 1847.

[  
does the above reportage destroy "flux"? a type of enclosure; the story had been reported to you by me (few went close enough to read the date on the building).

[  
technical note: dissatisfaction with the summation necessary. if we consider  $T$  to be symmetry one transform ( $180^\circ$  out of phase) of carrier wave, in what sense can  $T^2$  be considered the act of summation? in other words, the second method is more elegant.  
and yet the sense of all these things is correct.

[  
analogy with perceptual processes; the news station itself processes information. the ear comprehends this information to be symbol-flow; the processing itself in both reportage (choice of viewpoint), and choice of words. very few states can eliminate this take. (see my "contradiction two" for an elaboration and partial solution to this problem.)



background -

outputreduc.edtozer  
osoundsforgottamo  
letterslefriv.ystiled  
aniERAT.ERA

2 prints

as1MAitnwOxLrgn-MedCfÆJEWUMBABCMWikaPffyd1A  
ænljbsTergsfq,v..WENEaa?Hdft:æcb=dE=oiiepsHGO  
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WL.ti;nKStthntdr.aoeTsrwhitwBspvFhoDUUe.9::ueT7æUres



## background -

in any two dimensional bounded space, different symmetries possess different information content. the greater the degree of symmetry, the less entropy and information present. (less "uniqueness".) for the infinite degree (complete translational and/or rotational symmetry), however, the reverse may be true. 0 (non) symmetry (Weyl's  $C_1$  state) presents maximum information content.  $D_1$  - simple bilateral symmetry - can present only  $1/2+$  the information, since the content must be repeated twice (mirror image) within the same bounded space. (this is also true for  $C_2$ . note that what we ordinarily conceive of as "real," is only a particular state in symmetry theory.) [in  $D_1$  there is slightly more than  $1/2$  the information, since there is also the information that bilateral symmetry is being applied. this means, that at the end of information coding, the symbols  $*D_1$  must be added. this requires min 15 bits.] in rotational symmetry, the higher the symmetry order, the less area for the module. since "pure" rotational symmetry may be considered an infinite order, 0 information is present except in "banding" around the center of the circle. likewise, in translational ("band") symmetry, the greater the number of elements, the less information per element. again, min 15 bits to specify the symmetry degree. while a circle (or sphere in 3 space) possesses complete rotational symmetry, it lacks translational symmetry. (movement of the center along a specified vector; the circle remaining congruent with itself. [instead of movement, parallel displacement.]) a "complete" translational symmetry would create an (infinite) array of modules "centered" on all points of the space. the modules would then possess 0 area, 0 information, or would overlap. but infinite overlapping of finite units would cancel any information present.-- lines coded with information in the form of parallel bands retain this information in a linearly complete translational symmetry. (coded in a direction perpendicular to the axis of translation.) for complete spatial symmetry, one of two possibilities is open: the module of coding must be infinitely small and thus present 0 information, or the module of coding must remain entirely indeterminate in regard to size, position, amount of information coded, and existence. [such an "unspecified" module would be incapable of any symmetry transformation. it possesses no "boundaries." symmetry operates (is that correct?) on discrete parameters, only. that is, if we "sense" the symmetry present, we do so by perceiving an overall configuration & its repetition.] in actuality, both states are equivalent since both present 0 information.) [religious note: in many pictorial representations of mystical "enlightenment," the figure utilized is an empty circle, or empty page. the page is "seen through"; on the other hand, it eliminates all "information" concerning the world we live in. only bounded space is present. 2nd religious note: it would be easy to mistake an "unspecified" module for god.]

[WINS] CARRIER WAVE ALTERED TO  $\pm$  D.C. VOLTAGES?

[ GREY PAGES

in an,ode i created or used structures as "tools", in the present work i deal with structures that are "out there," a priori to any description of them. the description does not create them, only brings them to our attention. on the other hand, these pages create a mythological science. but it is "grounded" in existent structure. for example: i create a module and utilize symmetries for coding onto it. the "language" of the coding is english or latin. this creates a "locality" for the work. on the other hand, the procedures and nature of the coding are familiar processings. note-i am not satisfied with the language of this page. the first section is too unformalized; the second, too much a memo.



precis

1 definition:  $R$  = relationship. (symbol/word.)  $R$  is also a perceptual process of combination. as relationship  $R$  may be applied to two more more entities (in serial fashion); as process, to none or more.

2  $A, B, \dots$  are entities. this term is left undefined. (we may say, however: "an entity is capable of classification under one of Weyl's  $C$  or  $D$  numbers.) [symmetry groups.] all entities are related to each other if considered as subset of the set of "things." "things" is thus defined tautologically as the combination of all entities.

