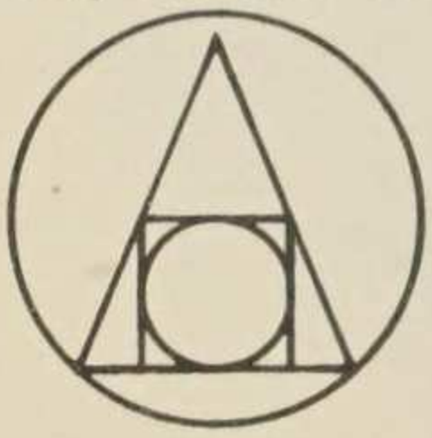
LOGICAL SPACE

JAMES REINEKING

TEXT BY LUIGI BALLERINI

OUT OF LONDON PRESS

Divided into three sections, ONtoLOGIC, LOGIC, and ANALOGIC, the book's non-linear organization locates its center in a reading of James Reineking's sculpture, which can thus be regarded as a combined effort of artist / maker and artist / user. Within LOGIC, plates are accompanied by "descriptions": some of them factual (describing the operation), others conceptual (describing the mental image formed by the operation), others yet lexicographic (describing a lexeme analogically related to the piece to be assessed). Although these three descriptive processes are at times conjoined, they account for a tripartite division of the iconic documentation.



Centrifugation resulted in twelve choices in philosophy, Zeno of Elea, Plato, Aristotle, Robert Grosseteste, James Joyce, Dante Alighieri, Black Elk, Michael Maier, Carl Gustav Jung, G. Spencer Brown, Gertrude Stein, Kenneth Burke, which in varying ways reflect back to the center; in this centripetal return ONtoLOGIC evolves as an attempt to justify ideologically the mutual kinetics of the parts and of the whole.
The book does not purpose an exhaustive panorama of the modes in which the analogues bear relevance to the sculpture and onto themselves; nor does it intend any demonstration of truth or falsity that might be contained in the analogic excerpts, whatever meanings will be attributed to their interactions.
It could then be said that the content of *LOGICAL SPACE* is a form of inferential grammar, or, in other words, that it posits an art aiming at a formulation of "non-prevaricative LINGUISTIC MODELS of which the notion of reality is a necessary concomitant and in which the notion of TASTE is substituted for by that of STRUCTURAL AWARENESS."
The specific material adopted as the only possible ground for communication is extended along semantic (verbal) and non-semantic (sculptural) vectors, towards the intensional experience of an incipient materialistic aesthetics. Necessarily, exegis becomes part of praxis and constitutes the "spirit" of its corporeal form.

James Reineking was born in Minot, North Dakota, in 1937. His work has been exhibited in various one-man and group shows (Texas Gallery, Houston; San Francisco Museum of Art; Whitney Museum, New York; Galerie DeGestlo, Hamburg; etc.).
Reineking regards his sculpture as a form of discourse in which TIME and PLACE are members of a metonymic relationship. He has also taught art at the San Francisco Art Institute, and for the past three years he has lived and worked in New York, exhibiting both in America and Europe.

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CONTENTS

ONtoLOGIC

ex absurdo sequitur quodlibet
pseudo-Scotus

place (plās), *n.* [ME.; OFr.; L. *platea;* Gr. *plateia,* a street < *platys,* broad], 1. a recognizable sculptural unit achieved through activity on an original state presented as altered state. 2. the physical pre-eminence of an if/then connection. 3. a planar syndrome of references. 4. a three-dimensional syndrome of references visited by events. 5. the meeting point of continuum and discretion.

place is *time in* and *time out* of time
time is *space in* and *space out* of space
space is where time acts out the vision
place is the acting out of the vision is
the vision being acted out / is
the power of the vision
the problem
is the autonomy of the form

approximately at Baroque (inflation of metrics, beginning of *oeuvre ouverte*) form discontinues eso-traditional role of conjuring, turning to self-theoretics. natural magic put to temporary end. late renaissance as mental cataract profanely dammed in by religious proficiency and orthodox surrender. REFORMATION as piety and surface objectual knowledge; as political settling of

cognitive issues; as return to order barring the breaking out of conditions; as partial purification lacking dialectics between semantic attitudes and inferential processes — thus leading to a betrayal of implications:

corrosive etymon
contemplates the
engine of its pronunciation
lekton
is losing sight of

counter-REFORMATION as
occasion (ə-ka'zhən), *n.* [ME. *occasioun;* OFr.; L. *occasio,* accidental opportunity, fit time < *occasus,* pp. of *occidere,* to fall < *ob-* + *cadere,* to fall],. 1 to fall (in) = to bend inward, cave in /to agree agree / to line up in proper formation. 2 to fall (in) (with) = to meet by chance / to meet and join / to agree with, comply with. 3 to fall (out) = to have a disagreement, quarrel / to happen, result / to leave one's place in line.

the problem becomes dance on the double valence (FORM ignored and in FORMATION), becomes
the what should have and what did, becomes the time of structural indecisions, becomes
the neglected premonition, the distinction
of meaning and sense (the direction)
RESTORING
to identify

pre-occupied by response to provocation (FALLING INTO the field of established ethics - acceptance/assumption of the provoker's language -) counter-γg FORMer neglects primary issue: the avoidance of impositional logics (pivoting on states of affairs), the cultural instead, the cherishing of improbable theses

two adversative positions can be clearly outlined:

1. ARISTOTELIAN (metaphysics) – FORM as distinct from MATTER joins MATTER to result in SUBSTANCE
2. TELESIAN (pansensistic materialism) – MATTER is animated by POWERS (*heat* and *cold*) which are in themselves MATTER

to defend 2 (which eliminates the distance between *materia* and *substantia*) against 1, the road is made clear for 3 to come about.
within the operations of a sense-pervaded MATTER, individual beings acquire, through sensing, knowledge of *other (notio addita)* while at the same time acquiring knowledge of self, sensing *(notio abdita,* & various degrees of sensitiveness)

3. HERMETIC (magic) – FORM as MATERIAL REPRESENTATION capable of inducing MATERIAL CHANGE

with condemnation of 3 as concomitant result of
I die of thirst at the side of the fount

(Th. Campanella in

and out of prison, Bruno,
besieged by *horror vacui,* burnt at stake)

FORM is

a) brought back to metaphysical independence and thus forced out of the aesthetic sphere
b) offered apparent redemption as *extension of content,* a fact that divorced the very notion of content from that of substance, and was generously, but, in final analysis, absurdly put to use by the supporters of localistic mythologies
c) let loose to become marvel
d) intelligence of wit as first step out of ornamental aesthetics

the solely edonistic function assigned to FORM *per se* in c),

which can in itself be regarded as a cultural *faux pas*, becomes, when viewed in perspective (d), the inevitably awkward beginning of a radically new axiology of aesthetics. clear distinction must be made, however, between the origin of the process and the phase it has now entered (and in some cases already superseded); between, that is, FORM as a device for autonomous ornament/pleasure and FORM as AUTONOMY. although it would be hard to conceive of the latter without acknowledging the unsuspected positivity of the former, the fact remains that one is actually the result of a reduction: the taking away from art of cognitive and speculative functions formerly assigned to it, while the other is the result of an attribution: the bestowal upon art of cognitive and speculative functions whose frame of ideological references and evaluation is to be tested in the pure structure of their linguistic casts. the mark of autonomy is indeed the fact that, here, FORM(s) can be worked with and organized in patterns with no vital regard for their immediate semantic obligations, while their connectional arrangement belongs, instead, to the order of sufficient and necessary arguments.

further and yet more important considerations can be drawn from the emancipation of FORM:

A) MATERIAL FORMS (forms recognized in and/or abstracted from the physical presences of a chosen medium) account for a coherently ideological promotion of dialexis between the cognitive and interactional functions that qualify art's intellectual processes. that is: materials regarded as common ground/denominator between maker and user make it possible for *COMMUNIS* [? f. *com-* together + -munis (: *-moinis*) bound, under obligation (cf. early Lat. mūnis obliging, ready to be of service, as opposed to immūnis not under obligation, exempt; etc.)] to exercize its ideo-semantic role in COMMUNICATION

B) responsible *COMMUN*ICATION can only be defined in

terms of a logically based program of COMMUNAL inferential possibilities which, in turn, enable(s) us to identify FORM with THOUGHT itself (Della Volpe) and CONTENT with IMAGED STRUCTURES of SYNTAXED MATERIAL FORMS

conditions are thus created to tell the distance
to reformulate, to see the novelty in a change of axis,
break the seal of catharsis
delve into it for beyonding
the pity and the fear, the motivational tangle
(in the language of Burke)
Eumenides yielding to Athena
(as read by Friedrich Engels)

the aristotelian dictum:

> the poet should prefer probable impossibilities
> to improbable possibilities (S.H. Butcher, transl.)
> ... ought the poet to choose impossible likelihoods rather than unpersuasive possibilities (K.A. Telford, transl.)

must thus be assessed in view of the fact that the *saltus* between the *heretofore* of restorational philology and the *henceforward* of praxis entails an altogether complete reversal of its premises.

Aristotle exemplifies his argument (*Poetics*, 1460 a, 25 (10)) by referring to the episode of the "Washing" in the *Odyssey* (XIX, 164-260) where Odysseus says to Penelope that he is a Cretan who has met her husband. she believes him because he can describe Odysseus and even his attendant Eurybates. the argument is, though credible, logically impossible because Penelopæ infers the truth of the antecedent (if you have seen Odysseus) from that of the consequent (then you can describe him). by showing – on the aesthetic level and in view of an ethic finality – a common sense support of the logically impossible argument, Aristotle confirms the suspicion that, on a logical level, he could only conceive of deriving a true consequent

from a true antecedent. (the lack of a clearly formulated theory of logical connections prevents the aristotelian mind from conceiving the material implication of a true consequent and (rather than from) a false antecedent). admission and acceptance of a dichotomy between inferential logic and rhetorical logic, the logic, that is, of symbolic actions in aesthetic activity, result in a form of communication based on the principles of a received and unquestioned ideology, and bar aesthetics from any dialectical relevance in the process, previously hinted at, of shaping a COMMUNAL COMMUNICATION where POSSIBLE and IMPROBABLE/UNPERSUASIVE will indeed cease to be a tenable coupling

ON THE ROAD TO DAMASCUS (John of) – where FORM is resorted to as a direct (though at times *iconographically* "distorted") outcome of mimesis, and subjected to a form of *proskúnēsis skhetikē*, or "relative worship", art claims at capturing instances of objective reality conceived as separate from the MEDIATIVE FORM that captures it, and regards the notion of ACCULTURATED TASTE as an act of viable criticism

ON THE ROAD TO CONSTANTINOPLE (Leo the Isaurian) – where FORM is resorted to as a direct (though at times *iconologically* symbolized) conceptual appreciation of abstracted and organized material forms (while the attraction to the iconic element itself is condemned as a form of *latreia*), art aims at formulating non-prevaricative LINGUISTIC MODELS of which the notion of reality is a necessary concomitant and in which the notion of TASTE is substituted for by that of STRUCTURAL AWARENESS

the problem is now the "mixing" of the levels (logical existential) and the ontological promotion of *aisthanestai*

to what liquid Parmenides, to what
value in a movable climb /
descent of values, to which

number of things and which
gender of emblems does *le variable* commit you?
if to be is to be the value of *le variable*
what beliefs will you state
if names occur as values?
history being contained
in the ordeal of etymon
and the phases of
its betrayal
art as specialized
aisthētikos space is restored /
promoted to an ultimate connective function

art. (ärt), *n.* [ME. *art, arte*; OFr.*arte*; L. *ars, artis*; IE base **ar-*
to join, fit together, as in L. *artus,* joint]

is the set of RESTRICTIONS (Quine) deputed to accomodate under one METAPHORICAL LOGIC such incompatible types of entities as those that depend on INTENSIONAL and EXTENSIONAL LOGICS, where restriction is akin to

restrain (ri-strān) *v.t.* [ME. *restreynen*; OFr. *restraindre*; L. *re-stringere*; *re-*, back (once again) + *stringere*, to draw tight]

the most basic (aristotelian) notion of metaphor is here adopted: a clear-cut line severs it from any loose & free-wheeling form of emotionally induced (ornamentational) resemblance to a given referent. metaphor is subject, *in other words,* to the same norms that govern inductive, hypothetical and definitional forms of rational discourse, its basic mechanism of transference depending upon, and at the same time resulting in, an abstraction of the *similar* from the *dissimilar.*

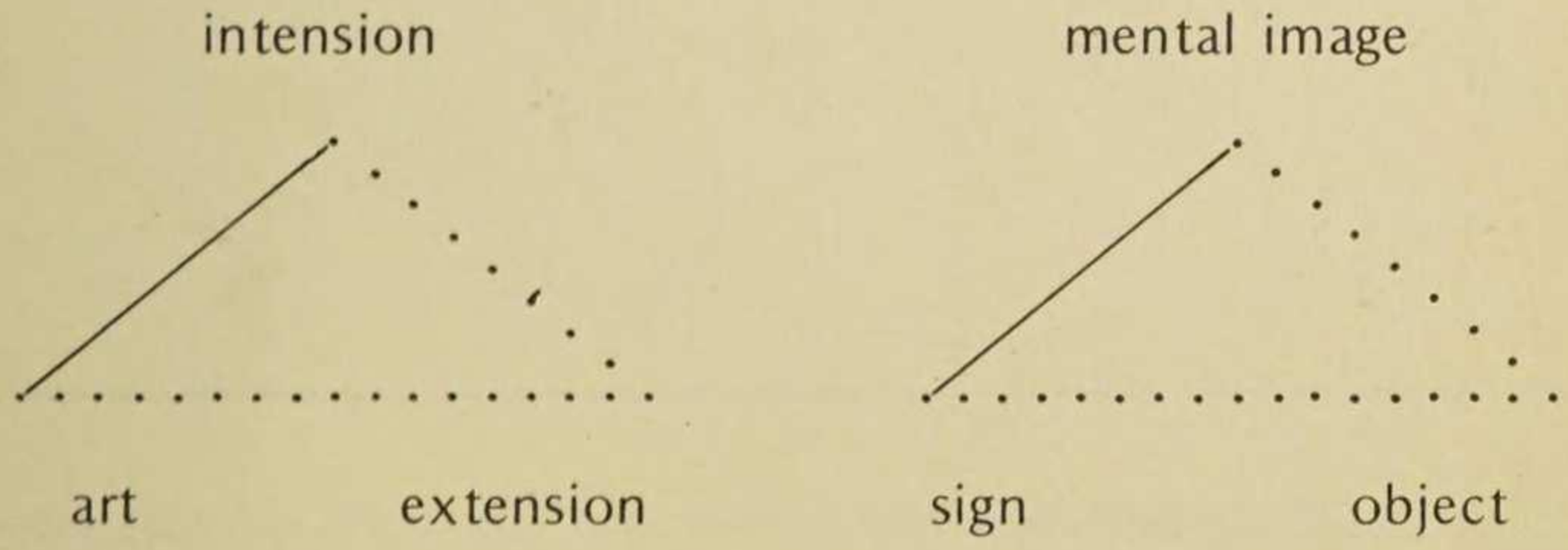
of the four types of metaphor defined by Aristotle, the fourth is "according to analogy" and occurs when "the second term is to

the first as the fourth is to the third. We may then use the fourth for the second, or the second for the fourth. Sometimes too we qualify the metaphor by adding the term to which the proper word is relative. Thus the cup is to Dionysius as the shield is to Ares. The cup may therefore be called 'the shield of Dionysius', and the shield 'the cup of Ares' " (*Poetics*, 1457 b, 17 - 23. S.H. Butcher, transl.). it is this case — especially its corollary, beginning with "Sometimes ...", — that reveals most poignantly and from beyond the other three cases of transference (genus to species, species to genus, species to species), the fact that while *analogy* is the structural principle by which the "exchange" is made possible and actually binding, and must therefore be referred to the relation of the first binomial expression (2 & 1) to the second (4 & 3), it is to the potential presence of metonymy (hidden in the genitive case: *crown* instead of *king* only after crown *of* king) that we must resort to rest the case of the relation between the elements of each binomial. the "cup" and the "shield", quite simply, cannot be said to cover the full spectrum of implications carried by respectively, Dionysius and Ares. not only this will continue to obtain even after the analogical transference is actualized, but it will apply to such apparently absurd metonymic genitives as "Ares of (in) Dionysius" (and viceversa) where names are, once again assumed as symbolic species and genera, and employed as metaphors of one another, for the creation, according to I.A. Richards' instigations, of new occasional genera

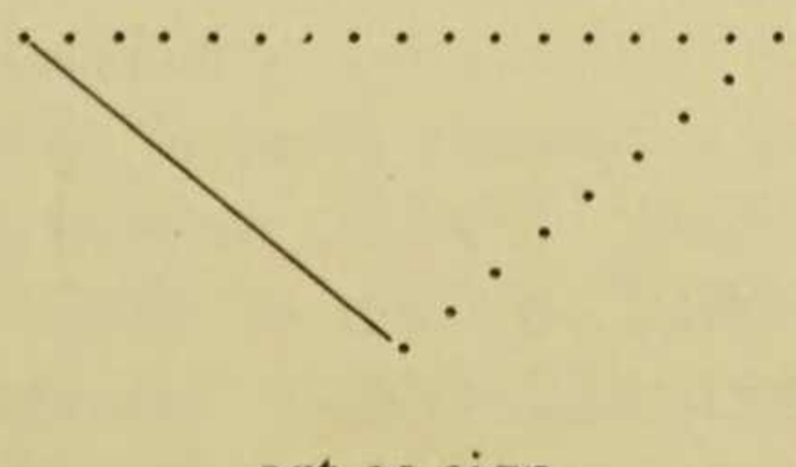
by assuming the structure of Aristotle's metaphor type 4 as a model for its own definition, art — as metaphor, exacting the legacy of the restrictional (metonymic) clause — can justifiably deal with, in each case at one sweep, the individual relation of material discriminations and ideological choices, and the truly sociological function of providing an *ideo-leptic "material implication"* (similarity as common partial meaning) between logically dissimilar universes

pherein
as choice
as libra
while
related to over and beyond
do draw
tight
to join
is relying on space
to carry
over is carving

far from the notion of a watershed aesthetic intuition intervening between logics and aesthetics after the, despite all, metaphysically deduced priority of aesthetics over logics (Croce), *art* takes upon itself intellectual responsabilities that match those of *sign* in its relation to *object* and to *mental image:*



and from art's inner point of view:



where the solid line identifies primary truth-functional conjunctions and the dotted lines secondary obligations

two considerations are at hand: a) the object may not exist: see the celebrated case of the unicorn for which we have both meaning *(lekton)* and sign and only lack the referent (Eco); b) art (like sign) possesses a double nature: 1) has a functional reality vis-à-vis the mental image and, occasionally, the object; 2) has the objectual reality of its own forms

on the assumption now that only the mental image is the necessary and sufficient constant for art as sign to exist, art's metaphorical action (as previously defined) is then to be enacted and assessed in the relation between intension and the very objectual reality of art (abstract art as unicorn)

N.B. the relation between the whole and the parts of this book depends very much on a notion of analogy which does not necessarily correspond to those used by the authors included in the section of ANALOGIC, nor by the authors quoted, discussed and or co-opted in ONtoLOGIC. rather than referring to substantially analogous facts, analogy here aims at defining a contact of at all times equally powered facts in LOGICAL SPACE, resulting in a FORM of INFRASCENDENCE, a form of WHERENESS, that is, in, by, through which RELATION "beyonds" RELATED and posits itself as a grammar of anticipation. the sculpture of James Reineking is a necessary step in the direction of such grammar.

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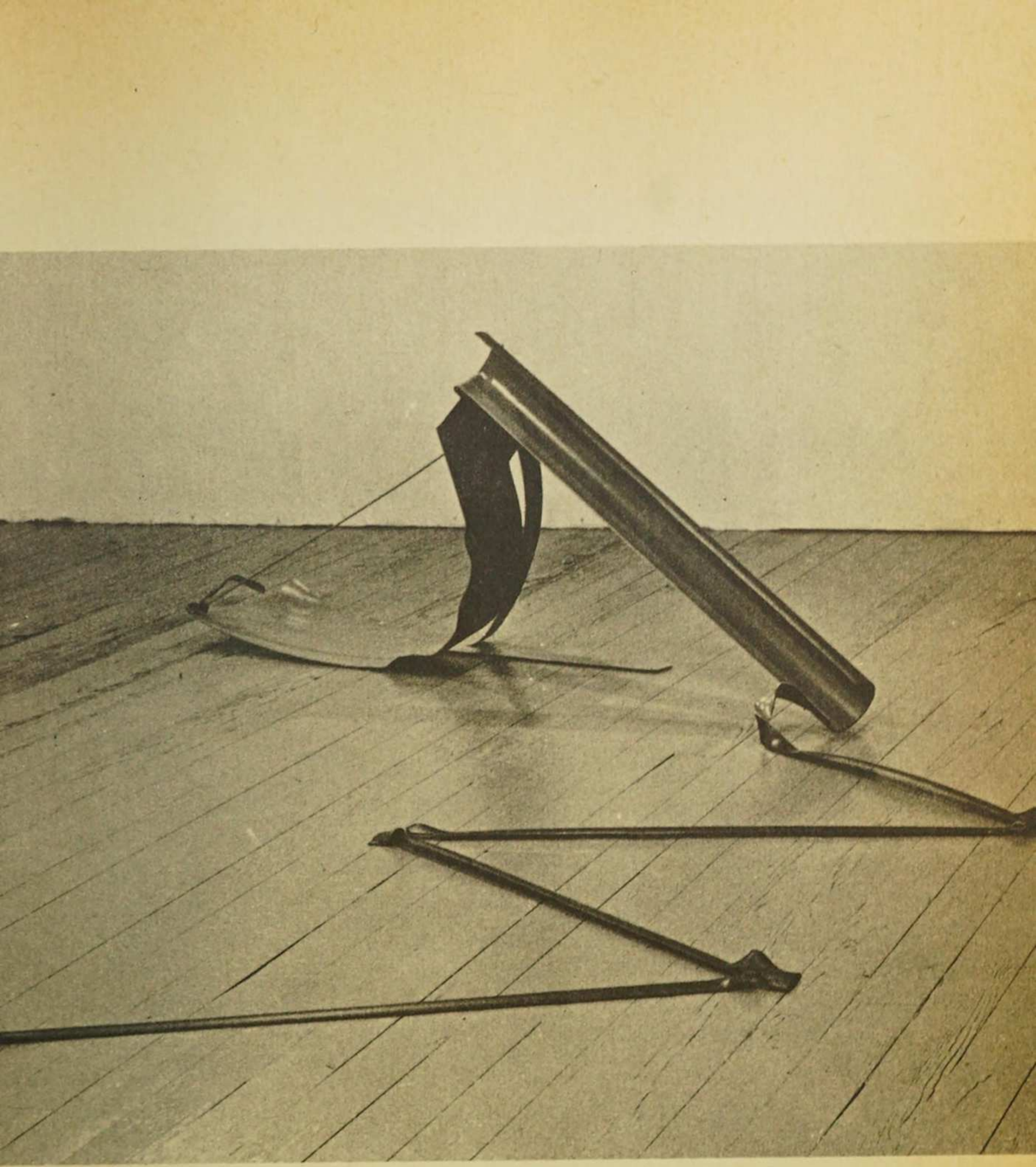
LOGIC

Line, volume, plane. Single uninterrupted surface.

line	a	
volume	b	
plane	c	a,b,c
		b,c,a
		c,a,b
		c,b,a
		b,a,c
		a,c,b

Deleting or adding integer:

a,a,b,c	a,b,c,a	b,c,a,a	c,a,a,b	a,c,b,a	b,a,c,a
c,a,b,a	c,b,a,a	etc.			



Volume generating plane generating line describing plane. Single uninterrupted surface.

b,c,a

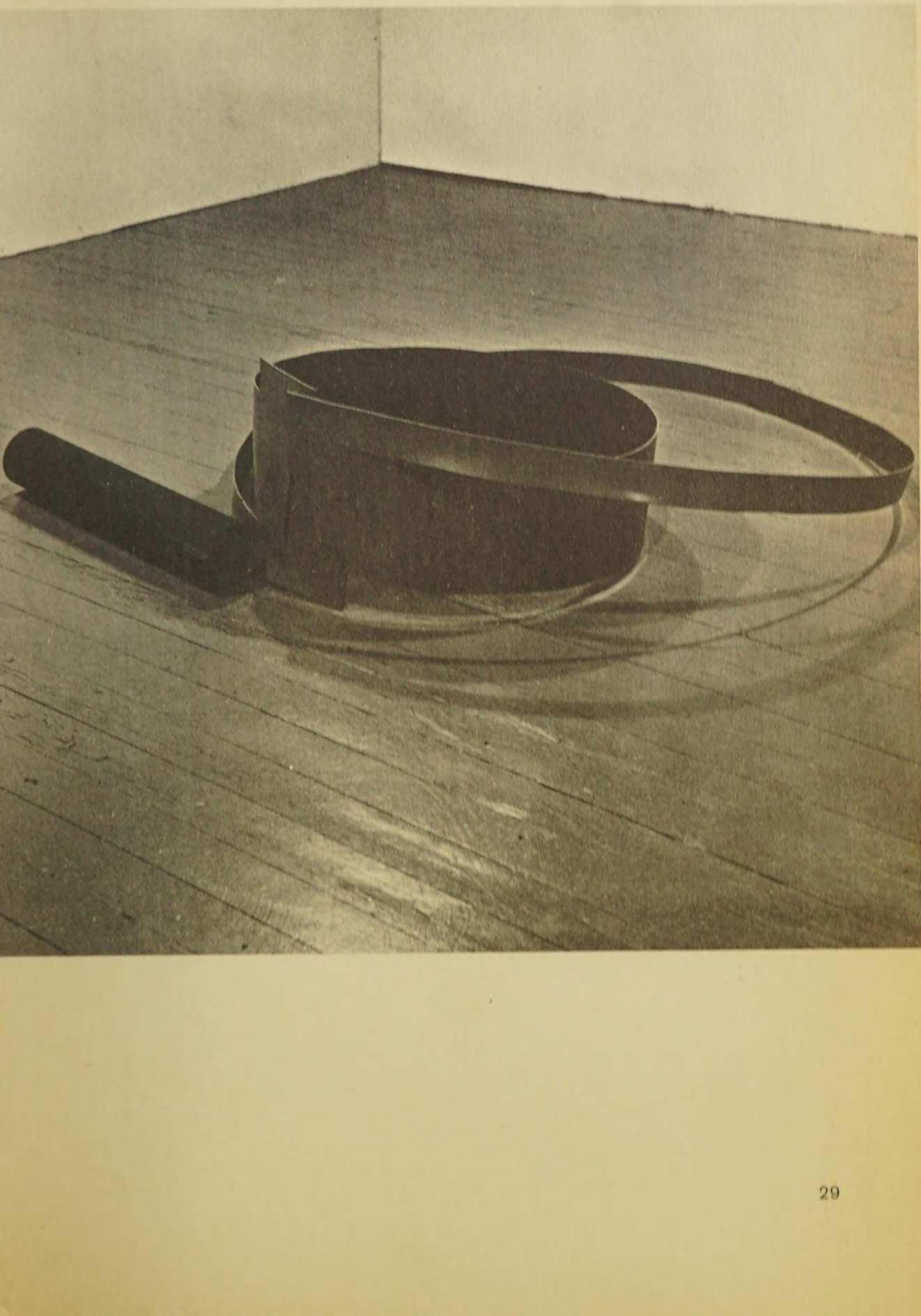
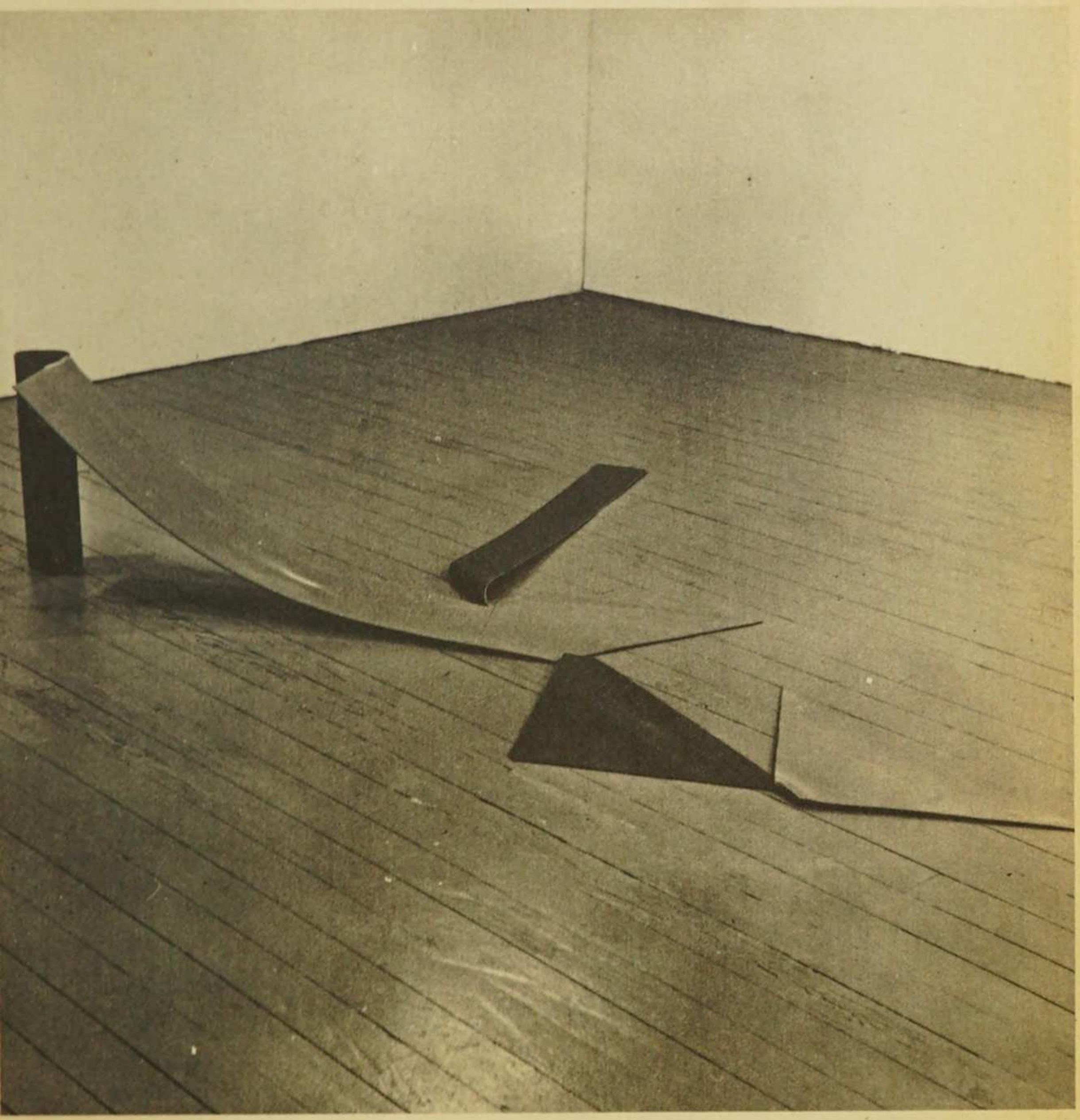


Image of volume (section) as image by volume (planes).

Cut fold out, cut fold over, cut fold under.

b,c

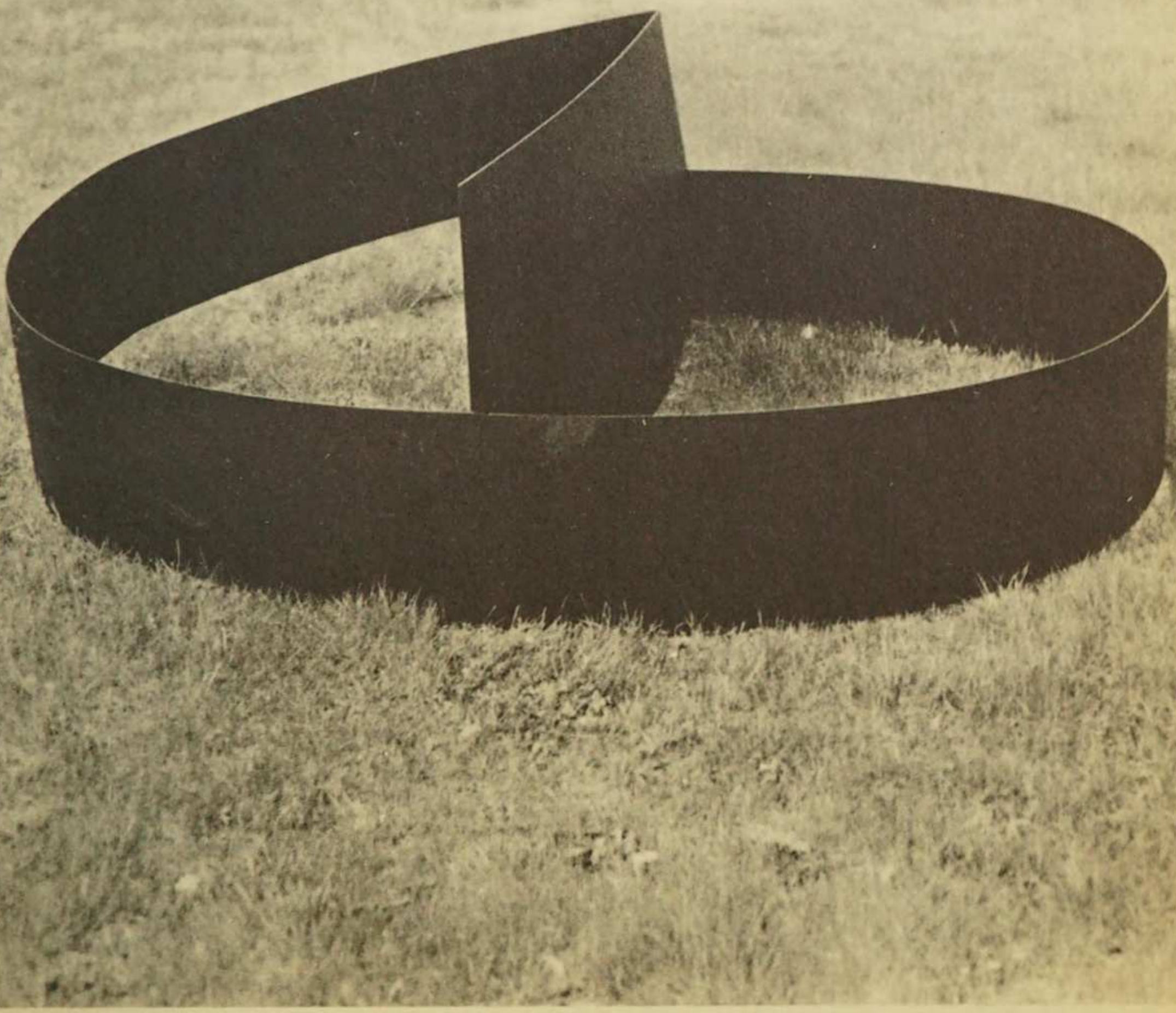


Plane generating planes circumscribing plane.

Single uninterrupted surface.

Cut, fold, touch

c, c', c''



Plane (semi-cloven, folded) implying volume.

Single uninterrupted surface.

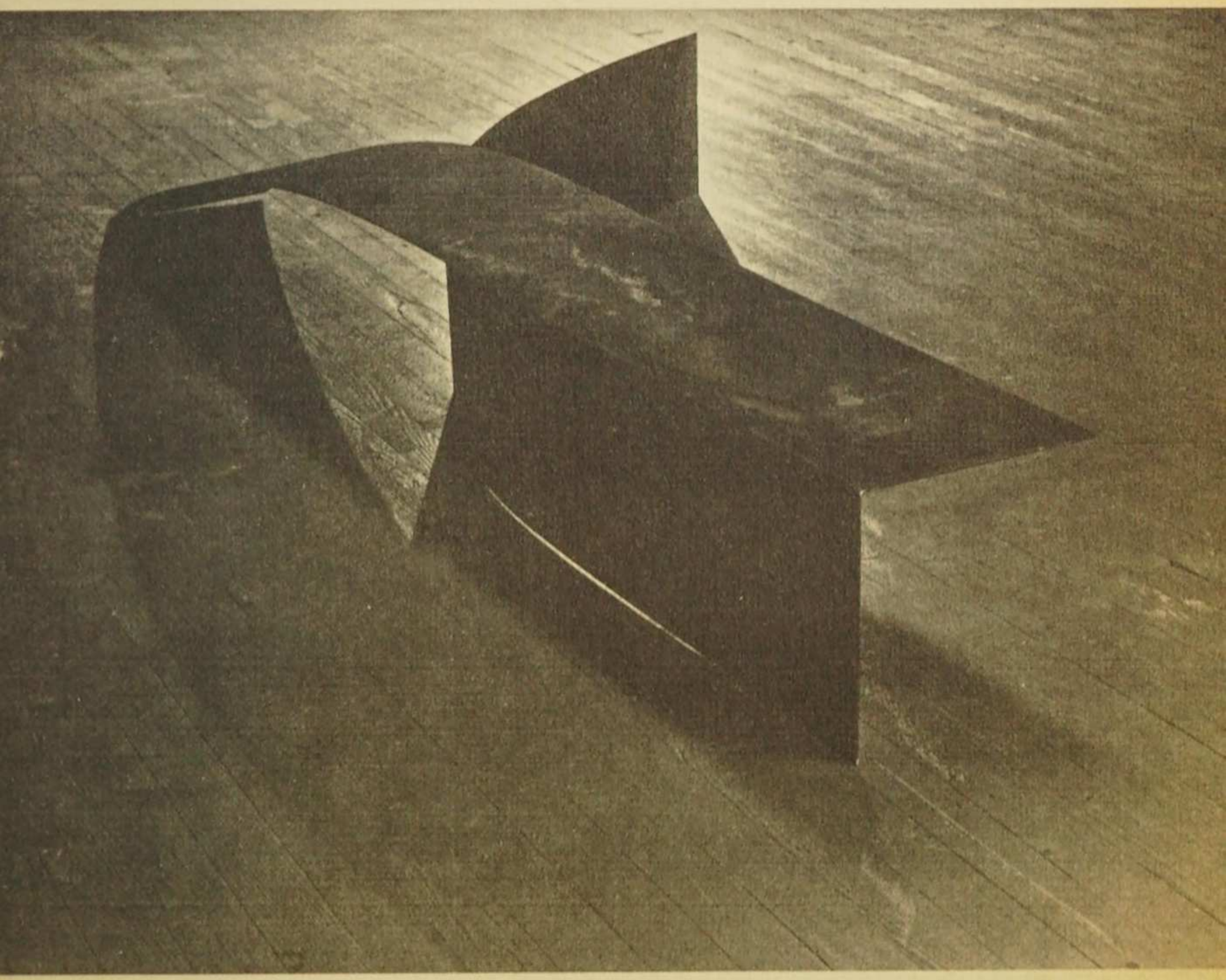
One cut, one fold.

A space of time between events
A pause or break in the regular course of something
A space separating qualities, states, objects

Imply

A space between thing and itself.

c, c', c'' b implied.

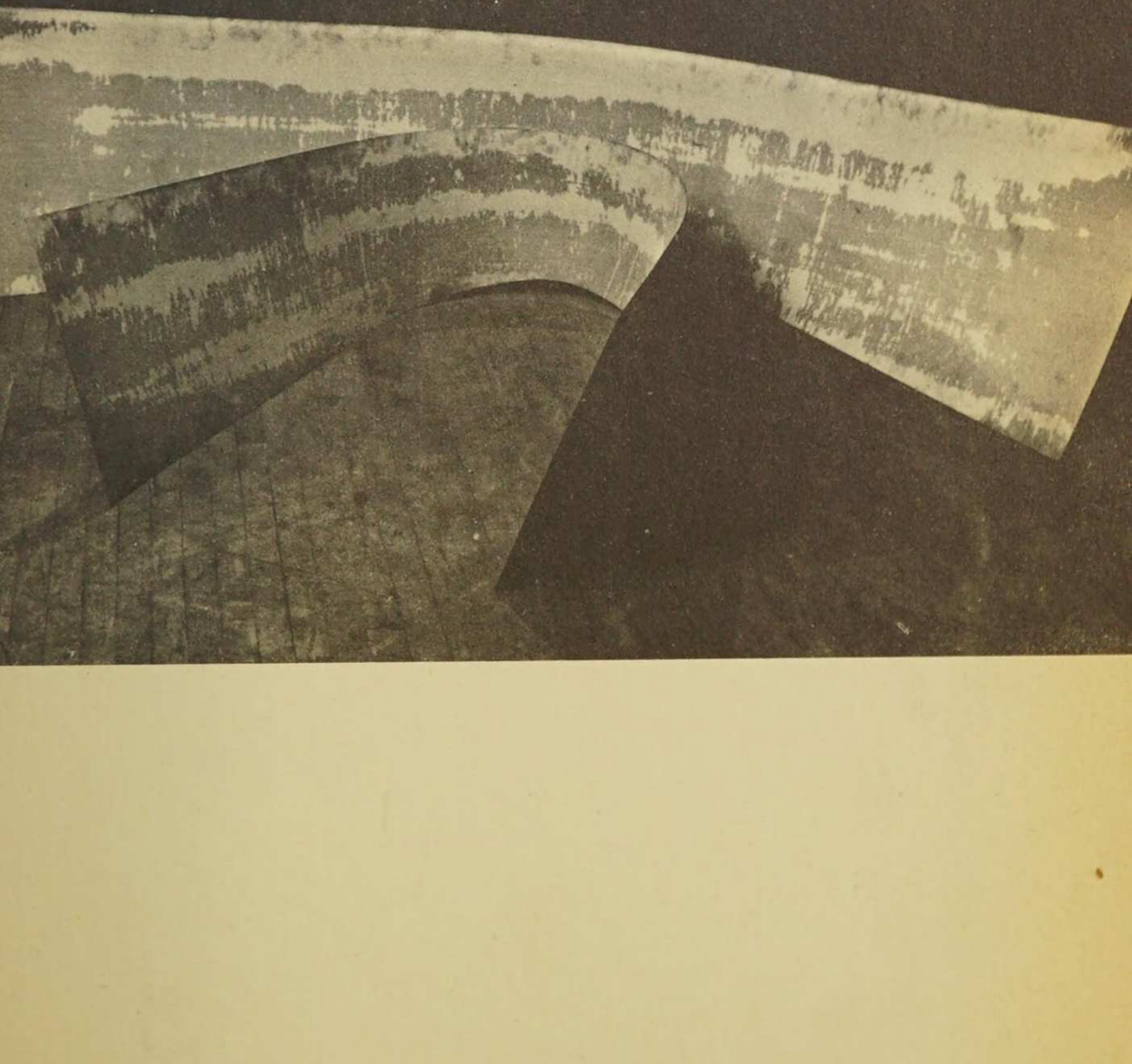


Single discrete plane separated into two discrete parts producing discrete volume between states.

Volume between states as image.

Image as hypostasis between composition and composite.

$c - c' - c'' = b$



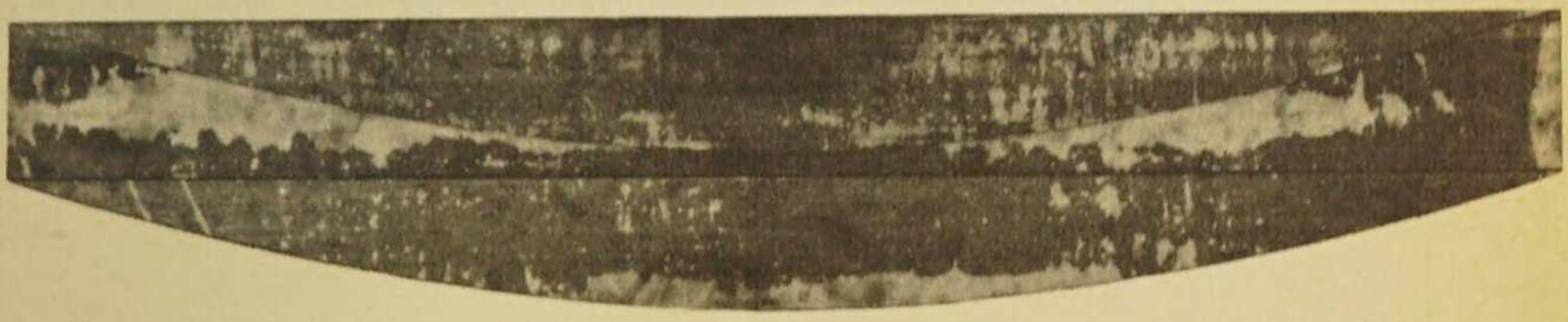
Cut plane to produce discrete shape. Fold shape to produce image.

Plane as field of reference or initial state.

Activity describes initial state as altered state by displacement of proximities.

Altered space reveals image as synthesis

Top unit: two cuts, three folds
Bottom unit: two cuts, two folds

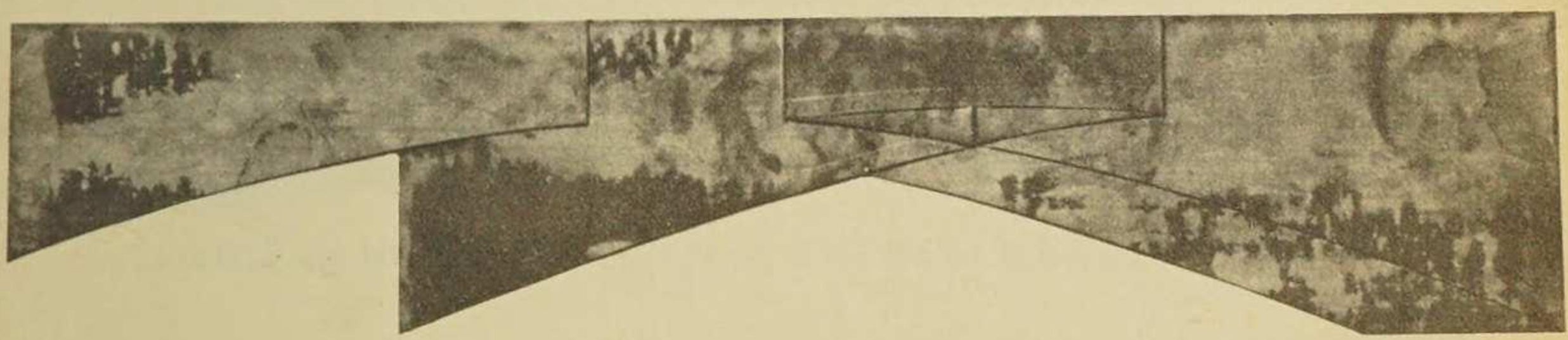


Two cuts / seven folds / double compressed arc.

Identical arcs / altered activity.

Proximity of cut to cut to surface.

Visual space / actual space.



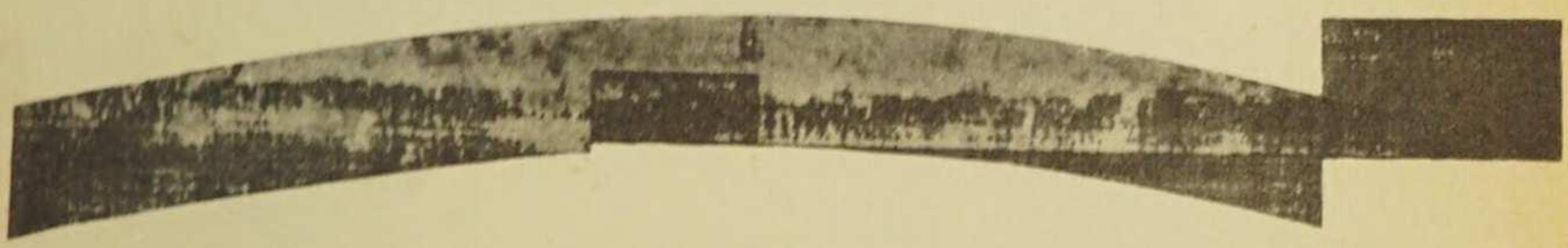
Three cuts / six folds.

Identical states / altered activity.

Proximity of surface to surface to surface.

Proximity of surface to surface to surface to surface to surface.

Actual space / actual mass.



Top unit: two cuts overfold.
Bottom unit: two cuts underfold.

Altered states / altered activity.

Cut-outs as equal areas: one actual one implied.

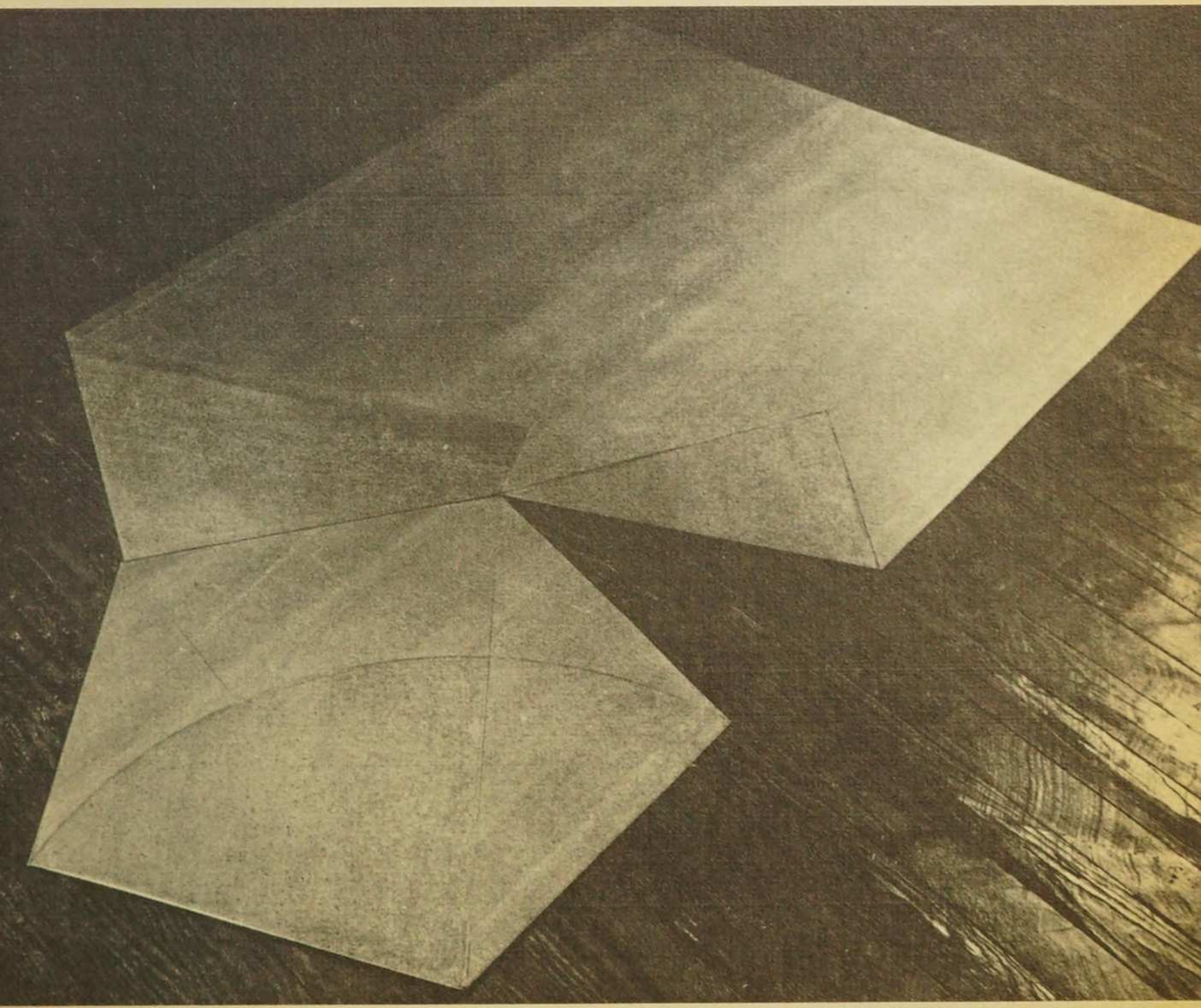
Unequal weights as equal masses.

Discrete plane producing discrete image defined by activity defined by image

Image defined by perimeter.
Perimeter defined by edge.
Edge defined by activity.

a) virtual edge of plane. *(Anamnesis)*
b) edge by cutting and folding remnant away.
c) edge by cutting and folding remnant over.
d) edge by cutting and folding remnant under.
e) edge by cutting and folding remnant in proximity to *(Praxis)*

defined by activity defined by image defined by activity.