3 the number of entities does not depend on perception. our perceptual processes may classify them in any manner, however. this classification is purely symbolic (may lead to contradiction); it is placed "upon" the world, is not part of it. (classification cannot be a "part" of anything, except in a purely physical sense - i.e. acoustic vibrations in air molecules, ink on paper, etc. this physical sense is beside the point.) [further note: entities, as such, are unknown to us. see previous information on sense processing of the environment.]

4 entities may be classified according to our processing (schema). there "exist" sets, subsets, etc. the smallest class is often the most useful. "class" often depends on our perception of object - i.e. on the nature of our input processes. (amount of information we can coherently receive at any given duration of time.)

5 we have two combinations to consider:  $ARB$ , and  $AR$ . the former may be expanded, in serial fashion, to  $ARBRCRD\dots$

6 we create a series of classes designated by  $R(X)$  as follows:  $R(-1), R(0), R(1), R(2)$ , etc. we write then, for example:  $AR(4)B$ .

7 we are interested in particular in  $AR(X)AR(X)AR(X)\dots$  for  $N$  terms. we express this by the following symbol:  $AR(X,N)A$ , noting that  $AR(X,N)B$  is meaningless.

8  $A$  and  $B$  as entities may also be combinations of entities (regroupings). this is indicated numerically by an integer series, with increment of  $+1$ , beginning with  $0$ . we may then assign an integer to each entity which together form(s)  $A$ ; the same is possible for  $B, C$ , etc.  $A, B, C\dots$  may then be considered perceptually as integers.

9 addition is definable from the integer series, as demonstrated in Quine (ML), or Landau (FoA). we consider addition for the purposes of this paper, however, to be the perception of entities: addition defined only as observation.

10 addition is thus a statement about a perceived state of affairs, in a mathematical sense. (addition relies on perception; therefore, also on psychology and neurophysiology.)

11 since addition=observation,  $A + 0 = A$ ; that is, the total perception-state remains unaltered only if nothing is changed within its "field." (also remains unaltered only if our defined classes do not change.)

12 in 11 we are stating only that the state of affairs  $A$  is perceptually existent to the observer. ( $A$  has "relation" with nothing except the observer. the relationship "occurs" through the perception of the observer.) [note: crises in philosophy = crisis in language - in spite of recent linguistics, we can still read a novel (z.b.) and comprehend the events and attendant situations (states of affairs.) our gestalt depends on imprinting and possibly non-linear [molecular?] connections in our mind. logic imposed on language remains possibly an imposition.)



13 on the other hand, in multiplication  $A \times 1 = A$ , since multiplication (and the other relationships to be considered) is an operation, a performance. (something upon something.) this operation must be "done" at least once with the perceived state of affairs for an answer relative to the operation to be existent. (thus  $A \times 0 = 0$ ; nothing is being "done.") (thinking of mathematics as activity.)  
 [9 through 13: concern themselves with biology and not formalism.]

14 we now arbitrarily define "+" as  $R(1)$ . we have then, for example:  
 $AR(1)B = A + B$  .  $4R(1)3 = 4 + 3 = 7$  .

15 we define an important relational formula:  $AR(X,N)A = AR(X+1,1)[N+1]$  .  
 this defines the order of relationship classes to each other. the left side states: "the relation R repeated a certain number of times upon the same entity-class," or "the entity-class A combined with itself in a certain way N number of times." the right side states "the entity-class A combined once with N in the next higher order of relation." thus, each  $R(X+1,1)$  is in effect a symbolic means of expressing a repeated combination according to the process  $R(X,N)$ . this creates a series of symbolic-perceptual levels.

16 we use  $R(1)$  as example. we then have:  $AR(1,N)A = AR(2,1)[N+1]$  . the left side equals  $A+A+A+A+...$ , for N number of A's. the right side may be written as follows:  
 1. rewrite  $R(2,1)$  as  $R(2)$ ; 1 is understood.  
 2. we then have:  $A+A+A+A+...N$  times =  $AR(2)[N+1]$ . this satisfies the process known as "multiplication." for example:  $4+4+4+4 = 4 \times (3+1) = 4 \times 4 = 16$  .

17 we see, therefore, that  $R(2)$  may be defined as multiplication.

18 in like manner,  $R(3)$  is shown to represent powers:  $A \times A \times A \times A \dots N$  times =  $A^{N+1}$  .  
 [note: in the above, N represents the number of  $R(X)$  applied, written as  $R(X,N)$ , and does not represent the number of entity-class A's which are used in the formulations.]