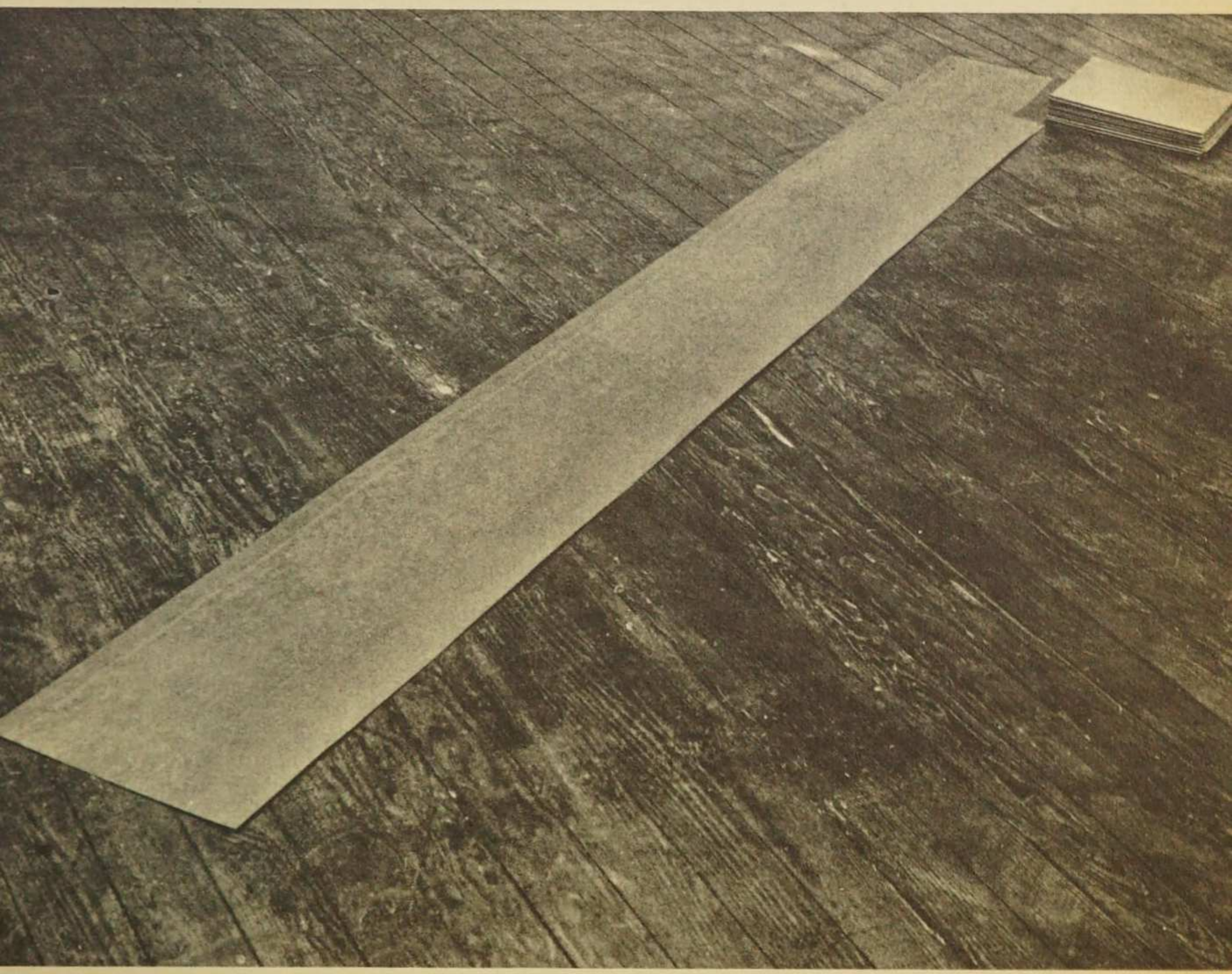
Discrete plane cut and folded to build mass.

Single uninterrupted surface.

Altered state wrapped over / around itself.

Identical states, identical activity (surface to surface to surface to surface to surface — to thirty folds).

Image defined by activity contained in initial state. The seen is one third of the sensed.

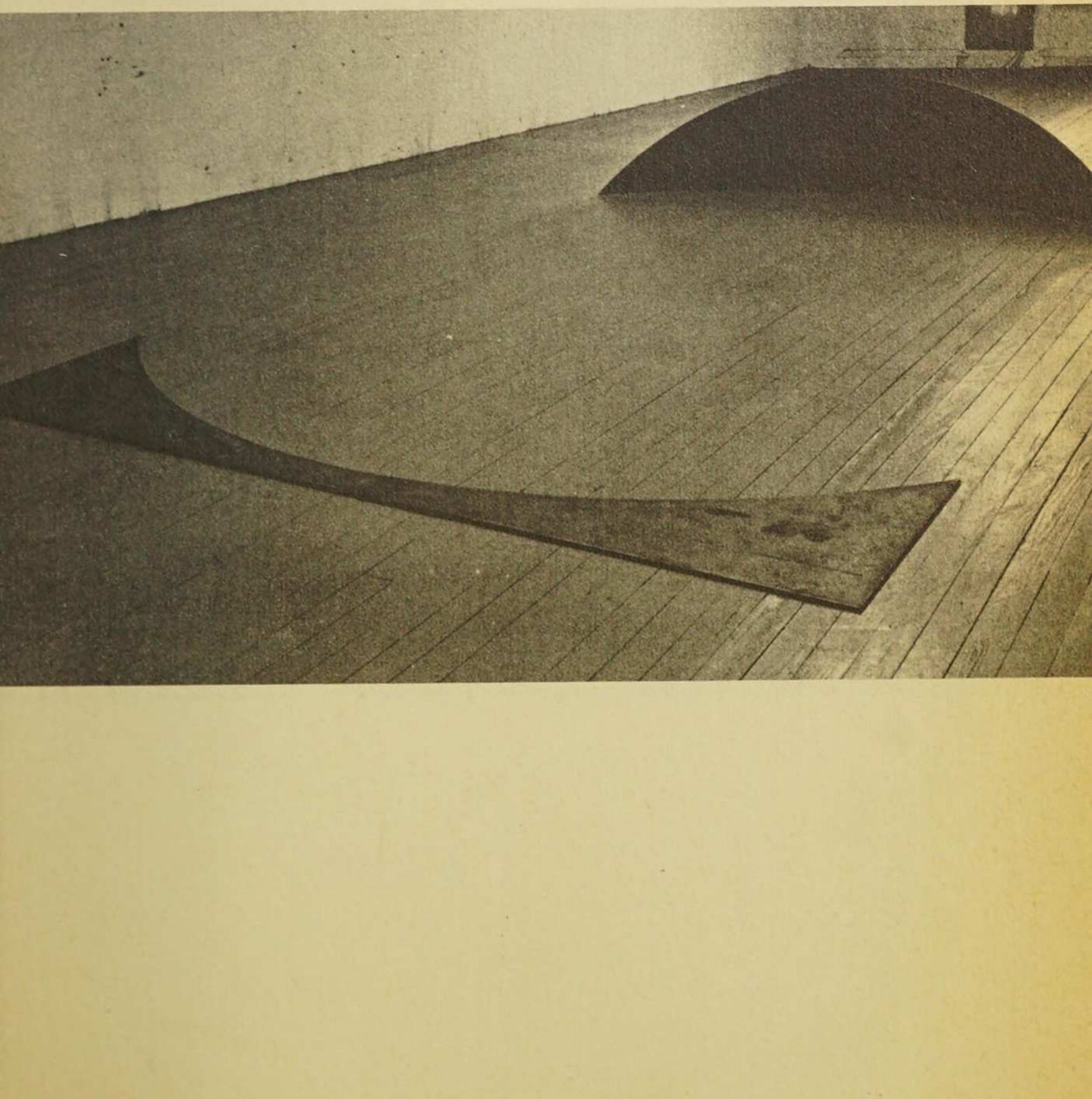


Using a radius of 84" draw an arc from left corner to right corner (same edge) on a 3/8" x 30" x 120" steel plate. With torch, cut this arc dividing the plate into two pieces.

Roll the positive arc section to curvature of circumference of a 14' (168") diameter circle.

Cut arc equals rolled arc: total of cut and rolled arc is equal to 1/2 circumference of circle it indicates.

Image exceeds initial state.



Establish exact center of a 72" x 72" x 3/8" steel plate. Using radius of 28.5" describe circle around center point.

With torch, cut circle from plate.

Take plate with circle cut from it and roll an arc, parallel with one edge, that has chord line of 57" inside dimension.

Equal masses appear as unequals.

Image contained within initial state.

Cut a 200 cm. x 200 cm. x 1.5 cm. square into three equal parts using arc with 141 cm. radius.

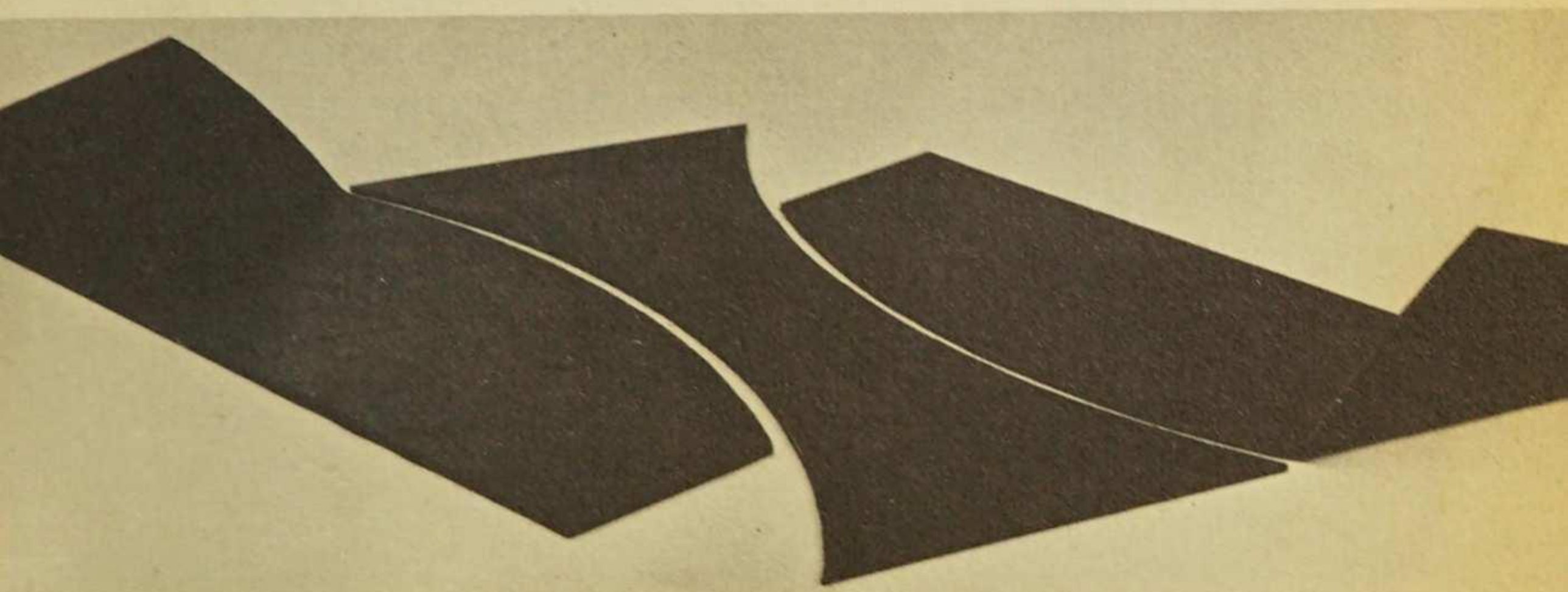
Label parts a,b,c.

Rotate part a along cut line 30 degrees. Bend up 90 degrees part of a exceeding perimeter of b.

Rotate part c along cut line 30 degrees. Bend up 90 degrees part of c exceeding perimeter of b.

Internal relationship drastically altered by external implications. Boundaries intact.

Initial state perceived by memory and inference. Image both physically and by extension exceeds initial state.



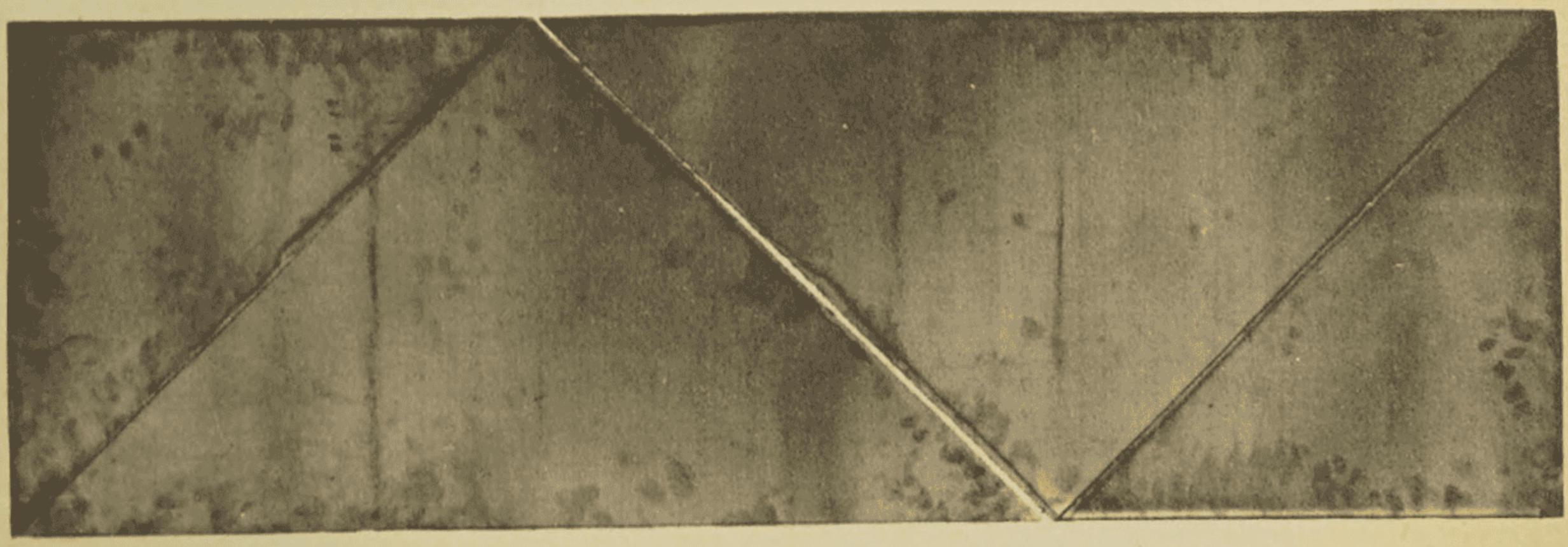
Divide a square diagonally. Cut diagonal. Slide one of two resulting pieces along axis of cut until its former outside corner edge reaches mid-point of other part. Fold over projections (triangular) of both parts, keeping outside edges parallel with edges of original square.

Reduce area by 1/4: increase surface mass by 1/4.

Internal axial shift. Square to rectangle: external altered by internal. Boundaries exceeded.

Initial state perceived by memory.

Equals perceived as equals.



Bisect square X with diagonal line. Establish point at one of bisected corners. Using this point and ratio .692 X as radius, draw a quadrant. Establish other point along diagonal projection .692 cm. outside square. Using second point and ratio 1/2 .692 X as radius, draw other quadrant. Cut two arcs. Leaving corner in place, rotate piece bounded by two arcs 30 degrees counterclockwise. Fold over area of rotated segment projecting beyond initial square. Folded edge parallel with edge of initial square.

First quadrant 1/3 original square: second quadrant 1/2 first quadrant, 1/6 initial state. Limit of variable quantity.

Boundaries maintained, initial state altered.

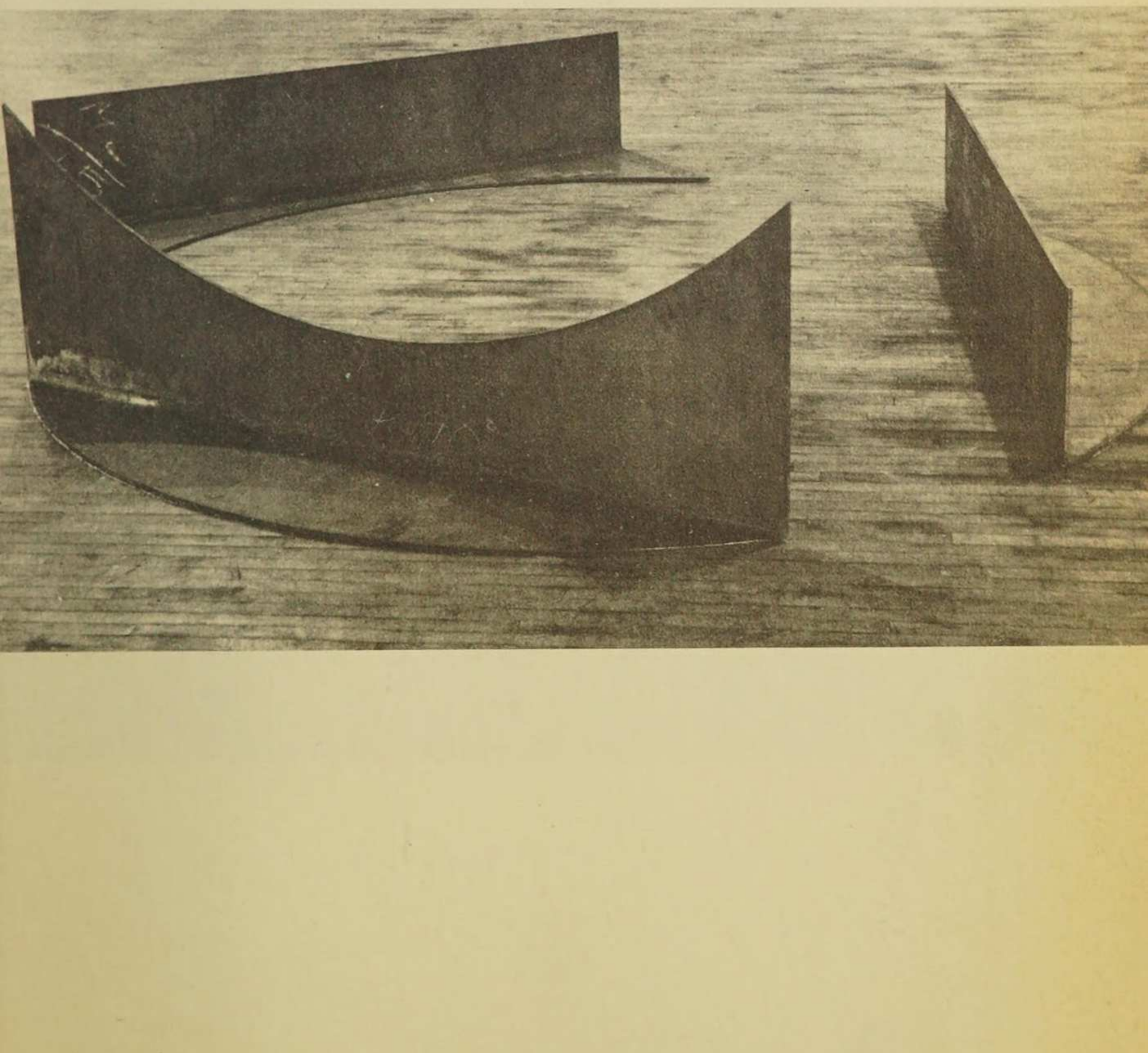
The circle that it is describes the square that it was described by the circle that it is.

Circumscribe square. Using quadrant arc from circle, divide square into three equal parts, keeping arcs parallel. Cut along dividing arcs. Bend two positive arc segments 90 degrees along their chord line. Bend negative arc segment of remaining section 90 degrees parallel with edge and slightly before bend intersects arc.

Reposition segments around original drawn circle, keeping space between each segment equal.

Image exceeds initial state.

Equals appear unequals.



A relative clause, an intervening space:

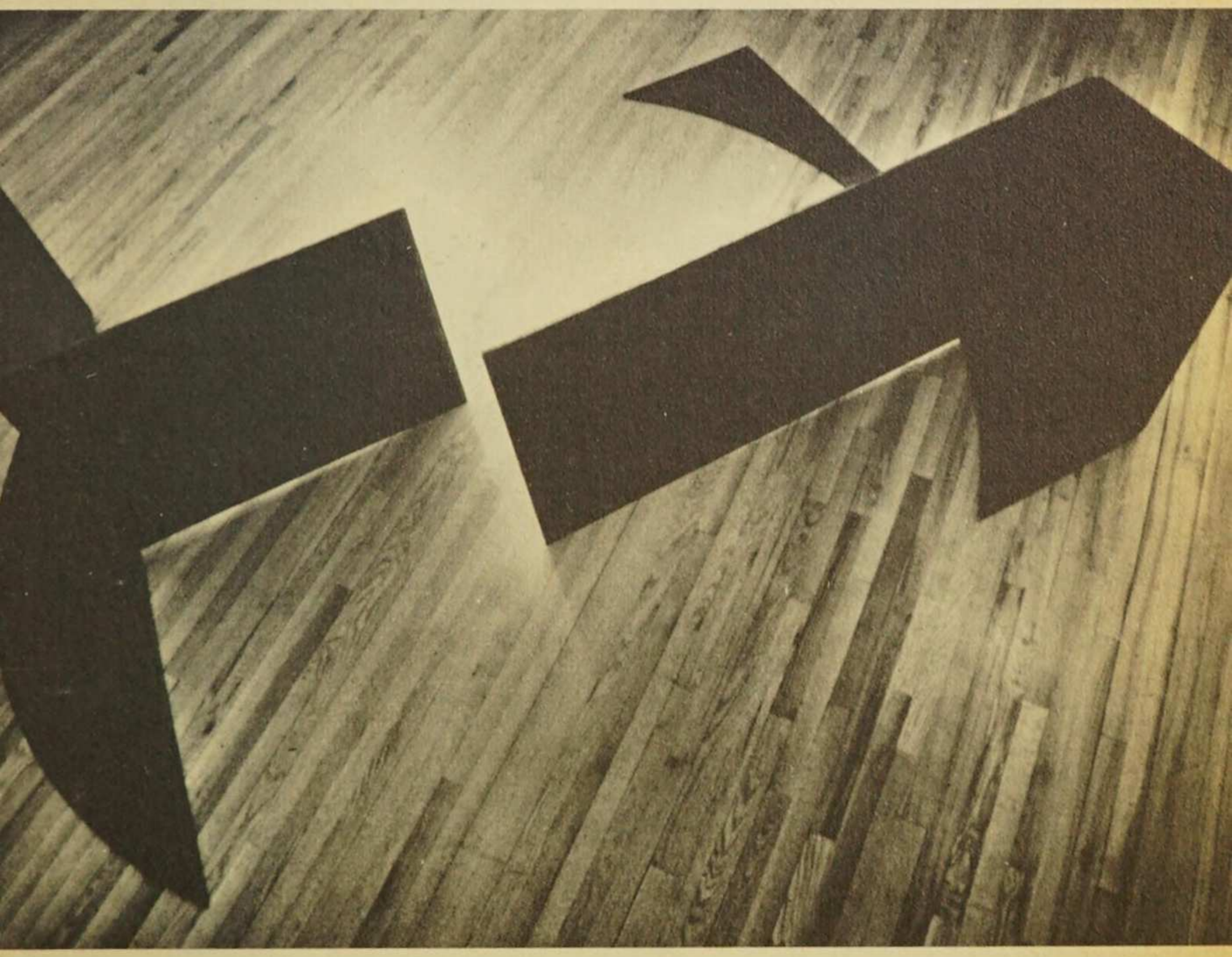
between parts of objects
between objects
between objects and notions of object
between parts and notions of part
between notions of part and object and the notions of notion.

Matter to energy to matter.

Fullness through vacuum to fullness.

Equal through other to non-equal.

Proportion through integrity to clarity.



18 That which is conceived as having position but not magnitude.

19 A place having definite spatial position but no extent or of which the position alone is considered.

22 a A definite position in a scale of any kind; a position reached in a course; a step, stage or degree in progress or development, or in increase or decrease; an exact degree of some measurable quality or condition.

22 b A critical position in the course of affairs; a decisive state of circumstances, a juncture; the precise moment for action.

23 That which has position but no duration; the precise time at which anything happens.

24 A (specified) degree or condition; condition, plight, state, case.

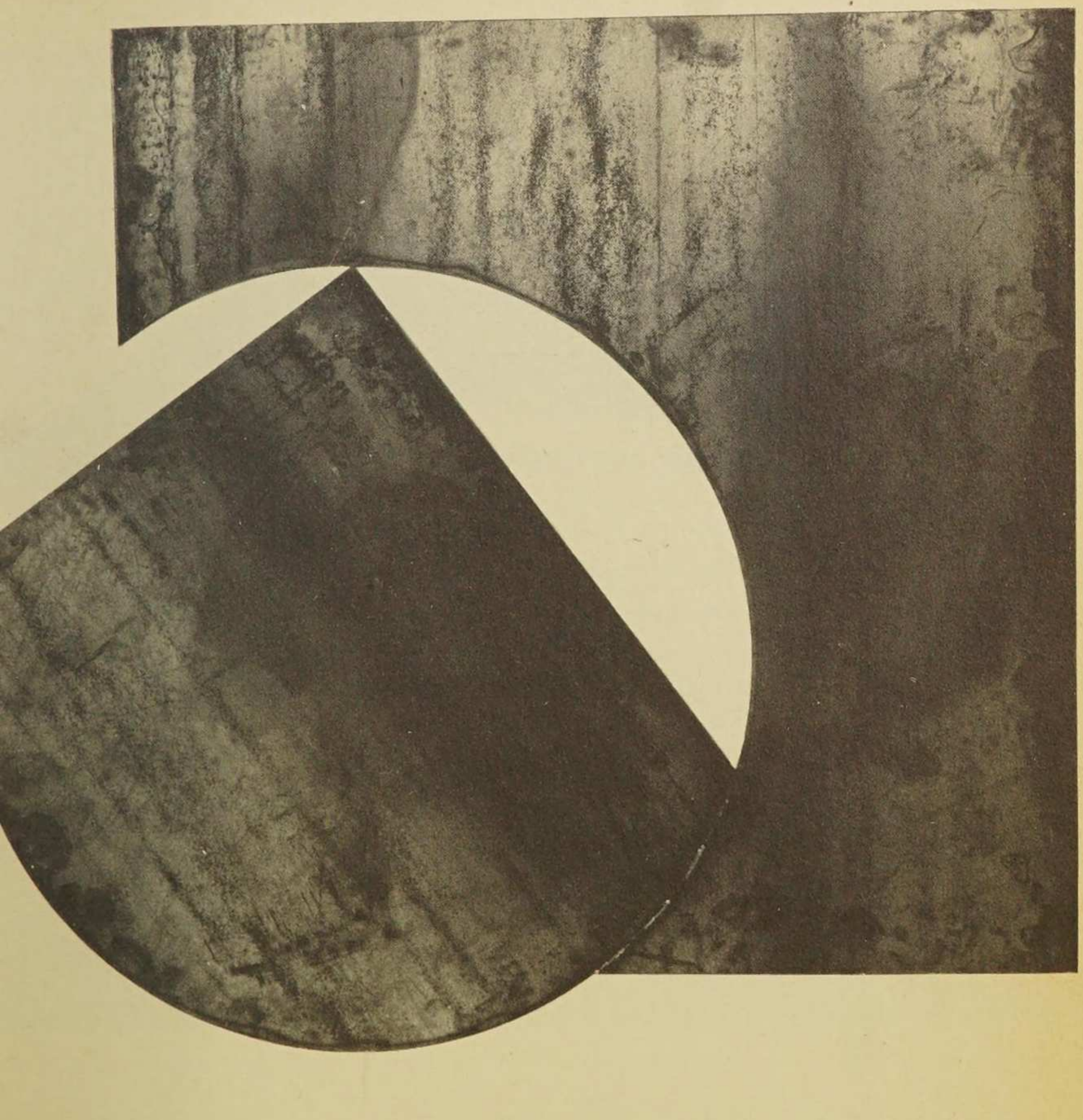
25 The highest part or degree; the height, summit, zenith, acme.

27 The precise matter in discussion, the essential or important thing.

28 That at which one aims, or for which one strives or contends; aim, object, end.

O.E.D., *P*, p. 1048.

In a square locate three points a,b,c. Construct arc common to them. Cut arc. Rotate arc segment 270° counterclockwise. Affix in position.



Noun: recognition through arbitrary selection.

Verb: locate three points to form a right angle.

Noun: impression of virtual information on physical state.

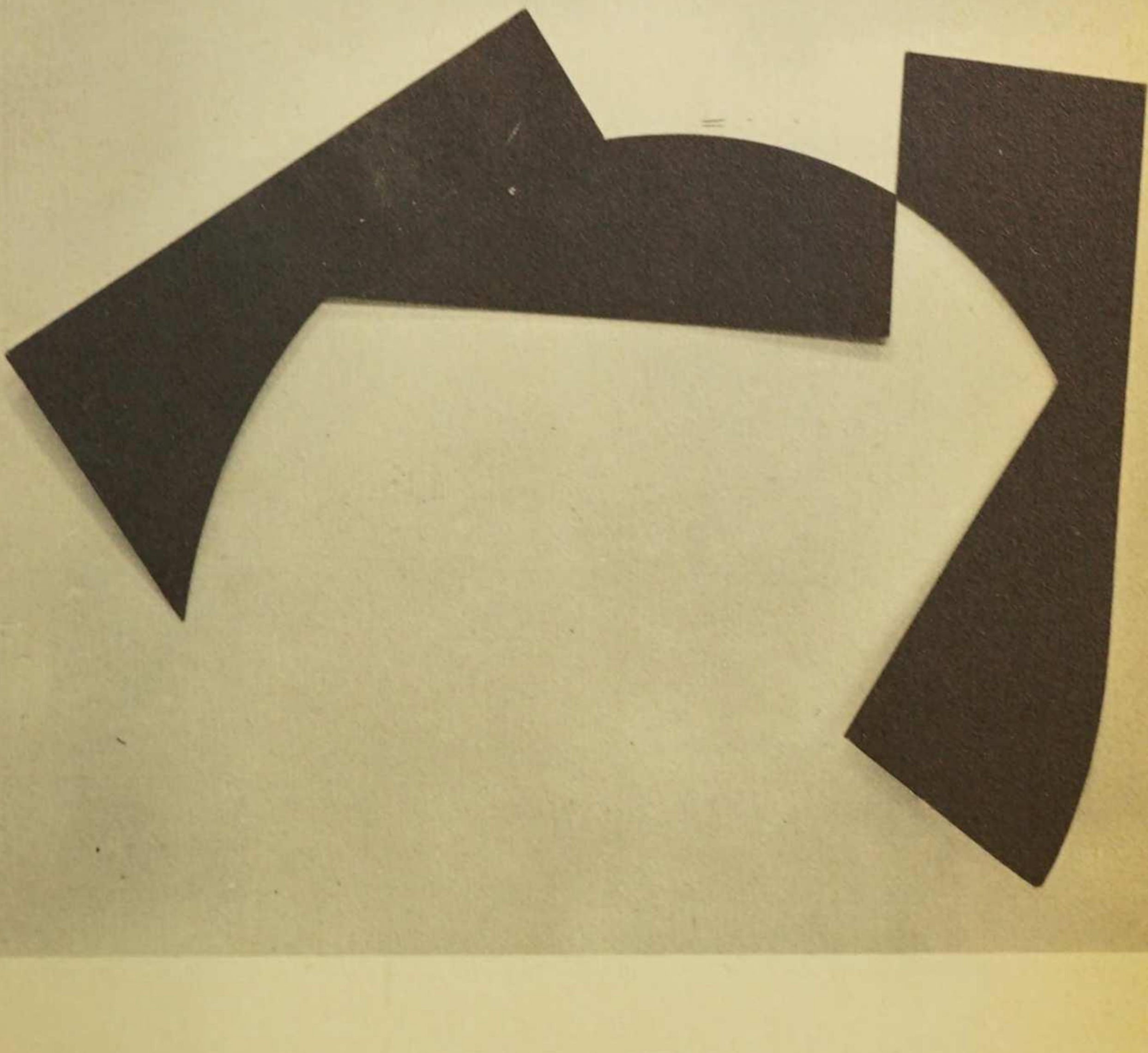
Verb: construct an arc common to three points in a right angle.

Noun: passage from implication to explication through an act of locating and dislocating.

Verb: cut and rotate arc segment (s).

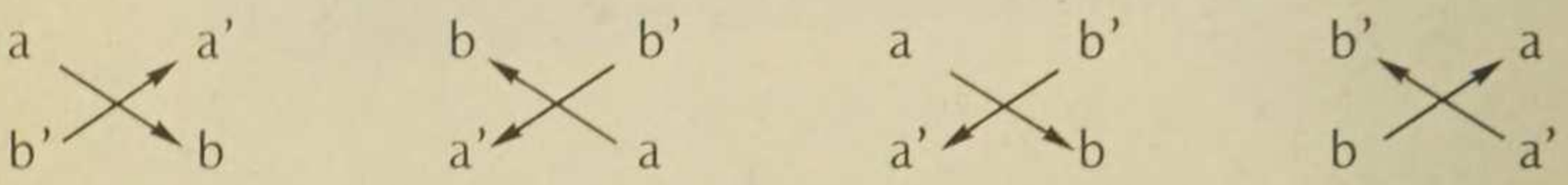
Noun: virtual (in) space = actual (out) space.

Through going through.

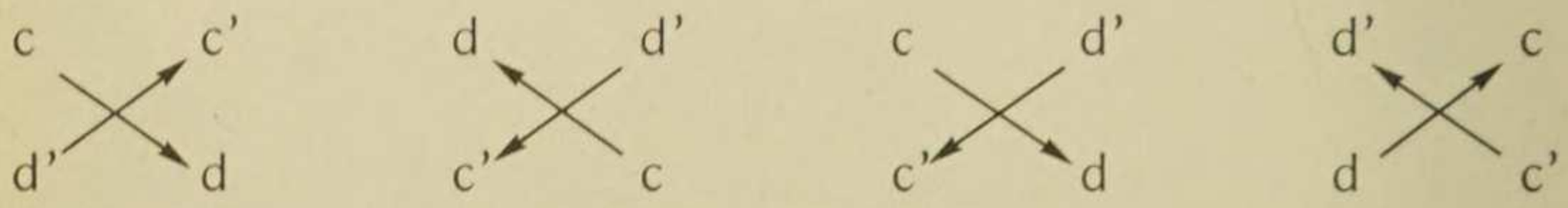


21 as initial state.

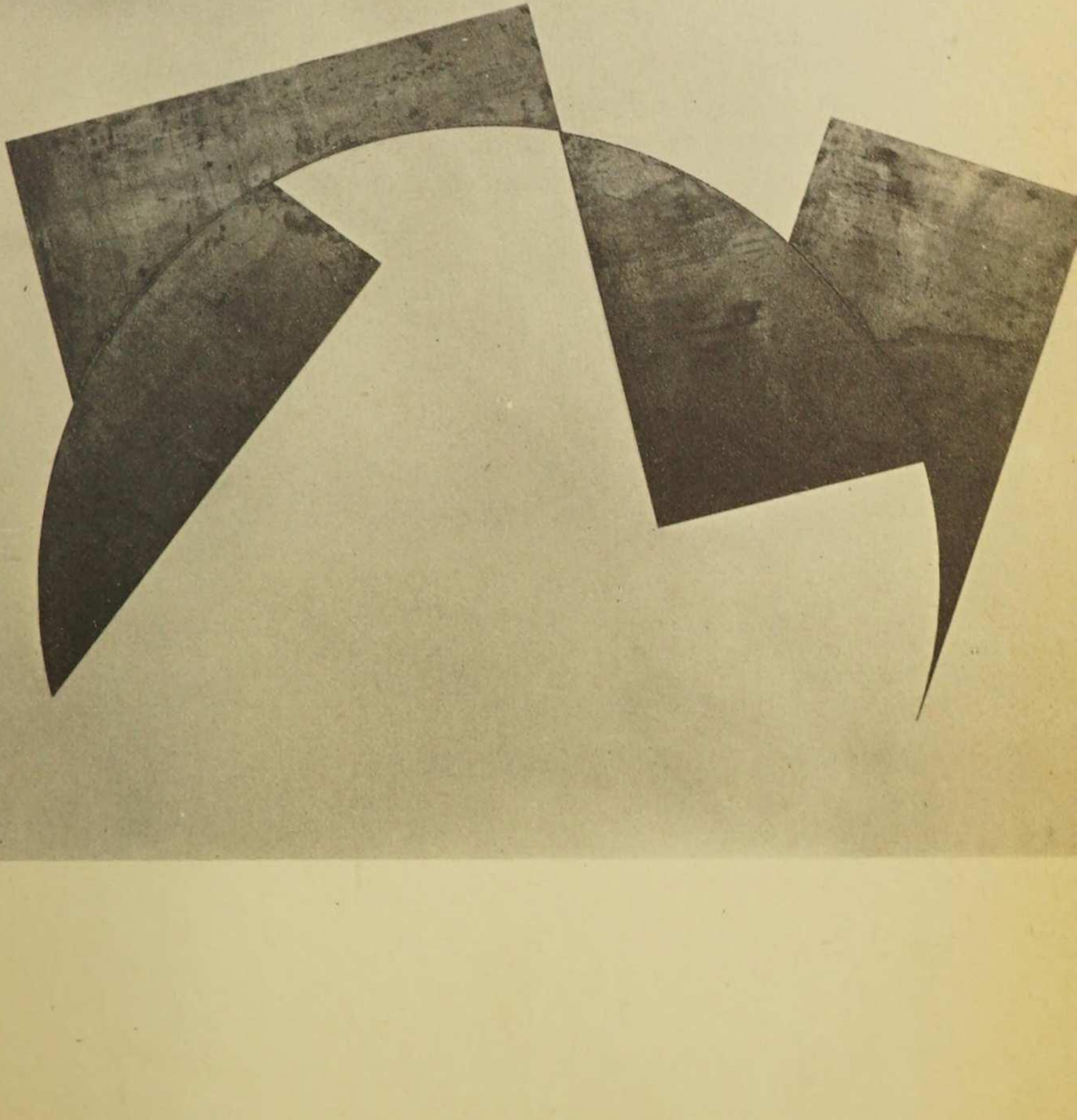
Chiasmus of MOTION and STATION. Motion = a, Station = b, → = becomes



Chiasmus of ROTATION and SYMMETRY. Rotation = c, Symmetry = d, →= becomes



Chiasmus of chiasmus exceeds initial state.

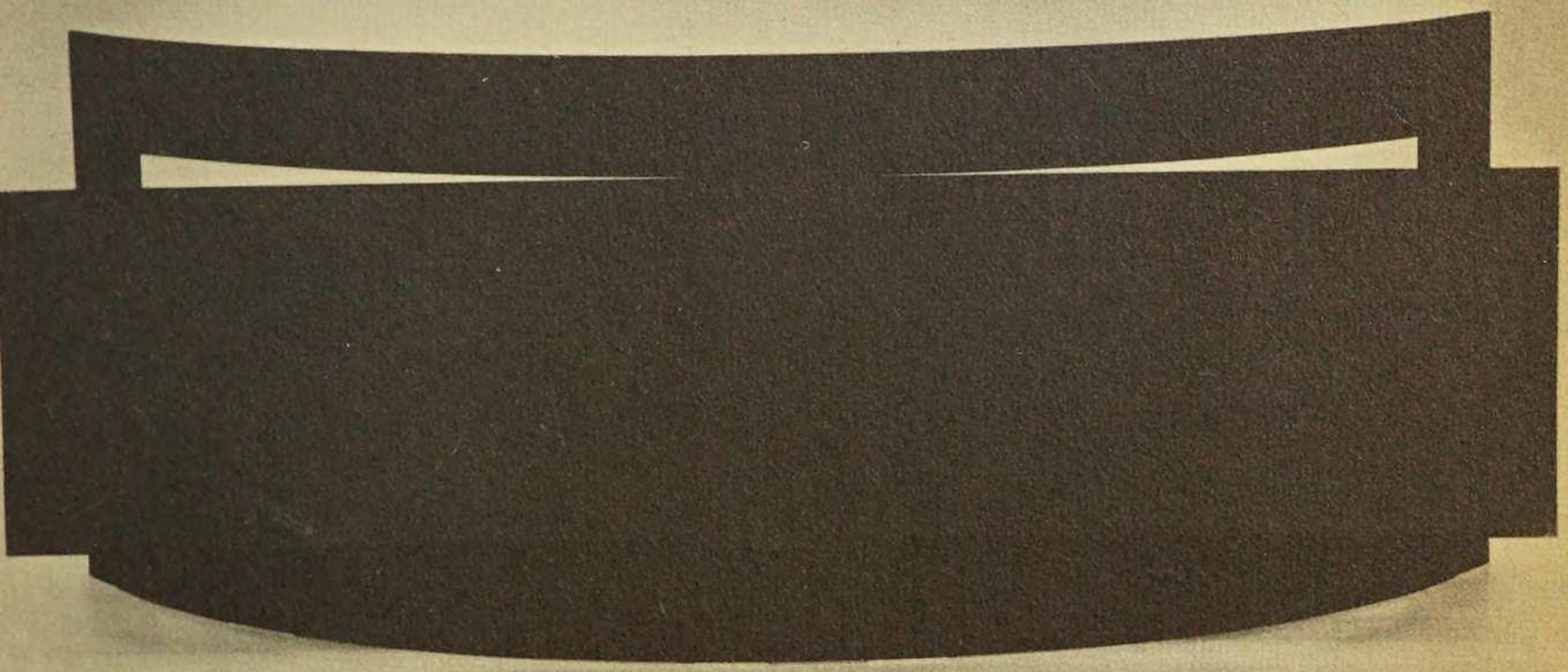


4 Sensuous perception of an external object, involving a false belief or conception; strictly distinguished from *hallucination* but in general use often made to include it, and hence the apparent perception of an external object when no such object is present, or of attributes of an object which do not exist.

O.E.D., *I*, p. 48

I Apparent displacement or difference in the apparent position of an object, caused by actual change (or difference) of position of the point of observation.

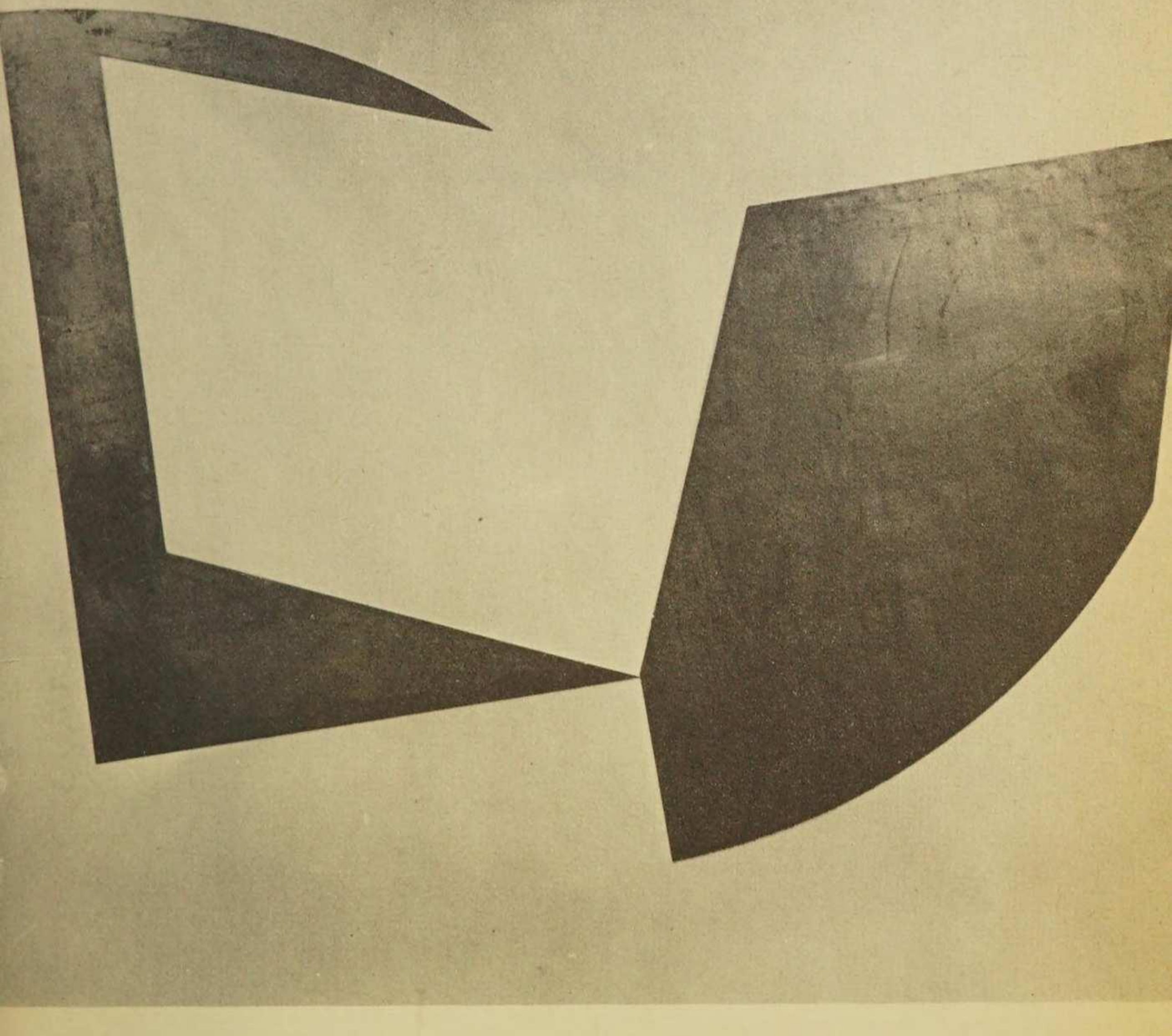
O.E.D., *P*, p. 455



a Displacement as take away: in atomic physics an atom deprived of one of its electrons acquires the physico-chemical properties of the element preceding it in the periodic table.

b Displacement as movement: the geometrical relation between the position of a moving object at any time and its original position.

c Displacement as union of take away and movement in equivalence of initial quadrant and resultant right angle.



ANALOGIC

ZENO OF ELEA

PLURALITY

ARGUMENTS DIRECTED TO PROVE ELEATIC MONISM

(i) And Themistius says that Zeno's argument tries to prove that what is, is one, from its being continuous and indivisible. "For" runs the argument "if it were divided, it would not be one in the strict sense because of the infinite divisibility of bodies."

(ii) Themistius, f. 12. 1. ⟨Zeno⟩ tried to prove that what is, is one, from its being continuous and indivisible, arguing that, if it were divided, it would not be validly one, because of the infinite divisibility of bodies.

Parmenides had another argument which was thought to prove by means of dichotomy that what is, is one only, and accordingly without parts and indivisible. For, he argues, if it were divisible, then suppose the process of dichotomy to have taken place: then either there will be left certain ultimate magnitudes, which are minima and indivisible, but infinite in number, and so the whole will be made up of minima but of an infinite number of them; or else it will vanish and be divided away into nothing, and so be made up of parts that are nothing. Both of which conclusions are absurd. It cannot therefore be divided, but remains one. Further, since it is everywhere homogeneous, if it is divisible, it will be divisible

everywhere alike, and not divisible at one point and indivisible at another. Suppose it therefore everywhere divided. Then it is clear again that nothing remains and it vanishes, and so that, if it is made up of parts, it is made up of parts that are nothing. For so long as any part having magnitude is left, the process of division is not complete. And so, he argues, it is obvious from these considerations that what is is indivisible, without parts, and one.

And they say that Zeno said that, if anyone would explain to him what the one is, he would be able to speak about existent things. He raised the difficulty, it seems, because each particular sensible object is called many both categorically and by division, but the point he supposed to be nothing at all. For what does not increase a thing when added to it, nor decrease it when subtracted from it, he thought has no existence.

Zeno's argument in this passage seems to be different from the one in his book to which Plato refers in the *Parmenides.* For there, arguing in support of Parmenides's monism from the opposite point of view, he shows that there is no plurality: but here, as Eudemus says, he both does away with the one (for he speaks of the point as the one), and allows the existence of plurality. However Alexander thinks that here too Eudemus is referring to Zeno as doing away with plurality. He says: "As Eudemus records, Zeno the friend of Parmenides tried to show that it is not possible for there to be plurality because there is no 'one' among existing things, and plurality is a collection of units."

Alexander says that the second argument, that from dichotomy, is Zeno's, who says that, if what is had magnitude and were divided, then what is would be a plurality and no longer one, and thus shows that the one is not an existent.

PASSAGES WHICH APPARENTLY QUOTE ZENO'S ACTUAL WORDS

In his book, in which many arguments are put forward, he shows in each that a man who says that there is a plurality is stating something self-contradictory. One of these arguments is that in which he shows that, if there is a plurality, things are both large and small, so large as to be infinite in magnitude, so small as to have no magnitude at all. And in this argument he shows that what has neither magnitude nor thickness nor mass does not exist at all. For, he argues, if it were added to something else, it would not increase its size; for a null magnitude is incapable, when added, of yielding an increase in magnitude. And thus it follows that what was added was nothing. But if, when it is subtracted from another thing, that thing is no less; and again, if, when it is added to another thing, that thing does not increase, it is evident that both what was added and what was subtracted were nothing.

The infinity of magnitude he showed previously by the same process of reasoning. For, having first shown that "if what is had not magnitude, it would not exist at all", he proceeds: "But, if it is, then each one must necessarily have some magnitude and thickness and must be at a certain distance from another. And the same reasoning holds good of the one beyond: for it also will have magnitude and there will be a successor to it. It is the same to say this once and to say it always: for no such part will be the last nor out of relation to another. So, if there is a plurality, they must be both small

and large. So small as to have no magnitude, so large as to be infinite."

There is no need to labour the point; for such an argument is to be found in Zeno's own book. For in his proof that, if there is plurality, the same things are both finite and infinite, Zeno writes the following words: "If things are a plurality, they must be just as many as they are, and neither more nor less. But, if they are as many as they are, they will be finite in number. If things are a plurality, they will be infinite in number. For there will always be others between any of them, and again between these yet others. And so things are infinite in number." Thus he demonstrates numerical infinity by means of the argument from dichotomy.

PLACE

Zeno's argument seemed to do away with place, putting the question as follows: if place exists, in what will it be? For every existent is in something; but what is in something is in a place. Place therefore will be in a place, and so on *ad infinitum:* therefore place does not exist. 563. 25 *ad ibid.* Eudemus records Zeno's opinion in the following words: "Zeno's difficulty appears to lead to the same conclusion. For it is justifiable to assume that everything that exists is somewhere; but if place exists, where would it be? Presumably in another place, and that in another and so on."

THE DICHOTOMY

The first argument is the following: If there is motion, then a moving object must in a finite time complete an infinite number of positions, but since this is impossible there is no motion. He proves his hypothesis thus: An object in motion must move through a certain distance; but since every distance is infinitely divisible the moving object must first traverse half the distance through which it is moving, and then the whole distance; but before it traverses the whole of the half distance, it must traverse half of the half, and again half of this half. If then these halves are infinite in number, because it is always possible to halve any given length, and if it is impossible to traverse an infinite number of positions in a finite time – this Zeno assumed as self-evident; and Aristotle has previously referred to his argument when he speaks of it being impossible to traverse an infinite number of positions or to make an infinite number of contacts in a finite time – anyhow, to resume, every magnitude has an infinite number of subdivisions, and therefore it is impossible to traverse any magnitude in a finite time.

Simplicius, 947. 5, *ad* 233 *a* 21 Zeno's argument is the following: If there is motion, it is possible in a finite time to traverse an infinite number of positions, making an infinite number of contacts one by one; but this is impossible, and therefore there is no motion. His hypothesis he proved by means of the infinite divisibility of magnitude. For if every magnitude is infinitely divisible, it will be made up of an infinite number of parts, and so a body, moving through and traversing a distance of given magnitude, will move through and complete an infinite number of positions and make an infinite number of contacts in a finite time, that is, in the time it takes to move through the whole finite distance. He says "to make an infinite number of contacts one by one", because it might seem that a body traversed an infinite number of positions by passing *over* them

without making *contact* with each. In this way he proves the hypothesis. The minor premiss, which says "but it is impossible (1) to traverse an infinite number of positions or (2) to make an infinite number of contacts in a finite time", he proves (1) from the interminability of the infinite and (2) from the impossibility of making an infinite number of contacts in a finite time, if the moving object makes contact with the successive parts of the distance in question at successive moments of time; for he said that it is impossible to make contact with each member of an infinite collection because the person making the contacts is as it were counting, and it is impossible to count infinite collections.