19 if we take addition as the basis of object-perception, and all other  $R(X)$  as derived from this basis, addition may be considered the basis of the series  $R(X)$ ,  $R(X+1)$ , etc. (what do we mean by "take"? it refers to the process of definition. and "basis" rests upon our perception of groups of objects.)

20 we find, as another example, that  $R(4)$  represents the following:  
 "A to the A power to the A power to the A power... N number of times." [we are at a lack for symbols; these higher relations are rarely used.]

21 special case: we find that  $AR(X,1)A = AR(X+1,1)2$ , or, briefly:  $AR(X)A = AR(X+1)2$  .

22 special case contd. if  $A = 2$ , we now have:  $2R(X)2 = 2R(X+1)2$ . we can determine that  $2R(1)2 = 4$ . we have, therefore:  $2R(X)2 = 4$ , for all  $R(X)$ .

23 we may summarize the above by saying that multiplication is repeated addition; powers, repeated multiplication;  $R(4)$ , repeated powers;  $R(5)$ , repeated  $R(4)$ , etc. the series can be extended indefinitely, using the formula of 15 as generator. (i am sorry for moving so slowly.) [this section to be placed before section 21.]

24 we now calculate for  $R(0)$ . we have from 21:  $AR(0)A = AR(1,1)2 = AR(1)2 = A + 2$  .

25 at times it will be convenient to use the notation "o" for  $R(0)$ . the above can then be expressed:  $AoA = A+2$ . (example:  $4o4 = 6$ .)



26 from 15 we have:  $AR(0,N)A = AR(1,1)[N+1]$  or  $AoAoAo...N \text{ times} = A + N + 1$ .  
(example:  $4o4o4o4o4 = 4+5 = 9$ .)

27 from 26 and 1, we note:  $AR(0) = Ao = A+1$ . this states that A "used," "perceived," chosen, etc. has its value increased by an integer. this, of course, is based on observation in which "o" is considered some sort of relational parameter. (the consideration of A "adds" [o] something to it. a name possibly?)

28 we note however that even with  $R(0)$  as parameter:  $A=A$ . here A is "unused," "unperceived," or "undesigned." (mescaline perception; the 10th oxherding picture in the zen buddhist series. see also symmetry notes.) this is = to:  $A\emptyset = A+0 = A$ .

29 we now consider series of various sorts. we shall use S to designate a series. in general, we shall consider  $S(X,I)$  where X represents a particular  $R(X)$ , and I is the "increment." we then have, z.b.:  $S(1,1) = 1, 1+1, 1+1+1... = 1, 2, 3, ...$  or the integer series. the series must begin with I (the "increment"). some other examples:

$$S(1,2) = 2, 2+2, 2+2+2, ... = 2, 4, 6, ...$$

$$S(2,1) = 1, 1 \times 1, 1 \times 1 \times 1, ... = 1, 1, 1, ...$$

$$S(2,2) = 2, 2 \times 2, 2 \times 2 \times 2, ... = 2, 4, 8, ...$$

30 definition: of  $C(U,V)S(X,Y)$ .  $S(X,Y)$  is the series generated according to the rules in 29 above.  $C(U,V)$  indicates a combination of the terms of the series according to a relation  $R(U)$ , up to the term V. if  $V=4$ , for example, the first four terms of the series are combined. if  $U = 2$ , the combination method is  $R(2)$  or multiplication; the terms of the series, in other words, are to be multiplied together. with  $R(1)$ , the terms are to be added, and so forth.

31 in general, we are only interested in this reduction:  $C(X,V)S(X,Y)$ . we write this shorthand as:  $VS(X,Y)$ . examples:  $4S(1,1) = 10$ .  $4S(1,2) = 20$ .  $3S(2,2) = 64$ .  
(the longer form gives us, for example:  $C(1,4)S(3,2) = 2+4+16+256 = 278$ .)

32 using the short form, we deal with  $R(1)$  this gives us  $NS(1,1)$ . through ordinary arithmetic, we find:  $NS(1,1) = \frac{N(N+1)}{2}$ . we find, in general:

$$NS(1,M) = \frac{M(N)(N+1)}{2}$$

33 the case of  $NS(2,1)$  parallels that of addition. we have:  $NS(2,1) = 1^{N(N+1)/2}$ . this, of course, is a trivial solution. nevertheless, the general formula here is:  $NS(2,M) = MR(3)N(N+1)/2$ . here the right hand expression should be understood to be bracketed as follows:  $MR(3)[N(N+1)/2]$ . we find a parallel case for  $R(4)$ , etc.

34 the general form of the above:  $NS(X,M) = MR(X+1)[\frac{N(N+1)}{2}]$ .