The argument of Zeno, to which he now refers, was as follows: If there is motion there will be something which has traversed an infinite number of positions in a finite time; for, since the process of dichotomy can continue infinitely, in every continuum there will be an infinite number of halves owing to every part of it having a half. A body therefore which has moved over a finite distance will have traversed an infinite number of halves in a finite time, that is, in the time which it took to traverse the finite distance in question. He then goes on to assume the opposite of the consequence that follows from his hypothesis, i.e. he assumes that it is impossible to get to the end of an infinite number of positions in a finite time, because it is impossible absolutely to exhaust any infinite collection, and so does away with the reality of motion. So Zeno argued: but some, Aristotle says, put the puzzle in a different way, as follows: 'If there is motion, since there is an infinite number of halves in any continuum, a body moving through a continuum should be able to count each of these halves as it comes to it. But if this is so, then when the moving body has traversed the finite magnitude in question, the counter will have counted an infinite number of halves. If therefore it is impossible to count an infinite number, then any premiss from which this follows as conclusion must be

impossible; but the premiss from which it followed was the supposition that motion is real.'

THE ACHILLES

This argument also bases its attempted proof on infinite divisibility but is arranged differently. It runs as follows: If there is movement the slowest will never be overtaken by the swiftest: but this is impossible: therefore there is no motion ... (1014.9). The argument is called the Achilles because of the introduction into it of Achilles, who, the argument says, cannot possibly overtake the tortoise he is pursuing. For the overtaker must, before he overtakes the pursued, first come to the point from which the pursued started. But during the time taken by the pursuer to reach this point, the pursued advances a certain distance; even if this distance is less than that covered by the pursuer, because the pursued is the slower of the two, yet none the less it does advance, for it is not at rest. And again during the time which the pursuer takes to cover this distance which the pursued has advanced, the pursued again covers a certain distance which is proportionately smaller than the last, according as its speed is slower than that of the pursuer. And so, during every period of time in which the pursuer is covering the distance which the pursued moving at its lower relative speed has already advanced, the pursued advances a yet further distance; for even though this distance decreases at each step, yet, since the pursued is also definitely in motion, it does advance some positive distance. And so by taking distances decreasing in a given proportion *ad infinitum* because of the infinite divisibility of magnitudes, we arrive at the conclusion that not only will Hector never be overtaken by Achilles, but not even the tortoise.

THE ARROW

The flying missile is at rest during its flight, if everything must either be in motion or at rest, but an object in flight always occupies a space equal to itself. But what always occupies a space equal to itself is not in motion, it is therefore at rest.

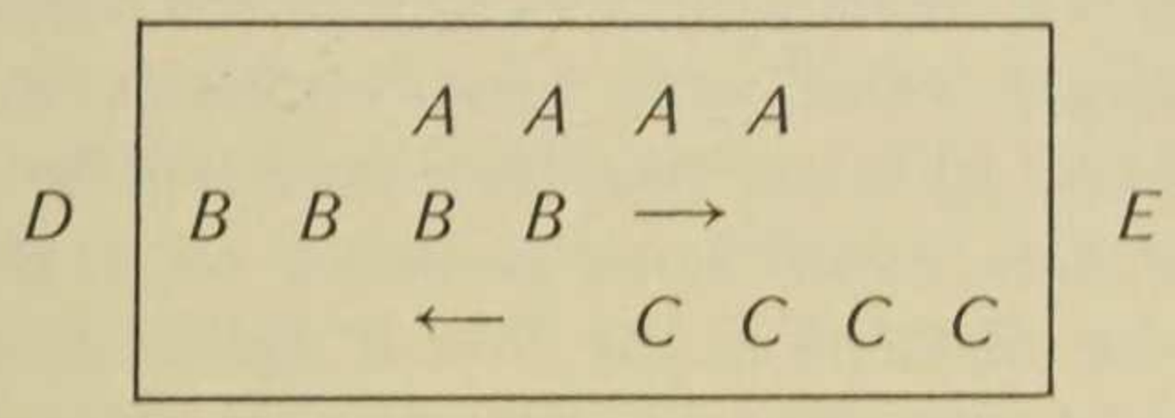
Zeno's argument after making the preliminary assumptions that everything when it occupies a space equal to itself is either in motion or at rest, that nothing is in motion in the instant, and that an object in flight occupies at each instant a space equal to itself, seems to infer as follows: The flying missile occupies a space equal to itself at each instant, and so during the whole time of its flight: what occupies a space equal to itself at an instant is not in motion, since nothing is in motion at an instant: but what is not in motion is at rest, since everything is either in motion or at rest: therefore the flying missile, while it is in flight, is at rest during the whole time of its flight.

By this reasoning also he disproved Zeno's argument that if the flying missile always occupies a space equal to itself, and if what occupies for any time a space equal to itself is at rest, then the flying missile is at rest all the time it is in motion.

THE STADIUM

The fourth of Zeno's arguments about motion, which also leads to the conclusion that it is impossible for motion to be a reality, was as follows: If there is motion, of two bodies of equal size and moving with equal velocities, one will move twice as far as the other, and not the same distance, in the same time. This is of course an absurd conclusion, but so also is the conclusion that

follows upon this that the time they take, which is equal and the same, is at once both double and half. In his proof he assumes as admitted that bodies moving with an equal velocity and of equal size move an equal distance in equal times, and further that of such bodies, if one moves half as far as the other, then the motion of the first will occupy half the time of that of the second. This being premised he goes on to suppose a stadium *DE*, and four bodies of equal size *AA* – or any number, provided it be even, so that the number of bodies (or, as Eudemus calls



them, cubes) has a half – which are stationary and are placed so as to occupy a central stretch of the stadium. Of these stationary bodies the "first" he defines as that nearest the beginning of the stadium, on our diagram *D*, the last as that nearest *E*. And he supposes four other bodies or cubes *BB* equal in size and number to the stationary, originally stretching from the beginning of the stadium to the middle of the four *A*s and moving towards the end of the stadium *E*. And therefore he calls the *B* which is over against the middle of the *A*s the "first" *B*, since it will be ahead of the others in their motion towards *E*. The reason for supposing the number of the bodies to be even is so that they should have a half: for this is necessary to the argument, as we shall see. Accordingly he places the first *B* over against the middle of the stationary *A*s, and then supposes another row of bodies *CC* equal in size and number to the *B*s, and therefore of course to the *A*s, and moving in the opposite direction to the *B*s. For the *B*s move from the middle of the stadium, which is also the mid-point of the *A*s, towards the end of the stadium *E*, while the *C*s move from the end of the stadium, which we have called *E*, towards the beginning of the stadium, *D* in our diagram, and so clearly the "first" of the four *C*s is the one furthest advanced towards *D*, in the direction of which the *C*s are moving, and the

first *C* is placed adjacent to the first *B*.

This then is the initial position. Then let the *A*s remain stationary, and let the *B*s move from the middle of the *A*s and of the stadium towards the end of the stadium *E*, and the *C*s from *the end of the stadium* towards the beginning (this must clearly be the meaning, and not *from the end B*, a reading which it seems that Alexander found in some manuscripts, and was forced to adopt: for then what he previously called the *first B* he has now called the *last*). Then it results that the first *B* and the first *C* will "be at the end" of their respective motions simultaneously "as they move past each other" with equal velocities. Or else we can interpret the phrase to mean that the first *B* will be opposite the last *C*, and vice-versa, at the same moment: for since the first *C* was to begin with adjacent to the first *B*, as the two rows move past each other in opposite directions and with equal velocity, the first *B* will come opposite the last *C* and the first *C* opposite the last *B*. And this would be the meaning of saying that it results that "the first *B* and the first *C* will, as they move past one another, each be opposite the end simultaneously": for their movement past each other brings each opposite the end body of the other row.

But it further results, he says, that "the *C*", that is, obviously, the first *C*, "has passed all the *A*s, but the ⟨first⟩ *B* has only passed half the *A*s". It is of course evident that the first *B*, starting from the mid-point of the *A*s, has moved past two *A*s or through half whatever the even number of bodies chosen, while *C* has passed double the number of *B*s: for the first *B* was supposed to start from the middle of the *A*s. Also while *B* moves past the *two* end *A*s, which are stationary, the first *C*, moving in the opposite direction to the *B*s, has passed *four B*s: for the two contrary motions, taken together, have the effect of doubling the distance of *B*'s motion, taken singly, past the stationary *A*s. So much is evident. But what is meant by saying that *C* has passed all the *A*s? For it was not past ⟨all⟩ the *A*s that it moved but past ⟨all⟩ the *B*s, nor did it move from the beginning of the *A*s but from the beginning of the *B*s, which was adjacent to the middle of the *A*s. The reason must be because the *B*s also are

equal to the *A*s. Therefore during the time in which the first *C* moved past the ⟨four⟩ *B*s it must have moved past ⟨four⟩ *A*s, since these are equal to the *B*s.

The fallacy lies in assuming without qualification that movements past bodies of equal size take an equal time, without taking into account the further fact that of the equal bodies some are moving in opposite directions and some are stationary. None the less he makes the assumption that the *C*s take an equal time to pass the *B*s and the *A*s and concludes that since, during the time which the first *B* takes to pass two *A*s, the first *C* has passed four *B*s *or* four *A*s, the first *B*, though its velocity is the same as that of the first *C*, yet moves only half the distance the first *C* moves in the same time — which is in accordance neither with the presuppositions of the argument nor with common sense: for bodies moving with an equal velocity cover an equal distance in an equal time, but only when their relative circumstances are the same and either both are moving past stationary bodies or both past moving, but not when some are moving past stationary bodies (like *B*) and some past bodies moving in an opposite direction (like *C*). Further, the time taken by *B* to pass two *A*s is half the time taken by *C* to pass four *B*s, if the *A*s are equal to the *B*s and *B* and *C* move with equal velocity. But the time in which *B* passes two *A*s and that in which *C* passes four *B*s are supposed to be equal or the same. It follows therefore *both* that the same magnitude is double and half, since in the same time of two bodies moving with equal velocity *B* passes two *A*s and *C* passes four *B*s, though the *B*s are equal in size to the *A*s: *and* that the same time is both double and half, if the time taken by *B* to pass two *A*s is both half and the same as the time *C* took to pass four *B*s.

The phrase "each takes an equal time to pass each body" means that *B* and *C*, since they move with equal velocity, take an equal time in passing both each *B* and each *A*. But if this is so, then it is clear that the time taken by *C* to pass four *B*s is double that taken by *B* to pass two *A*s, or rather that the time which *C* takes to pass four *A*s is double that which *B*, though moving with a velocity equal to *C*'s, takes to pass two *A*s: for as

was said the time *C* takes to pass the *B*s, it will also take to pass the *A*s.

THE MILLET SEED

By this means he solves the conundrum which Zeno the Eleatic asked Protagoras the sophist. "Tell me, Protagoras," he said, "does a single grain of millet or the ten thousandth part of a grain make any sound when it falls? " And when Protagoras said it did not, "Then", asked Zeno, "does a bushel of millet make any sound when it falls or not? " Protagoras answered that it did, whereupon Zeno replied, "But surely there is some ratio between a bushel of millet and a single grain or even the ten thousandth part of a grain"; and when this was admitted, "But then surely", Zeno said, "the ratios of the corresponding sounds to each other will be the same: for as the bodies which make the sounds are to one another, so will the sounds be to one another. And if this is so, and if the bushel of millet makes a sound, then the single grain of millet and the ten thousandth part of a grain will make a sound." This was the way Zeno used to put his questions.

The Thought of Zeno in the Writings of Simplicius, in *Zeno of Elea*, translated by Henry Desmond Pritchard Lee, Amsterdam, Adolf M. Hakkert Publisher, 1967, pp. 12-24, 37, 45, 49-63, 109.

*H.D.P. Lee: "... Simplicius is by far the best of the three [commentators: Themistius, Philoponus and Simplicius], and definitely claims (*Physics, *140.27) to have had access to an original work of Zeno. Whether this work was genuine or not [Tannery,* Rev. Phil. *XX, 1885, p. 391, thinks Simplicius "ne possédait qu'un résumé". Zeller (*Pre-Socratic Philosophy, *1881, vol. I, p. 611 note), thinks Simplicius "had probably something more than extracts", though not a complete text.] it at any rate represents a source of information independent of Aristotle. But Simplicius actually quotes only from the arguments on plurality, and makes no reference to Zeno's work in his exposition of the four arguments on motion; and had his original contained them this omission is remarkable in view of their admitted difficulty. Nor do I think his exposition implies any knowledge of the arguments apart from what he knew from Aristotle, and, possibly, commentaries on him. In other words, the first-hand information he claims covers only the arguments on plurality, not those on motion. Themistius and Philoponus show no signs of having had first-hand knowledge.*

In my collection I have quoted first Simplicius, as his commentary is the best and most informative ...

We speak of many beautiful things and many good things, and we say that they are so and so define them in speech. — We do.

And Beauty itself and Goodness itself, and so with all the things which we then classed as many; we now class them again according to one Form of each, which is one and which we in each case call that which is. — That is so.

And we say that the many things are the objects of sight but not of thought, while the Forms are the objects of thought but not of sight. — Altogether true.

With what part of ourselves do we see the objects that are seen? — With our sight.

And so things heard are heard by our hearing, and all that is perceived is perceived by our other senses? — Quite so.

Have you considered how very lavishly the maker of our senses made the faculty of seeing and being seen? — I cannot say I have.

Look at it this way: do hearing and sound need another kind of thing for the former to hear and the latter to be heard, and in the absence of this third element the one will not hear and the other not be heard. — No, they need nothing else.

Neither do many other senses, if indeed any, need any such other thing, or can you mention one? — Not I.

But do you not realize that the sense of sight and that which is seen do have such a need? — How so?

Sight may be in the eyes, and the man who has it may try to use it, and colours may be present in the objects, but unless a third kind of thing is present, which is by nature designed for this very purpose, you know that sight will see nothing and the

colours remain unseen. — What is this third kind of things?

What you call light, I said. — Right.

So to no small extent the sense of sight and the power of being seen are yoked together by a more honourable yoke than other things which are yoked together, unless light is held in no honour. — That is far from being the case.

Which of the gods in the heavens can you hold responsible for this, whose light causes our sight to see as beautifully as possible, and the objects of sight to be seen? — The same as you would, he said, and as others would; obviously the answer to your question is the sun.

And is not sight naturally related to the sun in this way? — Which way?

Sight is not the sun, neither itself nor that in which it occurs which we call the eye. — No indeed.

But I think it is the most sunlike of the organs of sense. — Very much so.

And it receives from the sun the capacity to see as a kind of outflow. — Quite so.

The sun is not sight, but is it not the cause of it, and is it not also seen by it? — Yes.

Say then, I said, that it is the sun which I called the offspring of the Good, which the Good begot as analogous to itself. What the Good itself is in the world of thought in relation to the intelligence and things known, the sun is in the visible world, in relation to sight and things seen. — How? Explain further.

You know, I said, that when one turns one's eyes to those objects of which the colours are no longer in the light of day but in the dimness of the night, the eyes are dimmed and seem nearly blind, as if clear vision was no longer in them. — Quite so.

Yet whenever one's eyes are turned upon objects brightened by sunshine, they see clearly, and clear vision appears in those very same eyes? — Yes indeed.

So to understand the eye of the soul: whenever it is fixed upon that upon which truth and reality shine, it understands and knows and seems to have intelligence, but whenever it is fixed

upon what is mixed with darkness — that which is subject to birth and destruction — it opines and is dimmed, changes its opinions this way and that, and seems to have no intelligence. — That is so.

Say that what gives truth to the objects of knowledge, and to the knowing mind the power to know, is the Form of Good. As it is the cause of knowledge and truth, think of it also as being the object of knowledge. Both knowledge and truth are beautiful, but you will be right to think of the Good as other and more beautiful than they. As in the visible world light and sight are rightly considered sun-like, but it is wrong to think of them as the sun, so here it is right to think of knowledge and truth as Good-like, but wrong to think of either as the Good, for the Good must be honoured even more than they.

This is an extraordinary beauty you mention, he said, if it provides knowledge and truth and is itself superior to them in beauty. You surely do not mean this to be pleasure!

Hush! said I, rather examine the image of it in this way. — How?

You will say, I think, that the sun not only gives to the objects of sight the capacity to be seen, but also that it provides for their generation, increase, and nurture, though it is not itself the process of generation. — How could it be?

And say that as for the objects of knowledge, not only is their being known due to the Good, but also their being, though the Good is not being but superior to and beyond being in dignity and power.

Glaucon was quite amused and said: By Apollo, a miraculous superiority!

It is your own fault, I said, you forced me to say what I thought about it.

Don't you stop, he said, except for a moment, but continue to explain the similarity to the sun in case you are leaving something out.

I am certainly leaving out a good deal, I said. — Don't omit the smallest point.

Much is omitted, I said. However, as far as the explanation

can go at present, I will not omit anything. — Don't you!

Understand then, I said,that, as we say, there are those two, one reigning over the intelligible kind and realm, the other over the visible (not to say heaven, that I may not appear to play the sophist about the name). So you have two kinds, the visible and the intelligible. — Right.

It is like a line divided into two unequal parts, and then divide each section in the same ratio, that is, the section of the visible and that of the intelligible. You will then have sections related to each other in proportion to their clarity and obscurity. The first section of the visible consists of images — and by images I mean shadows in the first instance, then the reflections in water and all those on close-packed, smooth, and bright materials, and all that sort of thing, if you understand me. — I understand.

In the other section of the visible, place the models of the images, the living creatures around us, all plants, and the whole class of manufactured things. — I so place them.

Would you be willing to say that, as regards truth and untruth, the division is made in this proportion: as the opinable is to the knowable so the image is to the model it is made like? — Certainly.

Consider now how the section of the intelligible is to be divided. — How? In such a way that in one section the soul, using as images what before were models, is compelled to investigate from hypotheses, proceeding from these not to a first principle but to a conclusion. The other section which leads to a first principle that is not hypothetical, proceeding from a hypothesis without using the images of the other section, by means of the Forms themselves and proceeding through these. — I do not, he said, quite understand what you mean.

Let us try again, I said, for you will understand more easily because of what has been said. I think you know that students of geometry, calculation, and the like assume the existence of the odd and the even, of figures, of three kinds of angles, and of kindred things in each of their studies, as if they were known to them. These they make their hypotheses and do not deem it necessary to give any account of them either to themselves or to

others as if they were clear to all; these are their starting points, and going through the remaining steps they reach an agreed conclusion on what they started out to investigate. — Quite so, I understand that.

You know also that they use visible figures and talk about them, but they are not thinking about them but about the models of which these are likenesses; they are making their points about the square itself, the diameter itself, not about the diameter which they draw, and similarly with the others. These figures which they fashion and draw, of which shadows and reflections in the water are images, they now in turn use as images, in seeking to understand those others in themselves, which one cannot see except in thought. — That is true.

This is what I called the intelligible class, and said that the soul is forced to use hypotheses in its search for it, not travelling up to a first principle, since it cannot reach beyond its hypotheses, but it uses as images those very things which at a lower level were models and which, in comparison with their images, were thought to be clear and honoured as such. — I understand, he said, that you mean what happens in geometry and kindred sciences.

Understand also that by the other section of the intelligible I mean that which reason itself grasps by the power of dialectic. It does not consider its hypotheses as first principles, but as hypotheses in the true sense of stepping stones and starting points, in order to reach that which is beyond hypothesis, the first principle of all that exists. Having reached this and keeping hold of what follows from it, it does come down to a conclusion whitout making use of anything visible at all, but proceeding by means of Forms and through Forms to its conclusions which are Forms.

I understand, he said, but not completely, for you seem to be speaking of a mighty task — that you wish to distinguish the intelligible reality contemplated by the science of dialectic as clearer than that viewed by the so-called sciences, for which their hypotheses are first principles. The students of these so-called sciences are, it is true, compelled to study them by thought and

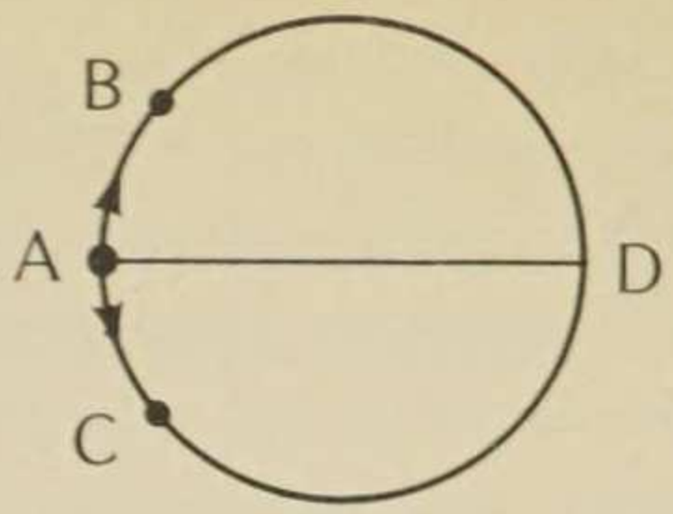
not by sense perception, yet because they do not go back to a first principle but proceed from hypotheses, you do not think that they have any clear understanding of their subjects, although these can be so understood if approached from a first principle. You seem to me to call the attitude of mind of geometers and such reasoning but not understanding, reasoning being midway between opinion and understanding.

You have grasped this very satisfactorily, I said. There are four such processes in the soul, corresponding to the four sections of our line: understanding for the highest, reasoning for the second; give the name of opinion to the third, and imagination to the last. Place these in the due terms of a proportion and consider that each has as much clarity as the content of its particular section shares in truth. — I understand, and I agree and arrange them as you say.

The Republic, Chapter VI, 507 b — 511 d, translated by G.M.A. Grube, Hackett Publishing Company, Indianapolis, 1974, pp. 161-166.

We shall now proceed to set forth the fact that it is possible for a motion, which is one and continuous, to be infinite, and the fact that this motion is circular.

Now everything in locomotion is moved with a motion which is either circular or rectilinear or a blend of the two; so if one of the first two kinds of motion is not continuous, neither can the composite of the two be. It is clear that a thing in locomotion along a finite straight line cannot proceed continuously, for it must turn back; and that which turns back along a straight line has contrary motions, for an upward locomotion is contrary to a downward locomotion, a forward locomotion is contrary to a backward one, and that to the left is contrary to that to the right, and this is so since the corresponding places are pairs of contraries. Previously we have defined a motion as being one and continuous if it is of one thing and during one time and without difference in kind. For there are three things here — (a) that which is in motion, e.g., a man or a divine being; (b) the whenness of the motion, i.e., the [individual] time; and (c) that in which [i.e., the category], and this is either a place or an affection or a form or a magnitude. Now contraries differ in species and are not one; and the differentiae of place are those which have just been stated. A sign that the motion from A to B is contrary to that from B to A is the fact that, if occurring simultaneously, they stop or cancel each other. And it is likewise with motions along a circle, e.g., that from A going toward B is contrary to that from A going the other way toward C, for these too stop even if they are continuous, and there is no return, and this is because contraries destroy or obstruct each other; but a lateral motion is not contrary to an upward motion. That a rectilinear

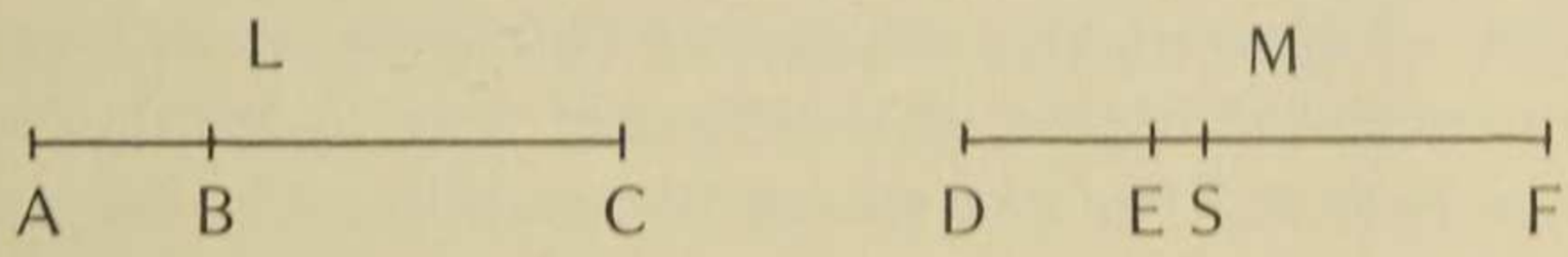


motion cannot be continuous is most evident from the fact that the object must stop before turning back. This is so not only in the case of a rectilinear motion, but also if the object were to go around a circle. (For to have a circular locomotion and to go around a circle are not the same: In the first case, the motion is connected; in the second, the object must come to the starting point but then turn back.)

One may be convinced that the object must come to a stop not only from sensation but also from argument. We may begin as follows: When there are three things, a beginning, a middle, and an end, the middle is in relation to each of the other two; and though it is one numerically, it is two in formula. Further, potential existence is distinct from *actual* existence. Hence any point between the ends of a straight line is potentially a middle; but it is not [a middle] in *actuality* unless one divides the line, and the object in motion stops there and then begins its motion again, in which case the middle becomes [*actually*] both a beginning and an end, the beginning of the later line [after division] and the end of the first line. For example, this would be the case if P, which travels [from A], stops at B and then again starts travelling to C. But when travelling continuously [from A] to C, it has neither arrived at B nor departed from B; but it is there only at a moment and not in any interval of time, unless it be in the sense in which the moment as a division is in the whole of the time [taken to traverse AC]. If one were to posit that P has arrived at B and also has departed from it, then P, while travelling, must stop, for P cannot have simultaneously arrived at B and departed from it; it will do so, then, at distinct cuts of time, and so there will be a time interval between these [moments] and P will be resting at B, and similarly with all other points since the same argument applies to all. But if the travelling

object P is to use the intermediate point B both as an end and as a beginning, then it must stop, because it will be using it as two, as if it were to think of it [as two] also. However, it is from A, which is the beginning, that P departs, and it is at C that it has arrived, that is, when it has ended and stopped. So it is this that should be used against a *difficulty* that arises, which is as follows.

If line L is equal to line M and P travels continuously from one end [of L] to C and if P is at B while at the same time Q, having started from one end of M also with a uniform speed and



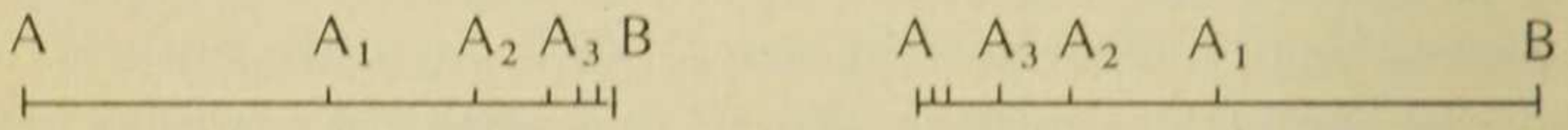
equal to that of P, is travelling toward F, then Q will arrive at F before P arrives at C; for that which started earlier and ends must arrive earlier, since P does not arrive at B and depart from it at the same time but is delayed (for if it arrives there and departs at the same time, it will not be delayed; but it must stop there).