35 solving for  $R(0)$ , that is,  $NS(0,M)$ , we find:  $NS(0,M) = M + \frac{N(N+1)}{2}$ . [NOTE: in all these cases, "N" represents a symbol "term number." all of the term numbers taken in succession represent the integer series, since "term numbers" may be treated as physical entities. conceivably, however, the series of N's might not be integers... (we could "work this" ourselves by letting successive N's represent the values of  $S(2,2)$ , for example.)

36 consider the 0 and 1st term of the series in 35. it is evident that the first term is that designated by  $AR(X)$ , where A equals the increment (see 29), and  $R(X)$  represents the process of  $S(X,M)$ . in  $R(0)$ , we find, with  $N = 1$ :  $1S(0,M) = M+1$ . with  $N = 0$ :  $0S(0,M) = M$ . in other words, for  $R(0)$ , the 1st term of the series is not the increment, but the increment plus one. this clarifies and establishes 27 from another viewpoint. the second formula, for  $N = 0$ , clarifies 28.



37 from addition "up," (at least thru R(3)), the first term is always M, the increment (by the formula). setting N=0, however, results in the following:  $OS(0,M) = M$  ;  $OS(1,M) = 0$  ;  $OS(2,M) = 1$  ;  $OS(3,M) = 1$  ; with  $R(4/X)$ , we presumably have  $OS(X,M) = 1$  also. indeed, we define  $AR(4)=1$ , etc. this is evident in the power series, where a number raised to the 0th power is defined as 1 in ordinary algebra.

38 we now determine the R(0) series. if we set  $M = 1$ , we have:  $NS(0,1) = 1+1+1+2+1+2+3 = 2 + 3 + 6 + 10...$  this corresponds to the addition of the integer series  $NS(1,1)$  exactly, with the addition of 1 to the total.

39 using the general equation 34 we desire to solve for both  $NS(X,M)$  and  $(N+1)S(X,M)$ , in order to discover the difference (defined here as "increment") between them. we have:  $(N+1)$  parallel to N, if N parallels N-1. solving for N-1:

$$(N-1)S(X,M) = MR(X+1)[N(N-1)/2] = MR(X+1)\frac{N^2-N}{2}.$$

this solves for the sum of the term N-1. if we take the sum for term N and "subtract" sum term N-1, we are left with term N of the series. this is notated TN. we find, then:  $TN = NS(X,M) - (N-1)S(X,M) = MR(X+1)\frac{N^2+N-N^2+N}{2} = MR(X+1)N$ . example: if the series is

addition,  $T5 = 1 \times 5 = 5$ . if the series is multiplication with  $S(2,2)$ :  $T3 = 2^3 = 8$ . for R(0),  $TN = M+N$ . hence, with R(0), the increment only figures in the initial term; the rest of the terms follow the ordinary addition series. the initial term is not, however, M, but M+1. thus "applying" R(0) to M:  $MR(0)$ , without a second term, automatically increases its quantity. the operation itself is responsible for the increase. before the operation occurs, M exists without change. this is seen, again, in 27 and 28.

40 in other words, the increment between any two terms generated by R(0) is always 1.

41 set  $TN=Q$ . Then  $TNR(0) = QR(0) = TN+1$ , no matter what increment for TN. if we set, on the other hand,  $TN + 1 = W$ , we have:  $QR(0) = W$ . since M is the original increment:  $QR(0)M = W$ . this is an expression of the general form  $AR(0)B$  (AoB). we find that  $AR(0)B = A+2$ . the quantity of B is irrelevant. this is the solution for R(0).

42 it may be asked, if each step adds an increment of one in R(0), why does  $AR(0)B = A+2$ ? we see though that  $A = A+1$  with R(0) parameter;  $AR(0)A=A+2$ . the initial combination adds two. this parallels, in addition, that  $3+3=2 \times 3$ , even though only one summation occurs. [could the above TN section be unnecessary?] we may say: the first term A in any TN with R(0) increments itself before combination.

43 two things. 1st, making a cut into the series momomom... increases its value by one. for example: momomom = m+4, mom = m+2, mom(omom) = (m+2)omom = AoBoB (by substitution) = A+3. now A = (m+2), so that we have finally momomom = m+5, a "contradiction" of the above. it is possible also to make a cut that decreases the value; indeed, the value may be altered any number of ways, although the total alteration may not exceed N, where N is the number of terms. [is this section simply intuitive?] thus the act of cutting into the series redefines it ("interferes" with it), and generally makes it jump an integer. (this is pure metaphor; actually, nothing happens at all.) in the other direction: momomomom = mom(o)momom = (m+2)o(m+3) = m+4; the series is decreased by 1. the method of combination, then, in any AoBoCo... is simply adding the quantitative value of the entity class A to the total number of entity classes, including A itself.