We should not posit, however, that when P has arrived at B, then Q, which started from one end of M, is simultaneously [in the process of] travelling [toward F]; for if there is an arrival of P at B, there will also be a departure [from B] which is not simultaneous [with the arrival], but P is at B in a *division* of time and not for an interval of time. Accordingly, we cannot truly speak in the above manner concerning a continuous motion.

But we must truly speak in that manner if the thing in motion turns back. For if R, in travelling upward to H, were to turn back at H, it would use H both as an end and as a starting-point and would thus use one point as two; and so it would be necessary for it to stop there and not both arrive at H and depart from H simultaneously, since otherwise it would both be and not be there at the same moment. And we should not use the former refutation; for one cannot [truly] say that R is at H in a *division* of time and that it has neither arrived there nor departed from there, since it must reach the end [i.e., the goal] *actually* and not potentially. Accordingly, [in the previous case]

the object exists potentially at a midpoint [i.e., P at B], but in the present case it exists *actually* [at H], and viewed from below, H is an end, but from above [i.e., from H], it is a starting-point; and so it [i.e., H] is related to the [two] motions in the same way. So that which is to turn back when travelling along a straight line must [first] stop. Hence a motion along a straight line cannot be eternally continuous.

We should reply in the same way (a) to those who bring up Zeno's argument and claim that if always half of the [remaining] distance must be traversed, there will be infinite halves, and it is impossible to traverse the infinite, or (b) to those who raise the same argument in another way and claim that if a motion were to exist, the first half [of the distance] would have to be counted, and this would be the case for each previous half, so in traversing the whole [distance] an infinite number would have to be counted, and this is something which people agree to be impossible.



Now in our first discussion concerning motion we have solved the problem through the fact that time has in itself an infinite number of parts; for there is nothing absurd if in an infinite time one traverses an infinite number of parts since the infinite exists alike in length and in time. But although this solution is adequate for him who raises the problem (for he raises the problem of whether it is possible to traverse an infinity of things in a finite time), it is not adequate regarding the fact itself and the truth; for if, leaving out of account the length and the question of whether it is possible to traverse an infinity of things in a finite time, one raises these questions concerning time itself (for time has an infinite number of divisions), this solution will not be adequate, but what must be presented is the truth which was stated just previously. For if one divides the continuous into two halves, he uses one point as two since he regards the same point both as a starting-point and as an end. Now both he who

counts and he who divides into halves do likewise. But in dividing in this manner, neither the line nor the motion will be continuous; for a continuous motion is of something continuous, and in that which is continuous an infinite number of halves do exist, but potentially and not in actuality. And if he were to make these [halves] actual, he would not be making something continuous but would be stopping (something which evidently happens to one who is counting the halves); for it would be necessary for him to count one point as two since one [point] would be the end of one of the halves and the other would be the starting-point of the other half (that is, if he were to count the continuous not as one but as two halves). Thus, if one asks us whether it is possible or not to traverse an infinite number of things in time or in length, our answer to him must be: In one way it is, in another way it is not. If these things be considered as existing actually, it is not possible, but if potentially, then it is possible; for he who is in motion continuously traverses the infinite not in an unqualified way but accidentally, in view of the fact that the line is an infinity of halves in an accidental way while its *substance* or its being is something else.

It will also be clear that if we do not posit a cut in time, which [cut] divides the earlier from the later time, as belonging to the thing [only] in its later state, then the same thing would both exist and not exist simultaneously, and it would also not exist when it has been generated. Now a cut [i.e., a moment] is common to both [times], i.e., it belongs to the earlier as well as to the later time, and it is the same and numerically one, but it is not one in formula, for it is the end of the earlier but the beginning of the later time. But it belongs always to the thing in its later affection. Let ABC be the time, P be the thing, and P be white in [time] A, but not-white in [time] C. Then it would be white and not-white at [moment] B; for it would be true to say that it is white at any moment of A if it were white in all this time [i.e., in A], and [likewise true] to say that it is not-white in C, and B is in both [A and C]. We must not grant, then, that P is white in all A but must delete its last moment, which is B. The moment B, then, belongs to the later state of the thing; and

whether P was becoming not-white or was being destroyed as white in all of A, it is at B that it came to be in its later state or was destroyed [as white], respectively. So it is true to say that it is at B (a) that the thing is first generated and is not-white and so is not white or (b) that it is first destroyed [as white] and is not-white; otherwise, it would be necessary for it to be simultaneously both white and not-white, and in general, both a being and not a being.

Now if that which exists without having existed previously was necessarily becoming a being [previously] and if it was not a being while in the process of becoming, then an interval of time cannot be divided into *indivisible* intervals of time. For if P was becoming white in time A and has simultaneously become [white] and exists [as white] at another *indivisible* time B which is consecutive with A and if it was not white while becoming white in A but is white in B, then there must be a becoming of the thing between [A and B] and so [there must be] a time during which it was in the process of becoming. Now the same argument does not apply also to those who say that no *indivisible* time exists, but for them the thing has become and is white at the last cut of the time during which [time] it was in the process of becoming; and this [cut] does not at all have a cut consecutive or in succession with it, whereas *indivisible* intervals of time would have to be in succession. So it is evident that if the thing was becoming white in the whole of time A, the sum of that at which the thing [first] became white and the time during which it was becoming white is not greater than all the time during which it was becoming white.

By these and other such arguments, which are *proper* to the subject, one might be convinced [of what has been said]. And if, from the following, one examines the matter logically, the result would again seem to be the same.

Now every thing in continuous locomotion which has arrived somewhere, provided that it was not deflected by anything, was previously travelling to that place. For example, if it has arrived at B, then it was previously travelling toward B, and not [only] when it was near B, but immediately when it started

travelling; for why should it be [travelling toward B] at a later moment rather than at an earlier one? It is likewise with the other kinds of motions. So let P, which is travelling from A toward C, turn back immediately after reaching C and arrive at A, [making the whole trip] in one continuous motion. Then, when travelling from A in the direction of C, it will also be travelling toward A during the [part of the] motion from C to A; so it will have contrary motions at the same time, for motions along a straight line in contrary directions are contrary. At the same time, it will also be travelling from that at which it is not. So if these are impossible, the object must stop at C. Its motion, then, will not be one, for a motion interrupted by a stop is not one.

Again, this is also evident from what follows, and more universally for every kind of motion. If every thing in motion is moved with one of the motions specified earlier or rests with the corresponding opposite state of rest (for we have shown that besides these [motions] no other exists), then that which has a given motion (I mean one which is distinct in species, and not one which is a part of a whole [motion]) but does not have it always must have previously been at rest with the corresponding opposite state of rest, for the privation of a motion is rest. Thus, if rectilinear motions [in opposite directions] are contrary and no thing can have contrary motions at the same time, then a thing travelling from A toward C would not at the same time be travelling from C toward A; and so since the thing [when in motion from C to A] cannot have both [contrary] motions at the same time but will have this motion [C to A], prior to this motion it must have rested at C, for this rest was shown to be opposite to the motion from C. So it is clear from these statements that the motion is not continuous.

Again, the following argument is even more special than the preceding. Now a thing [in alteration] is destroyed as not-white and becomes white simultaneously. So if the alteration [of the thing from not-white] to white and from white [to not-white] is continuous and [the thing] does not *rest* [as white] for some time, then there will be simultaneously a destruction of the not-white,

a generation of the white, and a generation of the not-white; for the time of all three will be the same.

Again, motion need not be continuous if time is, but it may be in succession. How could a pair of contraries, e.g., whiteness and blackness, have the same extremity.

A circular motion, on the other hand, may be one and continuous, since nothing impossible follows; for, with the same forward direction, the object in motion from A will be moving at the same time toward A, since that at which it is to arrive is also that toward which it is moving, and without having contrary or contradictory motions at the same time. For not every motion to A is contrary or contradictory to a motion from A; but motions to and from A are contrary if they are along a straight line (for in such a line the ends are contrary with respect to place, as in a motion along the diameter, whose ends are furthest apart), and they are contradictory if they are along the same line. So nothing prevents this [moving] object from being in motion continuously without pausing for an interval of time; for a circular motion is from A to A, a rectilinear motion is from A to something else, and a circular motion is never within the same limits, whereas a rectilinear motion is repeatedly within the same limits [i.e., ends]. Accordingly, a motion which occurs within limits which are [always] distinct may proceed continuously, but one which occurs repeatedly within the same [two contradictory] limits cannot; otherwise, the object would have contradictory motions at the same time. So neither along a semicircular arc nor along any other arc can an object be in motion continuously, for it is necessary for it to proceed within the same limits and have contrary changes, since the beginning of one motion is not connected with the end of the preceding. But in a motion along a circle the connection takes place, and only this [motion] is complete.

It is also evident from this distinction that the other [kinds of] motions too cannot be continuous; for in each of them the motion proceeds repeatedly within the same limits, e.g., in an alteration it is between the same limits, in a quantity it is between the same magnitudes, and in a generation and a

destruction, likewise. Nor does it make any difference whether the stages within the limits are posited as being few or many, or whether some are added or removed, for in either case the object in motion will still go through them repeatedly.

It is clear from these statements, then, that the natural philosophers who say that all things are always in motion do not speak well; for the motion of each of those things must be some one of those mentioned, and an alteration, most of all according to them, since they say that things are always in flux and decay and, moreover, that both generations and destructions are alterations. But the above argument concerning all motions states universally that an object cannot be in motion continuously with any of the motions except with a circular motion, and so it cannot alter or increase continuously.

Let this be our account, then, of the fact that no change can be infinite or take place continuously except a circular locomotion.

Physics, Book Θ, Chapter 8, 262 a - 265 a, translated by Hippocrates G. Apostle pp. 170-77.

ROBERT GROSSETESTE

In my opinion the first corporeal form, called by some corporeity, is light. By its essential nature, light shines in all directions so that a point of light will at once become a sphere of light of any size unless curbed by some opaque object. That matter must extend in three directions is a condition of corporeity in spite of the fact that matter and corporeity are only simple substances without any dimensions. A simple, dimensionless form could not impel extension in all directions into matter, likewise simple and dimensionless, except by extending and diffusing itself in all directions and by this means extending matter also. Being mutually inseparable, form cannot leave matter and matter cannot be deprived of form. As I have proposed, light, by its very nature, has the ability to multiply and diffuse itself in all directions. Whatever makes light act in this way is either light itself or some other entity that acts in and of the virtue of light which is part of its essence. Thus, corporeity is either light itself or the entity which acts in light and gives it dimensions by virtue of acting in light and through the power of light. But the first form cannot add dimensions to matter by the power of a subsequent form. Thus light is not a form subsequent to corporeity but corporeity itself.

According to the philosophers, a first corporeal form, being more exalted, is nobler and more excellent in essence than all forms subsequent to it. Also, it more closely resembles forms that exist separated from matter. But light is a more exalted, nobler, and more excellent essence than all other corporal substances. It has a greater degree of similarity than all other bodies to those forms which are separated from matter, i.e. the intelligence. Thus, light is the first corporeal form.

So that, being the first form created in the first matter, light by its essential nature multiplied itself an infinite number of times on all sides and spread itself uniformly in every direction. By this means from the beginning of time, it proceeded to extend matter, which it could not leave behind, by extending it with itself into the whole mass and dimensions of the material universe. A finite multiplication of light could not bring about such an extension of matter because, as Aristotle demonstrates in *De Caelo et Mundo*, a simple substance multiplied a finite number of times does not produce a quantity. But a simple substance multiplied an infinite number of times must produce a finite quantity because a product resulting from being multiplied infinitely exceeds infinitely what is produced by the multiplication. Also, one simple being cannot exceed another simple being infinitely since only a finite quantity can exceed a simple being infinitely: an infinite quantity exceeds a simple being by infinity times infinity. Therefore, when light, being in essence simple, is multiplied an infinite number of times, it must extend matter which is similarly simple into finite dimensions.

However, it is possible that an infinite numerical sum is related to an infinite sum in every proportion, both numerical and non-numerical. And since some infinites are larger than other infinites and some are smaller, the sum of all numbers both even and odd is infinite. At the same time, such a sum is greater than the sum of all the even numbers even though this sum is similarly infinite, for it exceeds it by the sum of all the odd numbers. Also, the sum of all numbers beginning with one and continuing by doubling each successive number is infinite, and similarly the sum of all the halves corresponding to the doubles is infinite: the sum of the halves must be half the sum of their doubles. Similarly, the sum of all numbers beginning with one and multiplying each successive number by three is three times the sum of all the thirds corresponding to these triples. Indeed, in all kinds of numerical proportions, a proportion of finite to infinite clearly enough can exist.

But if we posit an infinite sum of all doubles beginning with one, and an infinite sum of all halves corresponding to these

doubles, and if one or some other finite number, be subtracted from the sum of the halves, then, as soon as the subtracting is done, a two-to-one proportion between the first sum and what is left of the second sum will no longer obtain. In fact no numerical proportion will obtain, because if a second numerical proportion is to be left from the first as the result of subtraction from the lesser member of the proportion, then what is subtracted must be an aliquot part or aliquot parts of an aliquot part of that from which it is subtracted. But a finite number cannot be an aliquot part or aliquot parts of an aliquot part of an infinite number. Therefore, when we subtract a number from an infinite sum of halves, a numerical proportion between the infinite sum of doubles and what is left from the infinite sum of halves will not remain.

Because of this, it is clear that light extends matter, by infinitely multiplying itself, into finite dimensions that are smaller and larger according to certain proportions that they have to one another, namely, numerical and non-numerical. For if light by infinitely multiplying itself extends matter into a dimension of two cubits, then by the doubling of this same infinite multiplication it extends into a dimension of four cubits, and by the dividing in half of this infinite multiplication, it extends it into a dimension of one cubit. So it proceeds according to numerical and non-numerical proportions.

This, so I believe, was the meaning of the theory of those philosophers who held everything to be composed of atoms, and said that bodies are made up of surfaces, and surfaces of lines, and lines of points. This belief does not contradict the theory that a magnitude is composed only of magnitudes, because for every meaning of the word whole, there is a corresponding meaning of the word part. Thus do we say that a half is part of a whole because two halves make a whole. Also, we say that a side is part of a diameter, but in a different sense, because no matter how many times a side is taken it does not make a diameter, but is always less than a diameter. Again, we say that an angle of contingence is part of a right angle because there is an infinite number of angles of contingence in a right angle, and yet when

an angle of contingence is subtracted from a right angle a finite number of times, the latter becomes smaller. However, it is in a different sense that a point is said to be part of a line in which it is contained an infinite number of times, for when a point is taken away from a line a finite number of times this act does not shorten the line.

Thus, to return to my theme, I say that light by infinitely multiplying itself equally in all directions extends matter equally in all directions into the form of a sphere and, necessarily by this extension, the outermost parts of matter are more extended and more rarefied than those within, which are close to the center. And since the outermost parts will be rarefied to the highest degree, the inner parts will have the possibility of being further rarefied.

Thus did light, by extending first matter into the form of a sphere and by rarefying its outermost parts to the highest degree wholly actualize the potentiality of matter, and left this matter without any power of further impression. And thus the first body, in the outermost part of the sphere called the firmament, is perfect, because it is composed of nothing but first matter and first form. Thus it is the simplest of all bodies in the parts that make up its essence and in the quantity that is the greatest possible in extent. It differs from the genus body only in that matter is wholly brought into being in body through the first form alone. But the genus body, in this and other bodies, has in its essence first matter and first form, and abstracts from wholly actualized matter through the first form and from the diminution of matter through the first form.

On Light, translated by Carroll F. Terrel, *Paideuma*, vol. 2, Winter, 1973, pp. 455-58.

— To finish what I was saying about beauty, said Stephen, the most satisfying relations of the sensible must therefore correspond to the necessary phases of artistic apprehension. Find these and you find the qualities of universal beauty. Aquinas says: *ad pulcritudinem tria requiruntur, integritas, consonantia, claritas.* I translate it so: *Three things are needed for beauty, wholeness, harmony and radiance.* Do these correspond to the phases of apprehension? Are you following?

— Of course, I am, said Lynch. If you think I have an excrementitious intelligence run after Donovan and ask him to listen to you.

Stephen pointed to a basket which a butcher's boy had slung inverted on his head.

— Look at that basket, he said.

— I see it, said Lynch.

— In order to see that basket, said Stephen, your mind first of all separates the basket from the rest of the visible universe which is not the basket. The first phase of apprehension is a bounding line drawn about the object to be apprehended. An esthetic image is presented to us either in space or in time. What is audible is presented in time, what is visible is presented in space. But, temporal or spatial, the esthetic image is first luminously apprehended as selfbounded and selfcontained upon the immeasurable background of space or time which is not it. You apprehend it as *one* thing. You see it as one whole. You apprehend its wholeness. That is *integritas.*

— Bull's eye! said Lynch, laughing. Go on.

— Then, said Stephen, you pass from point to point, led by its formal lines; you apprehend it as balanced part against part

within its limits; you feel the rhythm of its structure. In other words the synthesis of immediate perception is followed by the analysis of apprehension. Having first felt that it is *one* thing you feel now that it is a *thing*. You apprehend it as complex, multiple, divisible, separable, made up of its parts, the result of its parts and their sum, harmonious. That is *consonantia*.

— Bull's eye again! said Lynch wittily. Tell me now what is *claritas* and you win the cigar.

— The connotation of the word, Stephen said, is rather vague. Aquinas uses a term which seems to be inexact. It baffled me for a long time. It would lead you to believe that he had in mind symbolism or idealism, the supreme quality of beauty being a light from some other world, the idea of which the matter is but the shadow, the reality of which it is but the symbol. I thought he might mean that *claritas* is the artistic discovery and representation of the divine purpose in anything or a force of generalisation which would make the esthetic image a universal one, make it outshine its proper conditions. But that is literary talk. I understand it so. When you have apprehended that basket as one thing and have then analysed it according to its form and apprehended it as a thing you make the only synthesis which is logically and esthetically permissible. You see that it is that thing which it is and no other thing. The radiance of which he speaks is the scholastic *quidditas*, the *whatness* of a thing. This supreme quality is felt by the artist when the esthetic image is first conceived in his imagination. The mind in that mysterious instant Shelly likened beautifully to a fading coal. The instant wherein that supreme quality of beauty, the clear radiance of the esthetic image, is apprehended luminously by the mind which has been arrested by its wholeness and fascinated by its harmony is the luminous silent stasis of esthetic pleasure, a spiritual state very like to that cardiac condition which the Italian physiologist Luigi Galvani, using a phrase almost as beautiful as Shelley's, called the enchantment of the heart.

Portrait of the Artist as a Young Man (1916), Viking Press, New York, 1968, pp. 211-13.

DANTE ALIGHIERI

Nine times already since my birth had the heaven of light returned to the selfsame point almost, as concerns its own revolution, when first the glorious Lady of my mind was made manifest to mine eyes; even she who was called Beatrice by many who knew not wherefore. She had already been in this life for so long as that, within her time, the starry heaven had moved towards the Eastern quarter one of the twelve parts of a degree: so that she appeared to me at the beginning of her ninth year almost, and I saw her almost at the end of my ninth year. Her dress, on that day, was of a most noble colour, a subdued and goodly crimson, girdled and adorned in such sort as best suited with her very tender age. At that moment, I say most truly that the spirit of life, which hath its dwelling in the secretest chamber of the heart, began to tremble so violently that the least pulses of my body shook therewith; and in trembling it said these words: "Here is a deity stronger than I; who, coming, shall rule over me." At that moment the animate spirit, which dwelleth in the lofty chamber whither all the senses carry their perceptions, was filled with wonder, and speaking more especially unto the spirits of the eyes, said these words: "Your beatitude hath now been made manifest unto you." At that moment the natural spirit, which dwelleth there where our nourishment is administered, began to weep, and in weeping said these words: "Alas! how often shall I be disturbed from this time forth." I say that, from that time forward, Love quite governed my soul; which was immediately espoused to him, and with so safe and undisputed a lordship, (by virtue of strong imagination) that I had nothing left for it but to do all his bidding continually.[...]

After the lapse of so many days that nine years exactly were completed since the above-written appearance of this most gracious being, on the last of those days it happened that the same wonderful lady appeared to me dressed all in pure white,

between two gentle ladies elder than she. And passing through a street, she turned her eyes thither where I stood sorely abashed: and by her unspeakable courtesy, which is now guerdoned in the Great Cycle, she saluted me with so virtuous a bearing that I seemed then and there to behold the very limits of blessedness. The hour of her most sweet salutation was certainly the ninth of that day; and because it was the first time that any words from her reached mine ears, I came into such sweetness that I parted thence as one intoxicated. And betaking me to the loneliness of mine own room, I fell to thinking of this most courteous lady, thinking of whom I was overtaken by a pleasant slumber, wherein a marvellous vision was presented to me: for there appeared to be in my room a mist of the colour of fire, within the which I discerned the figure of a lord of terrible aspect to such as should gaze upon him, but who seemed therewithal to rejoice inwardly that it was a marvel to see. Speaking he said many things, among the which I could understand but few; and of these, this: "I am thy master." In his arms it seemed to me that a person was sleeping, covered only with a blood-coloured cloth; upon whom looking very attentively, I knew that it was the lady of the salutation who had deigned the day before to salute me. And he who held her held also in his hand a thing that was burning in flames; and he said to me, "Behold thy heart." But when he had remained with me a little while, I thought that he set himself to awaken her that slept; after the which he made her to eat that thing which flamed in his hand; and she ate as one fearing. Then, having waited again a space, all his joy was turned into most bitter weeping; and as he wept he gathered the lady into his arms, and it seemed to me that he went with her up towards heaven: whereby such a great anguish came upon me that my light slumber could not endure through it, but was suddenly broken. And immediately having considered, I knew that the hour wherein this vision had been made manifest to me was the fourth hour (which is to say, the first of the nine last hours) of the night [...]

La Vita Nuova, translated by Dante Gabriele Rossetti, from chapters II & III.

BLACK ELK

After the heyoka ceremony, I came to live here where I am now between Wounded Knee Creek and Grass Creek. Others came too, and we made these little gray houses of logs that you see, and they are square. It is a bad way to live, for there can be no power in a square.

You have noticed that everything an Indian does is in a circle, and that is because the Power of the World always works in circles, and everything tries to be round. In the old days when we were a strong and happy people, all our power came to us from the sacred hoop of the nation, and so long as the hoop was unbroken, the people flourished. The flowering tree was the living center of the hoop, and the circle of the four quarters nourished it. The east gave peace and light, the south gave warmth, the west gave rain, and the north with its cold and mighty wind gave strength and endurance. This knowledge came to us from the outer world with our religion. Everything the Power of the World does is done in a circle. The sky is round, and I have heard that the earth is round like a ball, and so are all the stars. The wind, in its greatest power, whirls. Birds make their nests in circles, for theirs is the same religion as ours. The sun comes forth and goes down again in a circle. The moon does the same, and both are round. Even the seasons form a great circle in their changing, and always come back again to where they were. The life of a man is a circle from childhood to childhood, and so it is in everything where power moves. Our tepees were round like the nests of birds, and these were always set in a circle, the nation's hoop, a nest of many nests, where the Great Spirit meant for us to hatch our children.

But the Wasichus have put us in these square boxes. Our power is gone and we are dying, for the power is not in us any more. You can look at our boys and see how it is with us. When

we were living by the power of the circle in the way we should, boys were men at twelve or thirteen years of age. But now it takes them very much longer to mature.

I think I have told you, but if I have not, you must have understood, that a man who has a vision is not able to use the power of it until after he has performed the vision on earth for the people to see. You remember that my great vision came to me when I was only nine years old, and you have seen that I was not much good for anything until after I had performed the horse dance near the mouth of the Tongue River during my eighteenth summer. And if the great fear had not come upon me, as it did, and forced me to do my duty, I might have been less good to the people than some man who had never dreamed at all, even with the memory of so great a vision in me. But the fear came, and if I had not obeyed it, I am sure it would have killed me in a little while.

It was even then only after the heyoka ceremony, in which I performed my dog vision, that I had the power to practice as a medicine man, curing sick people; and many I cured with the power that came through me. Of course it was not I who cured. It was the power from the outer world, and the visions and ceremonies had only made me like a hole through which the power could come to the two-leggeds. If I thought that I was doing it myself, the hole would close up and no power could come through. Then everything I could do would be foolish. There were other parts of my great vision that I still had to perform before I could use the power that was in those parts. If you think about my great vision again, you will remember how the red man turned into a bison and rolled, and that the people found the good red road after that. If you will read again what is written, you will see how it was.

To use the power of the bison, I had to perform that part of my vision for the people to see.

Black Elk Speaks / as told through John G. Neihardt, University of Nebraska Press, Lincoln, 1961, 1970, pp. 198-200 & 209-09.

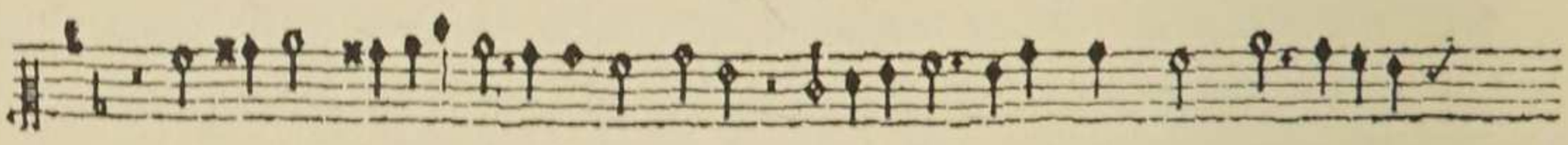
MICHAEL MAIER

Plato, that very illustrious philosopher, taught that the cognizance which is at the basis of all the arts and sciences is as if innately engraved and imprinted on the human spirit and that by remembering and by repeating it every man can grasp and understand all that is taught. To prove this he brings forward a boy, still of a tender age, uneducated and unlettered, and manages to arrange his interrogation on geometry in such a way that the child replies correctly to each question and thus, willy-nilly or unconsciously, enters into the inner sanctum of this most arduous science. From this he concludes that all science, all doctrine is not learnt and retained by children, at the beginning, but that they merely gather and unfold it in their spirit through memory *(recordatione);* he pretends to relate this to his great cycle, as a result of which, forty-eight thousand solar years ago, before the revolution of the sky, the same people and the same actions occurred in exactly the same way. But no one can fail to see that these are fancies with no basis in truth. We do not deny that there are certain sparks of cognizance and pure virtuality planted within us that must be actuated through apprenticeship and instruction, but that these are of such a nature and importance, that without any previous form of culture they constitute the seed-bed of the arts and sciences, is something that we refuse to admit.