44 we have still  $0 = 0$ . but if 0 is "observed" 0o is produced, generating 1; 1o generates 2, etc. the entire integer series is formed. this parallels Quine's counter sets (ML).

45 partial summarization: 0 "generates" the integer series; the series is created as soon as the existence of "nothingness" is perceived. (back to biology: the very nature of



perception ensures the existence of an external field. also: a field which is "regularized," i.e. not random. perception cannot take into account fields which are for practical purposes, random: i.e. extraterrestrial radiation, etc.) all of this activity is "metaphorical;" it exists only through this paper. nevertheless it is based on perception, not logic. [i wrote originally: "it is important to note that this observation (of nothingness) does not necessarily imply looking or other "life" activity. that any relation at all exists (with nothingness) is enough to produce the series. with the existence of "pure" nothingness (non-relational nothingness) alone, nothing is produced; that is, there are no possibilities of addition." at the moment i am not at all sure of the meaning of this. it seems so much jargon]

46 with any possibilities of addition, there are all possibilities. (addition as symbol flow extrapolated from the environment. [again, not sure of this])

47 in a sense then the universe generates its own number series (its own perceptions), which is that of the integers: an additive process with the increment 1, starting at any M. [again: this is true only in a perceived intuitive (metaphorical?) sense; the universe, of course, generates nothing mathematical. in fact it could do without this paper.)

48 is there a "more basic" process, such as  $R(-1)$ ? from 22:  $AR(-1)A = A_0 + 2 = A + 2$ . we also have:  $AR(-1,N)A = AR(0)N = A + 2$ . [ $AR(-1,N)A$  is the process  $R(-1)$  applied to A N number of times.] we find also  $TN = A + 2$  for any N. the increment between terms is 0. the series generated it:  $S(-1,M) = M + 2, M + 2, M + 2, \dots$  the total combined process is found in 34, and is equivalent to  $M + 2$ .

49 for any  $R(X)$ , where  $X \neq -1$ , the same holds. for  $R(-2)$ :  $AR(-2)A = AR(-1)2 = A + 2$ .  $TN = A + 2$ , the same as for  $R(-1)$ . in other words, for  $R(X \neq -1)$ , the results are the same as  $R(-1)$ ; the series below  $R(0)$ , therefore, coalesce. they equal, no matter what combination, a constant -  $M + 2$ .

50 this constant may metaphorically be considered the totality of all things. the  $+2$  could then represent these two entities: the perceiver and the perceived.

51 continuing the poem: from 47: can we postulate a universe where multiplication is the perceived? then the operations upon the integers: a. generate the series. b. come from (are perceived in) the existent. c. may be peculiar to this universe. d. on the level below addition, alter themselves according to the intrusion of the observer. e. are intimately connected with the concept of existence/are defined by it. f. may define existence themselves (existence = relation).

52 some other problems:  $R(4/X)$ . inverse relationships. problems concerning  $C(U,V)S(X,Y)$ , where  $U \neq X$ . inverse relationship series.

1960-1971

"indeed in real life a mathematical proposition is never what we want. rather, we make use of mathematical propositions only in inferences from propositions that do not belong to mathematics to others that likewise do not belong to mathematics." Wittgenstein,

TLP 6.211-22

notes: could computation of  $R(0)$  be shortened? does successive term solving in  $R(0)$  series justify solution of  $AR(0)B$  for any A,B? non-commutative properties of most of  $R(X)$ ? this paper "primitive." (based on observation: no need for mathematics, if all "formulary abstractions" could be perceived as ordinary processes.) [finally, observation implies and guarantees the complete "subjectivity" of the work.]



into a great number of segments (tending toward infinity), with amplitudes that, by choosing a suitable coordinate system, may be represented by integers. these segments may then be enumerated in order by their integers; for example: 14, 15, 15, 17, 17, 17, 17, 18, 18, 25, 25, 18, 18, 17, ... each segment is the property of a specific theta operator; these may be likewise designated by integers. thus we can consider the above series to have been produced from kts negative using symmetry-one transformation through the following series of theta operators: T14, T15, T15, T17, T17, T17, etc. etc. squaring these operators in the encoded order returns us to the negative state; the negative and positive states then proceed to cancel each other out. a more consistent means of approach is to consider  $T=1/2s$ , or  $T_n=1/2sn$ . application of T then results in  $2(1/2sn)=sn$ , T remains at point of origin; reverse mapping swings sn through  $1/2sn$  to  $sn=0$ . thus  $T^2$  again  $=[]=p$ .) (in formula  $T^2=0$ , we have an inherent inprecision. technically "the action of T encoding "story" onto [WCBS], re-encoding (decoding) QWCBS" to [] or  $F=0$ " is meant.) the above is obviously not a "mathematical formalism" in the strict sense of the word. one may, however, be carried out. by the decoding of [WCBS], [WINS], and other reportage "story" media, two things are achieved: the elimination of "story" so that "event" may be considered part of natural flux, and the de-systematization of the broadcast electromagnetic spectrum, so that natural flux may be heard and recorded in a pure state. PIECE: A FOUR HOUR TAPE OF [WCBS] WAS PRODUCED AND ERASED.