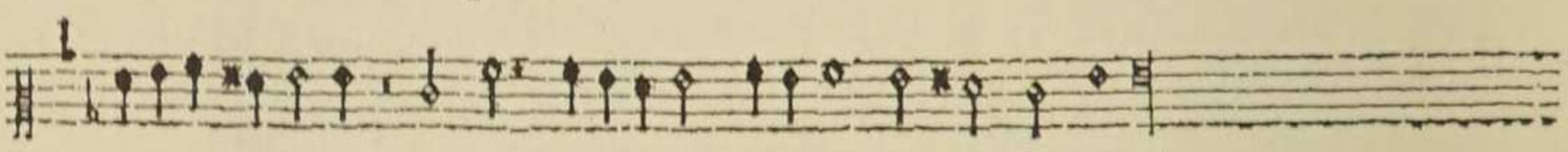
But others may ask from where, then, have the arts and sciences sprung, if men have not discovered them? Were they transmitted originally from the heavens above or by the pagan Gods? I reply that it is one thing to state that burning embers lie buried in such numbers beneath the ashes that if we remove them they will suffice to cook our food and to warm our chilled limbs,

Mache von Mann vnd Weib einen Circkel/darauß ein Quadrangel/hierauß ein Triangel/ mache ein Circkel/vnd du wirst haben den Schein der Weisen.

Atalanta Fugiens.

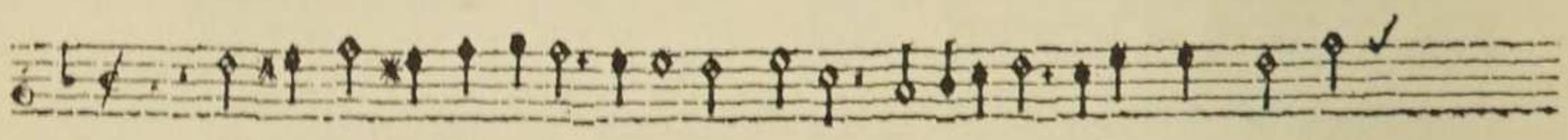


Fœmina mas que unus fiant tibi circulus ex quo sur-



gat habens æquum forma quadrata latus

Hippom. Sequens.



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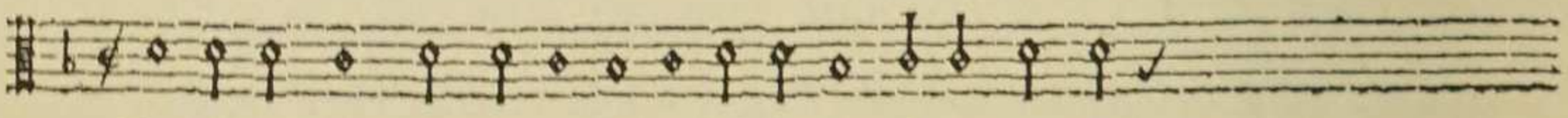
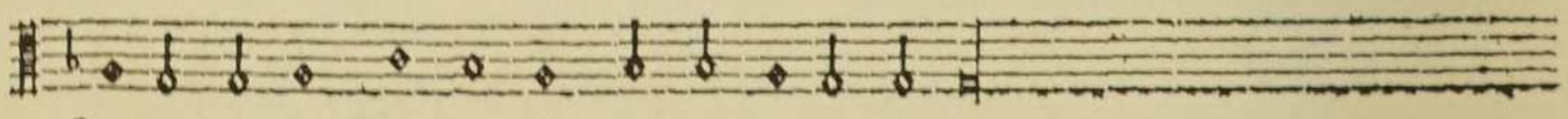
gat habens æquum forma quadrata latus.

Pomum Morans.



Fœmina masque unus fiant tibi circulus, ex quo



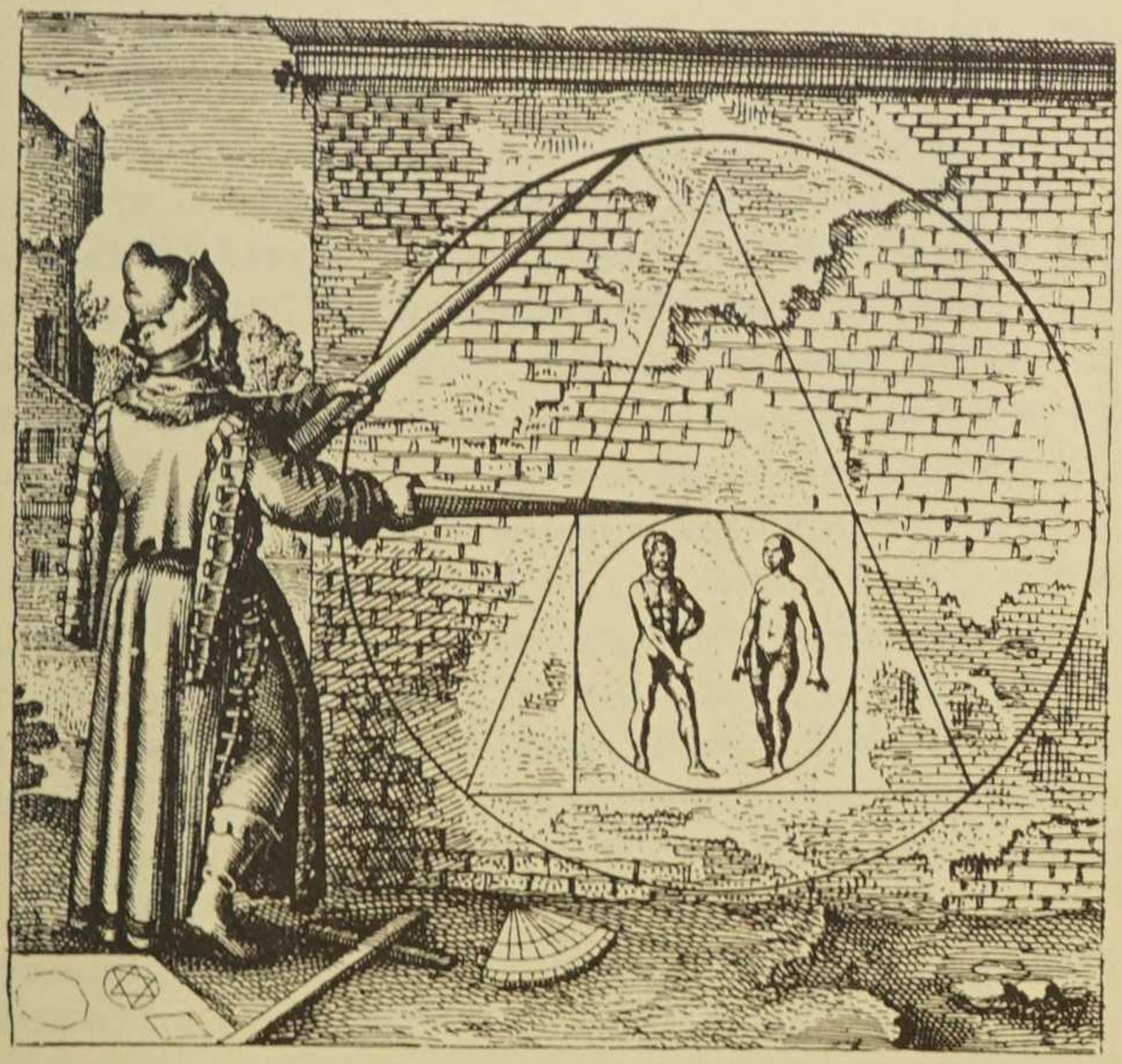
surgat habens æquum forma quadrata latus.

XXI. Epigrammatis Latini versio Germanica.

ALß Mann vnd Weib mache dir ein Circkel allermassen rund/
Darauß zieh ein Figur so vier Ecken hat zur stundt/
Bald verkehr solch in ein ander/so drey Ecken hat eben/
Vnd diese laß widerumb ein Circkel rund dir geben/
So ist gemachet der Schein/welchs so du nicht kanst wissen/
Die Geometrische Lehr zu verstehn sey geflissen.

EMBLE-

Fac ex mare & fœmina circulum, inde quadrangulum, hinc trian gulum, fac circulum & habebis lap. Philosophorum.



EPIGRAMMA XXI.

Fœmina másque unus fiant tibi circulus, ex que
Surgat, habens æquum forma quadrata latus.
Hinc Trigonum ducas, omni qui parte rotundam
In sphæram redeat: Tum LAPIS *ortus erit.*
Si res tanta tuæ non mox venit obvia menti,
Dogma Geometræ si capis, omne scies,

but it is another thing to say that hidden there, there are only some tiny sparks which first, before being used to cook or to provide heat, must be fed and augmented with their true nourishment, the art and industry of man, or they will die out and turn into cold cinders. The former is the opinion of the Platonists, the latter of the Aristotelians. The latter is supported by reason and experience whereas agreement on the former can only be reached through phantasy or imagination. One might ask why then Plato had an inscription placed over the door of his school saying that no one ignorant of geometry should be admitted, since according to him even an unlettered child already had it in him? Are men more ignorant than children? Or have adults consigned to oblivion what children already know? We cannot hold this opinion. We see in fact the unreasoning beast, instructed by nature, sensing and avoiding the peril of fire, of water, or a dreadful fall and other like things, though he saw the light of day only a moment ago, while the infant neither senses nor avoids things of this kind and burns his finger in the flame of a candle like a lightning bug burns his wings and dies. Why do not the young bees, the fly and the gnat with their swift flight drop into the flame since they have not been taught by experience the danger they run? Nature taught them but did not teach the infant child.

If geometry comes so naturally and easily to infants, how is it that the quadrature of the circle remained unknown to Plato, to the point where Aristotle, a disciple of Plato's declared that it was knowable but not known yet? In the meantime this problem was not ignored by the natural philosophers as one can see from their instructions on how to turn the circle into a square and the square, in its turn, into a circle through the intermediary of the triangle. By circle they mean the simplest body, without angles, and by square they designate the four elements, as if they said to take any corporeal figure susceptible of being extant and to divide it into the four elementary colours to obtain a quadrilateral of four equal sides. Everybody realizes that this quadrature is physical and in harmony with nature. Also it serves the State best and confers more glory upon the human spirit than the

other quadrature which is mathematical and purely theoretical or apart from matter.

To learn the first natural quadrature of the circle one must investigate the geometry which which concerns solid bodies; once the depth of solid figures, the Sphere and the cube for example, is recognized it can be used in practice or in manual application. In the distance round, or the circumference of, the Sphere is 32 feet what will the length of one side of the cube have to be to equal the capacity of the sphere? Inversely, if the sphere has a volume of 32 units and a circumference of the same numerical index, what length will one side of the cube have to be for it to have equal volume, or the volume of the sphere or cube in relation to the length in feet of each circumference? The philosophers also want to reduce the square to a triangle, that is to say to body, spirit and soul. These three appear in the form of three colours which precede the red, that is the body or earth in the Black of Saturn, the spirit as water in the white of the Moon, the soul or air in the Solar yellow. The triangle will then be perfect but it must be changed again into a circle, that is into invariable red. Through this operation woman is changed into male and becomes one with him while the senary is transformed into the first of the perfect numbers by one which is two, having returned to the monad wherein reside tranquillity and eternal peace.

Scrutinium chymicum, Discursus XXI, Francofurti, Impensis, Georgii Heinrici Oehrlingi Bibliopolae, pp. 61-63, Translated by Eddie Allen.

CARL GUSTAV JUNG

The Sanskrit word *mandala* means "circle" in the ordinary sense of the word. In the sphere of religious practices and in psychology it denotes circular images, which are drawn, painted, modelled, or danced. Plastic structures of this kind are to be found, for instance, in Tibetan Buddhism, and as dance figures these circular patterns occur also in Dervish monasteries. As psychological phenomena they appear spontaneously in dreams, in certain states of conflict, and in cases of schizophrenia. Very frequently they contain a quaternity or a multiple of four, in the form of a cross, a star, a square, an octagon, etc. In alchemy we encounter this motif in the form of *quadratura circuli.*

In Tibetan Buddhism the figure has the significance of a ritual instrument *(yantra),* whose purpose is to assist meditation and concentration. Its meaning in alchemy is somewhat similar, inasmuch as it represents the synthesis of the four elements which are forever tending to fall apart. Its spontaneous occurrence in modern individuals enables psychological research to make a closer investigation into its functional meaning. As a rule a mandala occurs in conditions of psychic dissociation or disorientation, for instance in the case of children between the ages of eight and eleven whose parents are about to be divorced, or in adults who, as the result of a neurosis and its treatment, are confronted with the problem of opposites in human nature and are consequently disoriented; or again in schizophrenics whose view of the world has become confused, owing to the invasion of incomprehensible contents from the unconscious. In such cases it is easy to see how the severe pattern imposed by a circular image of this kind compensates the disorder and confusion of the psychic state-namely, through the construction of a central point

to which everything is related, or by a concentric arrangement of the disordered multiplicity and of contradictory and irreconcilable elements. This is evidently an *attempt at self-healing* on the part of Nature, which does not spring from conscious reflection but from an instinctive impulse. Here, as comparative research has shown, a fundamental schema is made use of, an archetype which, so to speak, occurs everywhere and by no means owes its individual existence to tradition, any more than the instincts would need to be transmitted in that way. Instincts are given in the case of every newborn individual and belong to the inalienable stock of those qualities which characterize a species. What psychology designates as archetype is really a particular, frequently occurring, formal aspect of instinct, and is just as much an *a priori* factor as the latter. Therefore, despite external differences, we find a fundamental conformity in mandalas regardless of their origin in time and space.

The "squaring of the circle" is one of the many archetypal motifs which form the basic patterns of our dreams and fantasies. But it is distinguished by the fact that it is one of the most important of them from the functional point of view. Indeed, it could even be called the *archetype of wholeness.* Because of this significance, the "quaternity of the One" is the schema for all images of God, as depicted in the visions of Ezekiel, Daniel, and Enoch, and as the representation of Horus with his four sons also shows. The latter suggests an interesting differentiation, inasmuch as there are occasionally representations in which three of the sons have animals' heads and only one a human head, in keeping with the Old Testament visions as well as with the emblems of the seraphim which were transferred to the evangelists, and – last but not least – with the nature of the Gospels themselves: three of which are synoptic and one "Gnostic". Here I must add that, ever since the opening of Plato's *Timaeus* ("One, two, three ... but where, my dear Socrates, is the fourth? ") and right up to the Cabiri scene in *Faust,* the motif of four as three and one was the ever-recurring preoccupation of alchemy.

The profound significance of the quaternity with its singular process of differentiation extending over the centuries, and now

manifest in the latest development of the Christian symbol, may explain why *Du* chose just the archetype of wholeness as an example of symbol formation. For, just as this symbol claims a central position in the historical documents, individually too it has an outstanding significance. As is to be expected, individual mandalas display an enormous variety. The overwhelming majority are characterized by the circle and the quaternity. In a few, however, the three or the five predominates, for which there are usually special reasons.

Whereas ritual mandalas always display a definite style and a limited number of typical motifs as their content, individual mandalas make use of a well-nigh unlimited wealth of motifs and symbolic allusions, from which it can easily be seen that they are endeavouring to express either the totality of the individual in his inner or outer experience of the world, or its essential point of reference. Their object is the *self* in contradistinction to the *ego*, which is only the point of reference for consciousness, whereas the self comprises the totality of the psyche altogether, i.e., conscious *and* unconscious. It is therefore not unusual for individual mandalas to display a division into a light and a dark half, together with their typical symbols. An historical example of this kind is Jakob Böhme's mandala, in his treatise *XL Questions concerning the Soule.* It is at the same time an image of God and is designated as such. This is not a matter of chance, for Indian philosophy, which developed the idea of the self. Atman or Purusha, to the highest degree, makes no distinction in principle between the human essence and the divine. Correspondingly, in the Western mandala, the *scintilla* or soul-spark, the innermost divine essence of man, is characterized by symbols which can just as well express a God-image, namely the image of Deity unfolding in the world, in nature, and in man.

The fact that images of this kind have under certain circumstances a considerable therapeutic effect on their authors is empirically proved and also readily understandable, in that they often represent very bold attempts to see and put together apparently irreconcilable opposites and bridge over apparently hopeless splits. Even the mere attempt in this direction usually

has a healing effect, but only when it is done spontaneously. Nothing can be expected from an artificial repetition or a deliberate imitation of such images.

Mandala Symbolism, translated by R.F.C. Hull, Bollingen Series, Princeton University Press, Princeton, 1973, pp. 3-5.

G. SPENCER BROWN

THE FORM

We take as given the idea of distinction and the idea of indication, and that we cannot make an indication without drawing a distinction. We take, therefore, the form of distinction for the form.

DEFINITION

Distinction is perfect continence.

That is to say, a distinction is drawn by arranging a boundary with separate sides so that a point on one side cannot reach the other side without crossing the boundary. For example, in a plane space a circle draws a distinction.

Once a distinction is drawn, the spaces, states, or contents on each side of the boundary, being distinct, can be indicated.

There can be no distinction without motive, and there can be no motive unless contents are seen to differ in value.

If a content is of value, a name can be taken to indicate this value.

Thus the calling of the name can be identified with the value of the content.

AXIOM 1. THE LAW OF CALLING

The value of a call made again is the value of the call.

That is to say, if a name is called and then is called again, the value indicated by the two calls taken together is the value indicated by one of them.

That is to say, for any name, to recall is to call.

Equally, if the content is of value, a motive or an intention or instruction to cross the boundary into the content can be taken to indicate this value.

Thus, also, the crossing of the boundary can be identified with the value of the content.

AXIOM 2. THE LAW OF CROSSING

The value of a crossing made again is not the value of the crossing.

That is to say, if it is intended to cross a boundary and then it is intended to cross it again, the value indicated by the two intentions taken together is the value indicated by none of them.

That is to say, for any boundary, to recross is not to cross.

The following italicized pages are to be read as a footnote running opposite the text.

CONSTRUCTION

Draw a distinction

CONTENT

Call it the first distinction.

Call the space in which it is drawn the space severed or cloven by the distinction.

Call the parts of the space shaped by the severance or cleft the sides of the distinction or, alternatively, the spaces, states, or contents distinguished by the distinction.

INTENT

Let any mark, token, or sign be taken in any way with or with regard to the distinction as a signal.

Call the use of any signal its intent.

FIRST CANON. CONVENTION OF INTENTION

Let the intent of a signal be limited to the use allowed to it.

Call this the convention of intention. In general *what is not allowed is forbidden.*

It may be helpful at this stage to realize that the primary form of mathematical communication is not description, but injunction. In this respect it is comparable with practical art forms like cookery, in which the taste of a cake, although literally indescribable, can be conveyed to a reader in the form of a set of injunctions called a recipe. Music is a similar art form, the composer does not even attempt to describe the set of sounds he has in mind, much less the set of feelings occasioned through them, but writes down a set of commands which, if they are obeyed by the reader, can result in a reproduction, to the reader, of the composer's original experience.

Where Wittgenstein says [4, proposition 7]

whereof one cannot speak,
thereof one must be silent

he seems to be considering descriptive speech only. He notes elsewhere that the mathematician, descriptively speaking, says nothing. The same may be said of the composer, who, if he were to attempt a description *(i.e. a limitation) of the set of ecstasies apparent* through *(i.e. unlimited by) his* composition, *would fail miserably and necessarily. But neither the composer nor the mathematician must, for this reason, be silent.*

In his introduction to the Tractatus, *Russell expresses what thus seems to be a justifiable doubt in respect of the rightness of Wittgenstein's last proposition when he says [p. 22]*

> *what causes hesitation is the fact that, after all, Mr Wittgenstein manages to say a good deal about what cannot be said, thus suggesting to the sceptical reader that possibly there may be some loophole through a hierarchy of languages, or by some other exit.*

The exit, as we have seen it here, is evident in the injunctive faculty of language.

Even natural science appears to be more dependent upon injunction than we are usually prepared to admit. The professional initiation of the man of science consists not so much in reading the proper textbooks, as in obeying injunctions such as 'look down that microscope'. But it is not out of order for men

KNOWLEDGE

Let a state distinguished by the distinction be marked with a mark

of distinction.

Let the state be known by the mark.

Call the state the marked state.

FORM

Call the space cloven by any distinction, together with the entire content of the space, the form of the distinction.

Call the form of the first distinction the form.

NAME

Let there be a form distinct from the form.

Let the mark of distinction be copied out of the form into such another form.

Call any such copy of the mark a token of the mark.

Let any token of the mark be called as a name of the marked state.

Let the name indicate the state.

of science, having looked down the microscope, now to describe to each other, and to discuss amongst themselves, what they have seen, and to write papers and textbooks describing it. Similarly, it is not out of order for mathematicians, each having obeyed a given set of injunctions, to describe to each other, and to discuss amongst themselves, what they have seen, and to write papers and textbooks describing it. But in each case, the description is dependent upon, and secondary to, the set of injunctions having been obeyed first.

When we attempt to realize a piece of music composed by another person, we do so by illustrating, *to ourselves, with a musical instrument of some kind, the composer's commands. Similarly, if we are to realize a piece of mathematics, we must find a way of illustrating, to ourselves, the commands of the mathematician. The normal way to do this is with some kind of scorer and a flat scorable surface, for example a finger and a tide-flattened stretch of sand, or a pencil and a piece of paper. Taking such an aid to illustration, we may now begin to carry out the commands in Chapter 2.*

First we may illustrate a form, such as a circle or near-circle. A flat piece of paper, being itself illustrative of a plane surface, is a useful mathematical instrument for this purpose, since we happen to know that a circle in such a space does in fact draw a distinction. (If, for example, we had chosen to write upon the surface of a torus, the circle might not have drawn a distinction.)

When we come to the injunction

let there be a form distinct from the form

we can illustrate it by taking a fresh piece of paper (or another stretch of sand). Now, in this separate form, we may illustrate the command

let the mark of distinction be copied
out of the form into such another form.

It is not necessary for the reader to confine his illustrations to the commands in the text. He may wander at will, inventing his own illustrations, either consistent or inconsistent with the

ARRANGEMENT

Call the form of a number of tokens considered with regard to one another (that is to say, considered in the same form) an arrangement.

EXPRESSION

Call any arrangement intended as an indicator an expression.

VALUE

Call a state indicated by an expression the value of the expression.

EQUIVALENCE

Call expressions of the same value equivalent.
Let a sign

$$=$$

of equivalence be written between equivalent expressions.
Now, by axiom 1,

$$\neg\,\neg = \neg\,.$$

Call this the form of condensation.

textual commands. Only thus, by his own explorations, will he come to see distinctly the bounds or laws of the world from which the mathematician is speaking. Similarly, if the reader does not follow the argument at any point, it is never necessary for him to remain stuck at that point until he sees how to proceed. We cannot fully understand the beginning of anything until we see the end. What the mathematician aims to do is to give a complete picture, the order of what *he presents being essential, the order* in which *he presents it being to some degree arbitrary. The reader may quite legitimately change the arbitrary order as he pleases.*

We may distinguish, in the essential order, commands, *which call something into being, conjure up some order of being, call to order, and which are usually carried in permissive forms such as*

let there be so-and-so,

or occasionally in more specifically active forms like

drop a perpendicular;

names, *given to be used as reference points or tokens; in relation with the operation of* instructions, *which are designed to take effect within whatever universe has already been commanded or called to order. The institution or ceremony of naming is usually carried in the form*

call so-and-so such-and-such,

and the call may be transmitted in both directions, as with the sign =, so that by calling so-and-so such-and-such we may also call such-and-such so-and-so. Naming may thus be considered to be without direction, or, alternatively, pan-directional. By contrast, instruction is directional, in that it demands a crossing from a state or condition, with its own name, to a different state or condition, with another name, such that the name of the former may not be called as a name of the latter.

The more important structures of command are sometimes called canons. They are the ways in which the guiding injunctions

INSTRUCTION

Call the state not marked with the mark the unmarked state.

Let each token of the mark be seen to cleave the space into which it is copied. That is to say, let each token be a distinction in its own form.

Call the concave side of a token its inside.

Let any token be intended as an instruction to cross the boundary of the first distinction.

Let the crossing be from the state indicated on the inside of the token.

Let the crossing be to the state indicated by the token.

Let a space with no token indicate the unmarked state.

Now, by axiom 2,

Call this the form of cancellation.

EQUATION

Call an indication of equivalent expressions an equation.

PRIMITIVE EQUATION

Call the form of condensation a primitive equation.

Call the form of cancellation a primitive equation.

Let there be no other primitive equation.

appear to group themselves in constellations, and are thus by no means independent of each other. A canon bears the distinction of being outside (i.e. describing) the system under construction, but a command to construct (e.g. 'draw a distinction'), even though it may be of central importance, is not a canon. A canon is an order, or set of orders, to permit or allow, but not to construct or create.

The instructions which are to take effect, within the creation and its permission, must be distinguished as those in the actual text of calculation, designated by the constants or operators *of the calculus, and those in the context, which may themselves be instructions to name something with a particular name so that it can be referred to again without redescription.*

Later on (Chapter 4) we shall come to consider what we call the proofs or justifications of certain statements. What we shall be showing, here, is that such statements are implicit in, or follow from, or are permitted by, the canons or standing orders hitherto convened or called to presence. Thus, in the structure of a proof, we shall find injunctions of the form

consider such-and-such,
suppose so-and-so,

which are not commands, but invitations *or* directions *to a* way *in which the implication can be clearly and wholly followed.*

In conceiving the calculus of indications, we begin at a point of such degeneracy *as to find that the ideas of description, indication, name, and instruction can amount to the same thing. It is of some importance for the reader to realize this for himself, or he will find it difficult to understand (although he may follow) the argument (p. 5) leading to the second primitive equation.*

In the command

let the crossing be to the
state indicated by the token

we at once make the token doubly meaningful, first as an

SIMPLE EXPRESSION

Note that the three forms of arrangement, ⌐ ⌐ , ⌐⌐ , ⌐, and the one absence of form, , taken from the primitive equations are all, by convention, expressions.

Call any expression consisting of an empty token simple.

Call any expression consisting of an empty space simple.

Let there be no other simple expression.

OPERATION

We now see that if a state can be indicated by using a token as a name it can be indicated by using the token as an instruction subject to convention. Any token may be taken, therefore, to be an instruction for the operation of an intention, and may itself be given a name

cross

to indicate what the intention is.

RELATION

Having decided that the form of every token called cross is to be perfectly continent, we have allowed only one kind of relation between crosses: continence.

Let the intent of this relation be restricted so that a cross is said to contain what is on its inside and not to contain what is not on its inside.

instruction to cross, secondly as an indicator (and thus a name) of where the crossing has taken us. It was an open question, before obeying this command, whether the token would carry an indication at all. But the command determines without ambiguity the state to which the crossing is made and thus, without ambiguity, the indication which the token will henceforth carry.

This double carry of name-with-instruction and instruction-with-name is usually referred to (in the language of mathematics) as a structure in which ideas or meanings degenerate. *We may also refer to it (in the language of psychology) as a place where the ideas* condense *in one symbol. It is this condensation which gives the symbol its* power. *For in mathematics, as in other disciplines, the power of a system resides in its elegance (literally, its capacity to pick out or elect), which is achieved by condensing as much as is needed into as little as is needed, and so making that little as free from irrelevance (or from elaboration) as is allowed by the necessity of writing it out and reading it in with ease and without error.*

We may now helpfully distinguish between an elegance in the calculus, which can make it easy to use, and an elegance in the descriptive context, which can make it hard to follow. We are accustomed, in ordinary life, to having indications of what to do confirmed in several different ways, and when presented with an injunction, however clear and unambiguous, which, stripped to its bare minimum, indicates what to do once and in one way only, we might refuse it. (We may consider how far, in ordinary life, we must observe the spirit rather than the letter of an injunction, and must develop the habitual capacity to interpret any injunction we receive by screening it against other indications of what we ought to do. In mathematics we have to unlearn this habit in favour of accepting an injunction literally and at once. This is why an author of mathematics must take such great pains to make his injunctions mutually permissive. Otherwise these pains, which rightly rest with the author, will fall with sickening import upon the reader, who, by virtue of his relationship with respect to the author, may be in no position to accept them.)

DEPTH

In an arrangement *a* standing in a space *s*, call the number *n* of crosses that must be crossed to reach a space s_n from *s* the depth of s_n with regard to *s*.

Call a space reached by the greatest number of inwards crossings from *s* a deepest space in *a*.

Call the space reached by no crossing from *s* the shallowest space in *a*.

Thus

$$s_0 = s.$$

Let any cross standing in any space in a cross *c* be said to be contained in *c*.

Let any cross standing in the shallowest space in *c* be said to stand under, or to be covered by, *c*.

UNWRITTEN CROSS

Suppose any s_0 to be surrounded by an unwritten cross.

Call the crosses standing under any cross *c*, written or unwritten, the crosses pervaded by the shallowest space in *c*.

PERVASIVE SPACE

Let any given space s_n be said to pervade any arrangement in which s_n is the shallowest space.

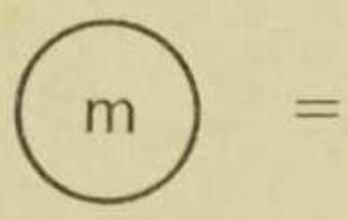
Call the space *s* pervading an arrangement *a*, whether or not *a* is the only arrangement pervaded by *s*, the pervasive space of *a*.

The second of the two primitive equations of the primary arithmetic can be derived less elegantly, but in a way that is possibly easier to follow, by allowing substitution prematurely.

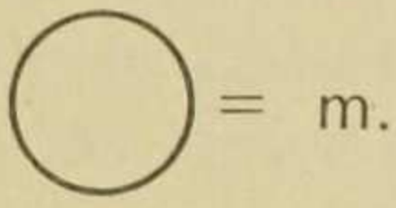
Suppose we indicate the marked state by a token m, *and, as before, let the absence of a token indicate the unmarked state.*

Let a bracket round any indicator indicate, in the space outside the bracket, the state other than that indicated inside the bracket.

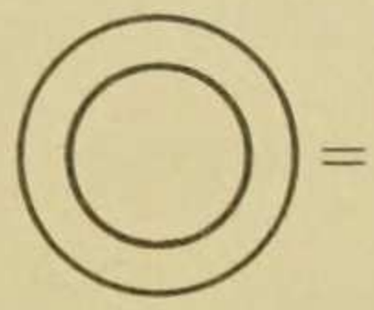
Thus



and



Substituting, we find

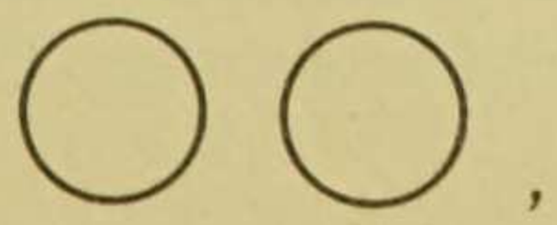


which is the second primitive equation.

The condition that one of the primary states shall be nameless is mandatory for this elimination.

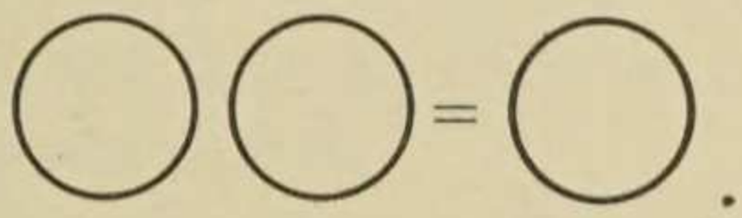
The first primitive equation can also be derived a different way.

Imagine a blind animal able only to distinguish inside from outside. A space with what appears to us as a number of distinct insides and one outside, such as


,

will appear to it, upon exploration, to be indistinguishable from

The ideas described in the text at this point do not go beyond what this animal can find out for itself, and so in its world, such as it is,



We may note that even if this animal can count its crossings, it still will not be able to distinguish two divisions from one, although it will now have an alternative way of distinguishing inside from outside which no longer depends on knowing which is which.

Reconsidering the first command,

draw a distinction,

we note that it may equally well be expressed in such ways as

let there be a distinction,
find a distinction,
see a distinction,
describe a distinction,
define a distinction,

or

let a distinction be drawn,

for we have here reached a place so primitive that active and passive, as well as a number of other more peripheral opposites, have long since condensed together, and almost any form of words will suggest more categories than there really are.

Laws of Form, The Julian Press Inc. Publishers, New York, 1972, pp. 1-7 & 77-84.

Sentences and paragraphs. Sentences are not emotional but paragraphs are. I can say that as often as I like and it always remains as it is, something that is.

I said I found this out first in listening to Basket my dog drinking. And anybody listening to any dog's drinkings will see what I mean.

When I wrote *The Making of Americans* I tried to break down this essential combination by making enormously long sentences that would be as long as the longest paragraph and so to see if there was really and truly this essential difference between paragraphs and sentences, if one went far enough with this thing with making the sentences long enough to be as long as any paragraph and so producing in them the balance of a paragraph not of a sentence, because of course the balance of a paragraph is not the same balance as the balance of a sentence.

It is only necessary to read anything in order to know that. I say if I succeeded in making my sentences so long that they held within themselves the balance of both sentences and paragraphs, what was the result.

I did in some sentences in *The Making of Americans* succeed in doing this thing in creating a balance that was neither the balance of a sentence nor the balance of a paragraph and in so doing I felt dimly that I had done something that was not leading to anything because after all you should not lose two things in order to have one thing because in doing so you make writing just that much less varied.

That is one thing about what I did. There is also another thing and that was a very important thing, in doing this in achieving something that had neither the balance of a sentence

nor the balance of a paragraph but a balance a new balance that had to do with a sense of movement of time included in a given space which as I have already said is a definitely American thing.

An American can fill up a space in having his movement of time by adding unexpectedly anything and yet getting within the included space everything he had intended getting.

A young french boy he is a red-haired descendant of the niece of Madame Recamier went to America for two weeks most unexpectedly and I said to him what did you notice most over there. Well he said at first they were not as different from us frenchmen as I expected them to be and then I did see that they were that they were different. And what, said I, well he said, when a train was going by at a terrific pace and we waved a hat the engine driver could make a bell quite carelessly go ting ting ting, the way anybody playing at a thing could do, it was not if you know what I mean professional he said. Perhaps you do see the connection with that and my sentences that had no longer the balance of sentences because they were not the parts of a paragraph nor were they a paragraph but they had made in so far as they had come to be so long and with the balance of their own that they had become something that was a whole thing and in so being they had a balance which was the balance of a space completely not filled but created by something moving as moving is not as moving should be. As I said Henry James in his later writing had had a dim feeling that this was what he knew he should do.

And so though as I say there must always be sentences and paragraphs the question can really be asked must there always be sentences and paragraphs is it not possible to achieve in itself and not by sentences and paragraphs the combination that sentences are not emotional and paragraphs are.

Writings & Lectures 1909-1945, Penguin Books, Ltd., Harmonds worth, 1971, pp. 133-135.

KENNETH BURKE

In *The Thought and Character of William James*, by Ralph Perry (Vol. II, p. 711) among the letters written by William James to his father there is one in which William is replying to some of his father's theological and ontological speculations. He raises an objection to something his father had written. This objection, he says, "refers to the whole conception of creation, from which you would exclude all arbitrariness or magic." And he continues:

> Now I don't see what the word "creation" can mean if this be totally excluded, or what there is to justify its discrimination from pantheism. Creation, emanation, have at all times been opposed to pantheism, immanence; and it is evident from the scorn with which you always mention pantheism that you, too, place a broad gulf between them. The essence of the pantheistic conception, if I understand it, consists in there being a necessary relation between Creator and creature, so that both are the same fact viewed from opposite sides, and their duality as Creator and creature becomes merged in a higher unity as Being. Consequently a conception really opposed to pantheism must necessarily refuse to admit any such ratio as this, — any such external ratio, — so to speak, between them; must deny that each term exists only by virtue of the equation to which it belongs; the Creator must be the all, and the act by which the creature is set over against him has its motive within the creative circumference. The act must therefore necessarily contain an arbitrary and magical element — that is, if I attach the right meaning to those words — undetermined by anything external to the agent. Of course it is impossible to attempt to imagine the *way* of creation, but wherever from an absolute first a second appears, *there* it must be; — and it must be magical, for if in the second there be anything coequal or coeval with the first, it becomes pantheism.

We should not be disturbed if we find this paragraph difficult to follow. After all, the philosopher is here discussing something which he was in no position to report on. Hence, if we attempt to understand his words as information, narration, exposition, we must necessarily find them incomprehensible. For there is nothing here to be understood in the sense in which one might try to understand a report about some event in history. James's discussion of the Creation is not "archaelogical". He is not offering a "historical reconstruction." As he himself observes, "It is impossible to attempt to imagine the way of creation," or as some contemporary advocates of physicalist vocabularies might put it: It is impossible to explain the meaning of "the act of Creation" in terms of concrete operations.

Dramatistically considered, there is a tremendous difference between "the Creation" and "the process of Evolution" as motivational summations. One sums up in terms of action, the other in terms of motion. A statement about Evolutionary motion is "true" only if it names events that literally take place. But "the Creation" is "true," as a prototype of action, if it has *the form of the most complete act.* We can come nearest to its kind of "truth", in terms of science, when we think of a composite photograph, which is got by superimposing the portraits of many individuals upon one another. In being a likeness of their "average", it is not literally a likeness of any. The analogy is not quite satisfactory, however, since a concept of "the Creation", as the prototype of action designates not the "average" act, but the logical conclusion of the concept of action (an opponent might rather call it the *reductio ad absurdum* of the concept of action).

Statements about both "evolution" and "the Creation" are alike in this: despite their reference to matters of sequence, to "befores" and "afters", they are *ontological* statements, statements about *being*, about what *is*. That is, the laws of Evolution *are* such-and-such; and the structure of the Creation *is* such-and-such. For even a fundamentalist who would treat the Creation as an act that *was* would have to agree that the *principles* involved in the act *are*.

We here stand at a moment of great indeterminacy, the watershed moment that slopes down to "being" on one side and "becoming" on the other. It is the ambiguity etymologically present in the Latin, *natura* (and its Greek counterpart, *physis*). For though we came to speak of a thing's "nature" as its essence, the word originally had a genetic or developmental meaning, a reference to *growth* and *birth*.

True, some terminologists would even hold that the laws of becoming themselves become. And this is true in the sense that a new species exemplifies new laws of motion: the particles of matter contained in it behave differently that the particles of matter contained in other species; hence, when this species arises, certain peculiar laws of motion are born, and these laws of motion cease to be when this species becomes extinct. But any such statement about the becoming of becoming ("emergent evolution") can be rephrased as a statement about the "laws" of the becoming of becoming, or as "generalizations" about the becoming of becoming — and this brings us back to the ontological level.

And if even a concept so super-genetic as the evolution of evolution forces us back to an ontological level as soon as we make generalizations about this process of processes, all the more clearly are we found shuttling between being and becoming in the concept of Creation. The shift is between temporal priority and logical priority. The Creation, considered as a prototype of action in our paradigmatic, or summational sense, involves "principles", and these are not historical or temporal "firsts", but logical firsts. They are the kind of "beginnings" that are always. James speaks of an "absolute first", which admonishes us that we here touch upon the paradox of purity. An "absolute" first is the kind of first that both is and is not followed by a second.

In sum: we are discussing the Creation not as a temporal event, but as the logical prototype of an act. Indeed, even if one believed it literally, one would hardly be justified in treating it as a temporal event, since it was itself the positing of time; it was the act that set up the conditions of temporal development;

hence a terminology that reduced it to terms of time would lack sufficient scope. Thus, even a literal believer would have to treat it in terms that placed it, rather, at an intersection of time and the timeless — a point at which we place ourselves when we discuss it in terms of those non-temporal firsts called "principles".

ACT AS LOCUS OF MOTIVES

If one would deny pantheism, James had said, "the Creator must be the all, and the act by which the creature is set over against him has its motive within the creative circumference". And the act must "necessarily contain an arbitrary and magical element ... undetermined by anything external to the agent". Further, we should note that arbitrariness and magic are equated with novelty, as when James says: "It is impossible to attempt to imagine the *way* of creation, but wherever from an absolute first a second appears, *there* it must be; — and it must be magical, for if in the second there be anything coequal or coeval with the first, it becomes pantheism". Indeed, the Creation as an act of God was a total novelty; and it was magic because, just as the magician would make it seem that he pulls a live rabbit out of an empty hat, so God made *everything* out of *nothing*.

The magician would have us think that he suspends the laws of motion. And God's act likewise "suspended" the laws of motion, though in an absolute sense: that is, upon his originating act depend all the laws of motion which men necessarily accept as the *conditions* of action. Indeed, the analogy suggests the thought that "true" magic prevails *outside* the strict realm of motion, in the area of more-than-motion that we call *action*. The demand of a kind of human magic that violates natural law is then revealed as a superstitious, quasi-scientific ideal. But magic, in the sense of novelty, is seen to exist normally, in some degree,

as an ingredient of every human act; for each act contains some measure of motivation that cannot be explained simply in terms of the past, being to an extent, however tiny, a *new thing*.

This consideration could be approached in another way. We have said that a fully-rounded vocabulary of motives will locate motives under all five aspects of our pentad *.

* We shall use five terms as generating principle of our investigation. They are: Act, Scene, Agent, Agency, Purpose. In a rounded statement about motives, you must have some word that names the *act* (names what took place, in thought or deed), and another that names the *scene* (the background of the act, the situation in which it occurred); also, you must indicate what person or kind of person *(agent)* performed the act, what means or instruments he used *(agency)*, and the *purpose*. Men may violently disagree about the purposes behind a given act, or about the character of the person who did it, or how he did it, or in what kind of situation he acted; or they may even insist upon totally different words to name the act itself. But be that as it may, any complete statement about motives will offer *some kind of* answers to these five questions: what was done (act), when or where it was done (scene), who did it (agent), how he did it (agency), and why (purpose).

Yet there is a paradoxical tendency to slight the term, *act*, in the very featuring of it. For we may even favor it enough to select it as our point of departure (point of departure in the sense of an ancestral term from which all the others are derived, sharing its quality "substantially"); but by the same token it may come to be a point of departure in the sense of the term that is "left behind". We see this temptation in the search for an act's motives, which one spontaneously thinks of locating under the heading of *scene*, *agent*, *agency*, or *purpose*, but hardly under the heading of *act*.

But if the scene of action is there already, and if the nature of the agent is also given, along with the instrumental conditions and the purposes of action, then there could be *novelty* only if there were likewise a locus of motivation within the act itself, a newness not already present in elements classifiable under any of the other four headings. And in this sense an act has an element of "arbitrariness" or "magic" insofar as it contains a motivational element requiring location under the heading of the term *act* itself.

At this point, we grant, our thinking departs somewhat from that in the James citation. Or rather, there is a strategic ambiguity in the James passage, as when he writes that, if one would avoid pantheism, "the creator must be the all, and the act by which the creature is set over against him has its motive within the creative circumference". If we think of "the Creator" as an "agent", we might contend that the motives of the act are here situated outside the locus of the term *act* and within the locus of the term *agent*. Yet the statement that God's creative act "has its motive within the creative circumference" comes quite close to satisfying our notion that "magic" or "novelty" arises by reason of the motive assignable under the heading of *act* itself. And the requirement is still more fully met if we recall the scholastic definition of God as "pure act".

But what precisely is our point? What are we trying to prove by an example that, we freely grant, cannot be adduced as the literal foundation of an argument? We are reasoning as follows: We are saying that, to study the natura of the term, *act*, one must select a prototype, or paradigm of action. This prototype we find in the conception of a perfect or total act, such as the act of "the Creation". Examining this concept, we find that it is "magic", for it produces something out of nothing. This enables us to equate magic with novelty – and leads us to look for a modicum of magic in every act to the extent that the act possesses a modicum of novelty. This consideration also admonishes us, however, to make a distinction between "true" and "false" magic. "False" magic is a quasi-scientific ideal that would suspend the laws of *motion*, as in the attempt to coerce natural forces by purely ritualistic means. "True" magic is an aspect not of motion but of *action*. And if the motives properly assignable to *scene*, *agent*, *agency*, and *purpose* are already given, there could be novelty only if we could also assign motives under the heading of *act* itself. That is, there would be something new intrinsic to the act; and this novelty would be the modicum of motivation assignable under the heading of act rather than under the heading of the other four terms, singly or in combination. There must, in brief, be some respect in which the act is a *causa*

sui, a motive of itself.

Up to this point, we have simply followed the implications of the prototype. We have found out something about the term, *act*, as "revealed" by the contemplation of "the Creation". Next we must look about, in the world of experience, to see whether our conclusions make sense. Proverbs in particular might help us; for surely they are in the flatlands, safely distant from the magic mountain (though often we may best understand them if we think of them not just as isolated observations, but as fragments of a vast and complex dialectic structure which the proverbialist discerns not sustainedly and systematically, but in glimpses and inklings).

Proverbs such as *l'appétit vient en mangeant* or *Uebung macht den Meister* seem well suited to our purposes. Skill and habit are derived from the very acts in which they are practiced. Or let us consider some protracted act, such as the writing of a long book, where the act of the writing brings up problems and discoveries intrinsic to the act, leading to developments that derive not from the scene, or agent, or agency, or extrinsic purposes, but purely from the foregoing aspects of the act itself. That is, there is nothing present in the agent or his situation that could have led to the *final* stages of this act, except the *prior* stages of the act itself, and the logic which gradually takes form as the result of the enactment. Or, recalling our *poiemata, pathemata, mathemata* alignment, we can generalize this consideration by noting that, when an act is performed, it entails new sufferances, which in turn entail new insights. Our act itself alters the conditions of action, as "one thing leads to another" in an order that would not have occurred had we not acted.

The mediaeval schoolmen would probably object that we are here confusing "creation" with "generation". In their terminology, only God can create, while his creatures can but generate, as with the parents' generation of offspring or the artist's generation of his art work. However, it is not the purpose of our Dramatism to abide strictly by any one system of philosophic terms that happens to exemplify the dramatist pattern. Rather, it is our purpose to show that the explicit and

systematic use of the dramatist pentad is best designed to bring out the strategic moments of motivational theory. Accordingly, at this point, we are more concerned to illustrate the Grammatical scruples than to select one particular casuistry as our choice among them. Philosophies again and again have got their point of departure precisely by treating as a distinction in kind what other philosophies have treated as a distinction in degree, or *v.v.* And we here come upon considerations that permit us to discern a novel ingredient in action, while this ingredient in turn can be equated with the creative.

The Aristotelian God, considered as universal motive, acted upon nature neither as creator nor as generator, but as a motionless inducement to development. The world and its genera and species were considered as eternal, hence not as derivations from God as "pure act". God acted upon nature solely as a goal, somewhat as a desired food might, by lying west of a rational and hungry man, induce him to move towards the west; or as the principles of a perfect art might lead the knowing artist to shape his work as nearly as possible in accordance with them.

The Christian merging of Aristotle's self-enwrapt *eromenon* with the Creator Jehovah (a tribal, tutelary deity made universal), necessarily calls for a drawing of the lines at a different place. In this scheme, stressing plenitude and fertility, God creates and creatures generate. But the Christian terminology also took over the concept of *hexis* (Latin, *habitus;* trained disposition), the term Aristotle uses in his Ethics to name that aptitude in virtues which is acquired by the practice of virtues. And we believe that we are but coming upon the function of this term by a different route when we recognize that the resources of the pentad invite us to locate some motives of action under the heading of Act itself.

There would thus be a modicum of novelty in the act, to the extent that the act could be said to have an ingredient not derivable from any other of the terms. And insofar as the act was derivable from the other terms it would not possess novelty, but would be a mere unfolding of the implicit into the explicit.

The modicum of novelty in the act would seem to be the

element that justified Coleridge's view of poetry as a "dim analogue of Creation". However, that formula was obscured by the idealist stress upon *agent*, as locus of the "shaping spirit of Imagination" by which we give forth that which we receive, since "in our life alone does Nature live". And to glimpse more clearly the independent claims of the term, act, we might better go back to Spinoza who, mediating between the mediaeval and the modern, defined the universal Substance as the "cause of itself". God would thus be perfect action, in that there would be no motivating principle beyond his own nature (a consideration, incidentally, that enables us to see why Spinoza would equate God and Nature).

All told, contemplating the Grammar in its simplest aspect, we are admonished to expect occasions when, in seeking for the motives of an act, the thinker will in effect locate the motive under the head of Act itself. However confusing the subject may become in the alembications of theology and metaphysics, it is at least obvious enough on this first level: That among the resources of the pentad is the invitation to locate the motives of an act under the head of Act (as with Faust's formula, *Im Anfang war die That*).

A Grammar of Motives, University of California Press, Berkeley & Los Angeles, 1969, pp. 62-69.

CATALOGUE

LINE TO VOLUME TO PLANE, 1971
304.8 cm x 182.8 cm x 71 cm
P.V.C. Tubing and paint

UNTITLED, 1971
172.7 cm x 106.6 cm x 35.5 cm
P.V.C. Tubing and paint

UNTITLED, 1971
213.3 cm x 152.4 cm x 50.8 cm
P.V.C. Tubing and paint
Private Collection, San Francisco

TOUCHING, 1971
182.8 cm x 60.9 cm
Hot Rolled Steel
Private Collection, Plymouth Meeting, Penn.

INTERVAL, 1972
304.8 cm x 182.8 cm x 38.1 cm
Hot Rolled Steel

SLOT, 1972
243.8 cm x 137 cm x 66 cm
Galvannealed Steel

TWO CUTS / THREE FOLDS – TWO CUTS / TWO FOLDS, 1972
152.4 cm x 86.3 cm x .05 cm
Galvannealed Steel

DOUBLE COMPRESSED ARC, 1972
152.4 cm x 35.5 cm x .05 cm
Galvannealed Steel

HALVED / HALVED, 1972
304.8 cm x 40.6 cm x .05 cm
Galvannealed Steel

CLAVIS, 1972
304.8 cm x 101.6 cm x .18 cm
Hot Rolled Steel, Sand Blasted

UNTITLED PENTAGON, 1973
271.7 cm x 121.9 cm x .05 cm
Galvannealed Steel
Private Collection, Philadelphia, Penn.

CONVERSION, 1973
304.8 cm x 60.9 cm x 7.6 cm
Galvannealed Steel

TRACE, 1973/1974 (two versions)
426.7 cm x 304.8 cm x 63.5 cm *
1 cm Hot Rolled Steel

282 cm x 200 cm x 41.5 cm
1 cm Hot Rolled Plate
Private Collection, Amsterdam

CIRCLE SQUARED, 1973/1974 (two versions)
122 cm x 97.5 cm x 35.5 cm *
1 cm Hot Rolled Plate
John Doyle Gallery, Chicago

182.8 cm x 147.3 cm x 47.6 cm
1 cm Hot Rolled Plate

DOUBLE ROTATION 1973/1974 (two versions)
122 cm x 182.8 cm x 25.4 cm *
1 cm Hot Rolled Plate

274.3 cm x 182.8 cm x 30.5 cm
1 cm Hot Rolled Plate
Galerie DeGestlo, Hamburg

SQUARE TO RECTANGLE, 1973
182.8 cm x 60.9 cm x .15 cm
Hot Rolled Steel
Private Collection, San Francisco

SLOTTED ROTATION, 1973
122 cm x 122 cm x .15 cm
Hot Rolled Steel
Private Collection, New York

CIRCULAR RUNE, 1974 (two versions)
210 cm dia. x 38 cm *
1 cm Hot Rolled Plate
Private Collection, Houston, Texas

282 cm dia. x 42.5 cm
1.2 cm Hot Rolled Plate
Private Collection, Germany

INTERSTICE, 1974 (two versions)
282 cm dia. x 76 cm *
1 cm Hot Rolled Plate
Private Collection, Caracas, Venez.

250 cm dia. x 70 cm
1 cm Hot Rolled Plate
Galerie DeGestlo, Hamburg

THREE POINTS IN A SQUARE, 1974
150 cm x 169 cm x .15 cm
Hot Rolled Steel
Galerie DeGestlo, Hamburg

THREE POINTS IN A RIGHT ANGLE, I, 1974
300 cm x 220.9 cm x .15 cm
Hot Rolled Steel
Galerie DeGestlo, Hamburg

THREE POINTS IN A RIGHT ANGLE, II, 1974
300 cm x 220.9 cm x .15 cm
Hot Rolled Steel

PARALLAX, 1974 (two versions)
250 cm x 100 cm x 78 cm *
1 cm Hot Rolled Plate
Galerie DeGestlo, Hamburg

243 cm x 95 cm x 72 cm
1 cm Hot Rolled Plate

QUADRANT WITH 90° MASS DISPLACEMENT, 1975
258.7 cm x 182.8 x .15 cm
Hot Rolled Steel

* Indicates version illustrated in the book.
Unless otherwise noted the piece belongs to the artist.

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TITLES

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