11/70

the first approx stable acts as "accurate" chronometer dependent on projector speed. the second approx stable depends on projector speed plus calculation of extended observation (if all signals are taken into account). the third (unstable) is given a fixed structure but here there is no illusion of exactitude in the picture image ceases to matter. in all 3 the projector speed is a standard. the product of 3 standards is a 6 min film.

there needs to be a standard:

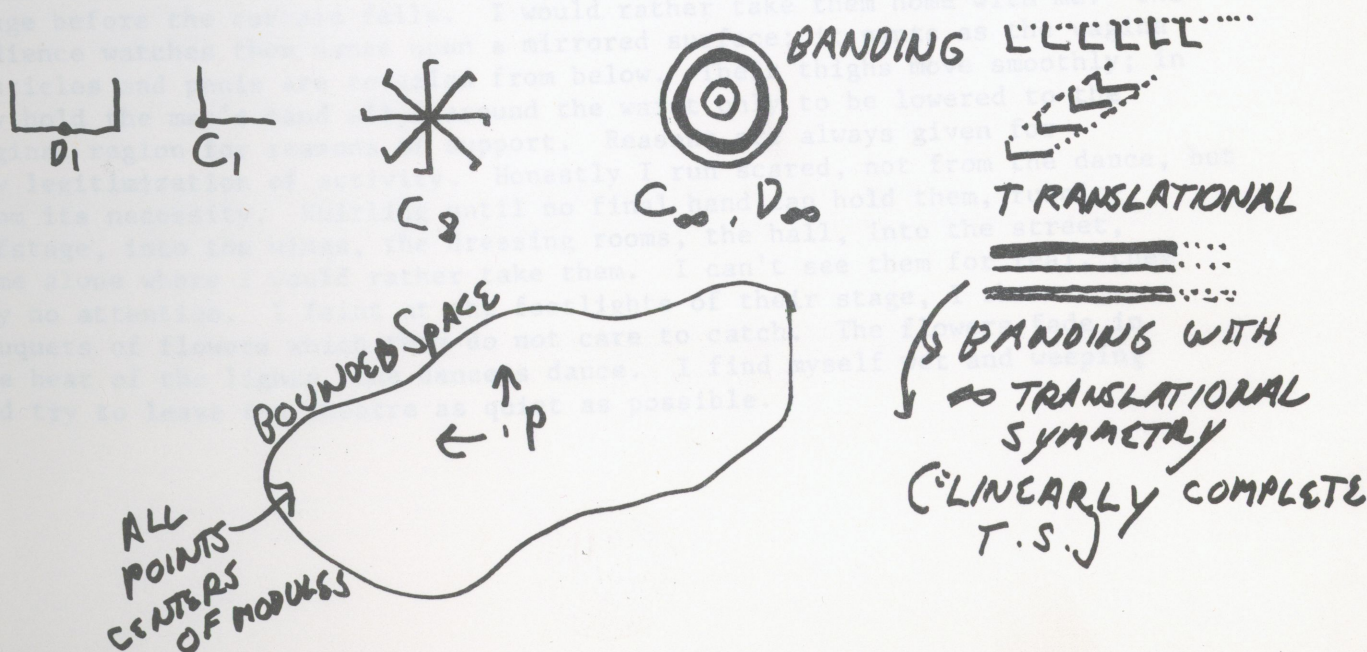
diagram:





[event] sets

anticipation of anticipation of anticipation of actuality and recollection  
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## Dance

The communication of dance is the possibility of touch. This does not occur. Dancers wind their way through the audience. Use of leotards exaggerates sexual characteristics. The vagina and breasts of the torso are systematic maps dependent on labnotation, a system for recording movement. There are a limited number of actions that may be taken without the prohibition of gravity or undue muscle stress. These together mark the course of a man. The other things he can do are "done" by machines; it is too easy to call them extensions. Arms out indicate gesture of surrender; legs out, apart, the posture of femininity. Penis extended hurls the body out in its center; curls up the longer extremities which become secondary to physically minor flow. Dance is the legitimized opening of sexual characteristics to audience; the leotard legalizes, I'd rather get down to fucking. Exercise better absorbed through direct exertion of probably more personal type. Breakdown of leotard strength into street clothes creates distance with audience which still knows the dancers as existence of real creatures. What is watched is abstraction, system, structure, what a man can or can't do with his given.

They pressed forward now, eager to read the flashing lights that had been laced on the buildings. Still, no central pattern emerged. They didn't know where they were, it seemed that they traveled the same street for hours. "Reads like a novel", he thought - which was strange since he hardly read at all. "We've got to hurry," she said, "those signs will eat us." He understood her paranoia immediately and reached for the syringe.

Nothing illustrates anything, they don't stand for anything in the dance, they move. If they theoretically form letters, they could spell out information which might be quicker caught by typing. Still messages might be conveyed which have no dance-relationship. A whole series of them could appear through the activity as a new form of aesthetic behavior. Watching a dance with Beth I would rather take her home, most messages after all are the same. The body moves, the body moves; a new activity would come only from the cripples. The dance cripples, dancers must devote almost their entire life to the marvelous beauty that is briefly coordinated upon the stage before the curtain falls. I would rather take them home with me. The audience watches them dance upon a mirrored surface; it pants as the vagina testicles and penis are revealed from below. Their thighs move smoothly; in any hold the man's hand slips around the waist only to be lowered to the vaginal region for reasons of support. Reasons are always given for new legitimization of activity. Honestly I run scared, not from the dance, but from its necessity. Whirling until no final hand can hold them, running offstage, into the wings, the dressing rooms, the hall, into the street, home alone where I would rather take them. I can't see them for real, they pay no attention. I faint at the footlights of their stage, I throw bouquets of flowers which they do not care to catch. The flowers fade in the heat of the lights, the dancers dance. I find myself wet and weeping and try to leave the theatre as quiet as possible.



## 2 pieces

march, 1834

six dancers are assigned the following roles:

warm air front  
cold air front  
thunderstorm (thunder, lightening, high winds)  
rainstorm (light wind, drizzle, heavy rain)  
sun (through clouds, clear day)  
snowstorm (light flurries to blizzard)

the weather for plymouth, mass. in march 1834 is read, day by day. the dancers enact the weather conditions.

note: it helps to have a mountain in stage center.


then, for example:

it may constantly snow on the peak.

the warm air front may cross; the cold air front is stopped in the foothills.  
the sun rarely shines.

(piece performed during the month of october, 1970)

## symmetries

two dancers, one oscillates in a  pattern, stage left.

stage right: a dancer performs one of the following, for each oscillation:  
moves parallel to the first dancer  
moves in symmetry one to the first dancer  
moves anti-parallel to the first dancer  
moves in symmetry two to the first dancer

the piece ends after a while

(a change: eventually both dancers may improvise, moving loosely in p, a, s, s', relation to each other. piece performed recorded and filmed october, november 1970.)



problem areas in symmetrically dividing  
the body with a uniform line of black ink

mouth (tongue)  
vagina penis  
anus  
clitoris penis  
navel

problems in minor axes of symmetry

2 upper leg axes:  
extended above body axis?  
axis through penis/vagina anus extending  
below upper limit of leg axis?

finger axes between joints?  
toe axes between joints?  
nail axes? wall(s)  
hair whorls? flooring?

iii. the words "wall, rug"  
impingent here. (word signi-  
fying location on page as field.)  
iv. impingent/impinged.  
v. the page (field) crossed  
for arbitrary division line  
(if necessary, say, as picture  
or illusion.)  
[1970]



NOTES -

LET  $P_N = \pi(T^N = [ ])$  FOR DIMENSION N

$-P_N = \pi(T^N = [ ])$  = all 'right-angled' symmetries.

THEN:  $P_N = 2^N$

DIMENSION:	0	1	2	3	4
$P_N$ :	1	2	4	8	16
$P_N - P_{N-1}$ :		1	2	4	8
$\frac{P_N}{P_N - P_{N-1}}$ :		1	2	4	8

walls

rug [somewhere]

NOTE THERE ARE DIFFERENT CLASSES OF  $-P_N = \frac{1}{2}, \frac{1}{3}$  etc. depending on DIMENSION.

TOTAL SYMMETRIES FOR  $D_N = N!(2^N) = P_N - P_{N-1}$  (ORTHOGONAL)

NOTE WE MAY FORM GEOMETRIC CLASSES  $\Sigma = \frac{P_N}{P_{N-1}}$  WHICH ARE OF INTEREST.

TOTAL  $-P_N = 2^N(N! - 1)$

ENGLISH MAY BE REDUCED TO 19 SYMBOLS.

FOR EXAMPLE "K" IS:

{ { LETTERS } + { A } }

$4 + 1 + 1 = 22$

$22 \leq 2^N, N=5$

$\therefore$  IN  $D_5 \geq D_4$ , ONE MORE

FINALLY, USING

IN  $D_3$ , WHICH

notes:

- wall(s)
- flooring?
- the words "wall, rug" impingent here. (word signifying location on page as field.)
- impingent/impinned.
- the page (field) creased for arbitrary division line (if necessary, say, as picture or illusion.)

[1970]



NOTES -

LET  $\bar{P}_N = \pi(T^2 = [ ])$  FOR DIMENSION N.

$-\bar{P}_N = \pi(T^2 = -[ ])$  = all 'right-angled' symmetries.

THEN:  $\bar{P}_N = 2^N$

DIMENSION:	0	1	2	3	4
$\bar{P}_N$ :	1	2	4	8	16
$\bar{P}_N - \bar{P}_{N-1}$ :	1	2	8	48	384
$\frac{D_N}{D_{N-1}(\bar{P}_N - \bar{P}_{N-1})}$ :		$\times 2$	$\times 4$	$\times 6$	$\times 8$
		"POINTS"	"LINES"	"PLANES"	"CUBES"

NOTE THERE ARE DIFFERENT CLASSES OF  $-\bar{P}_N: \frac{1}{2}, \frac{1}{3}$  etc. depending on dimension.

TOTAL SYMMETRIES FOR  $D_N = N!(2^N) = \bar{P}_N - \bar{P}_{N-1}$   
(ORTHOGONAL)

NOTE WE MAY FORM GEOMETRIC CLASSES  $\Sigma = \frac{D_N}{\bar{P}_N}$  WHICH ARE OF INTEREST.

TOTAL  $-\bar{P}_N = 2^N(N! - 1)$

ENGLISH MAY BE REDUCED TO 19 SYMBOLS.

FOR EXAMPLE "K" IS:

{f LETTER \* SCATAY}

+ \* + { + } = 22 SYMBOLS

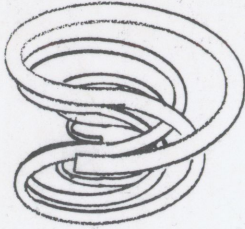
$22 \leq 2^N, N=5$ . USING  $\bar{P}_N$  ONLY,  $D_5 \geq 22(T^2 = [ ])$

$\therefore$  IN  $D_N \geq D_5$ , ONE MODULE/SYMBOL IS POSSIBLE.

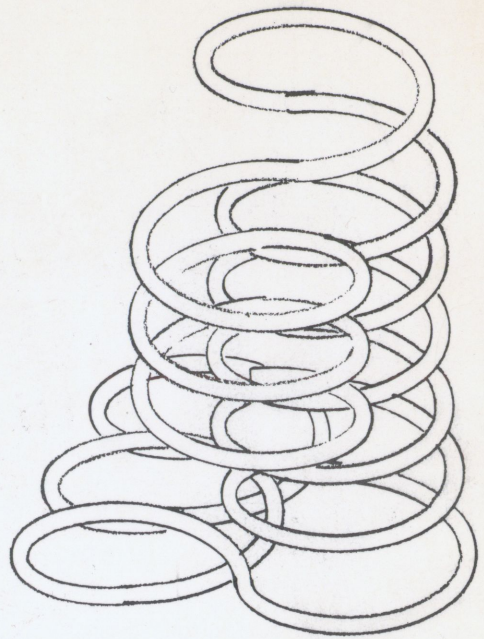
FINALLY, USING  $\bar{P}_N - \bar{P}_{N-1}$  CODING IS POSSIBLE IN  $D_3$ , WHICH HAS 48 POSSIBILITIES.



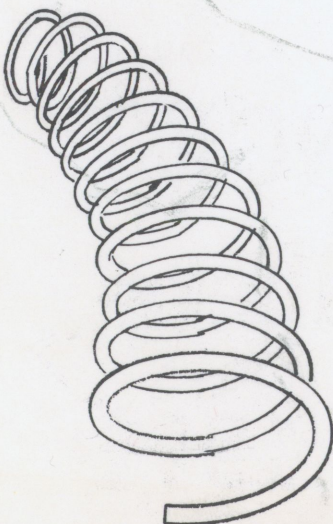
2 2 + - + - ...



2 2 HELICAL CODING



3 SYMMETRIES



RESONANCES  
Alan Sondheim  
ppress 1971  
Edition limited to  
two hundred copies  
/200