

**BENV2423**LOWE

DESIGN AND REAL TIME INTERACTIVITY – A POROSITY STUDIO

**ENVISIONING INFORMATION**

Edward R. Tufte

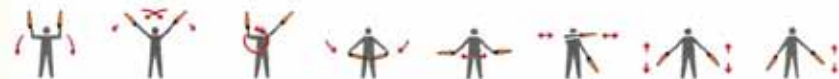
# Envisioning Information



ESCAPING FLATLAND



MICRO / MACRO READINGS



LAYERING AND SEPARATION



SMALL MULTIPLES



COLOUR AND INFORMATION



NARRATIVES OF SPACE AND TIME

## EDWARD TUFT

ENVISIONING INFORMATION; ESCAPING FLATLAND, MICRO/MACRO READINGS, LAYERING AND SEPARATION, SMALL MULTIPLES, COLOUR AND INFORMATION, NARRATIVES OF SPACE AND TIME

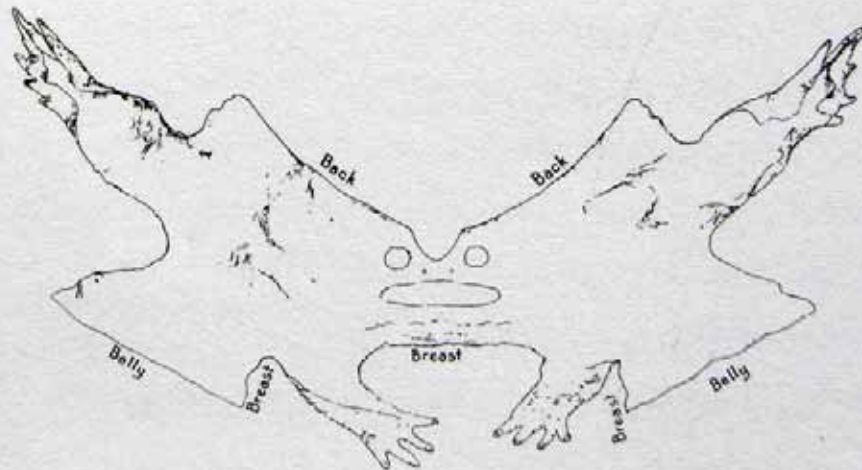
**ESCAPING FLATLAND**

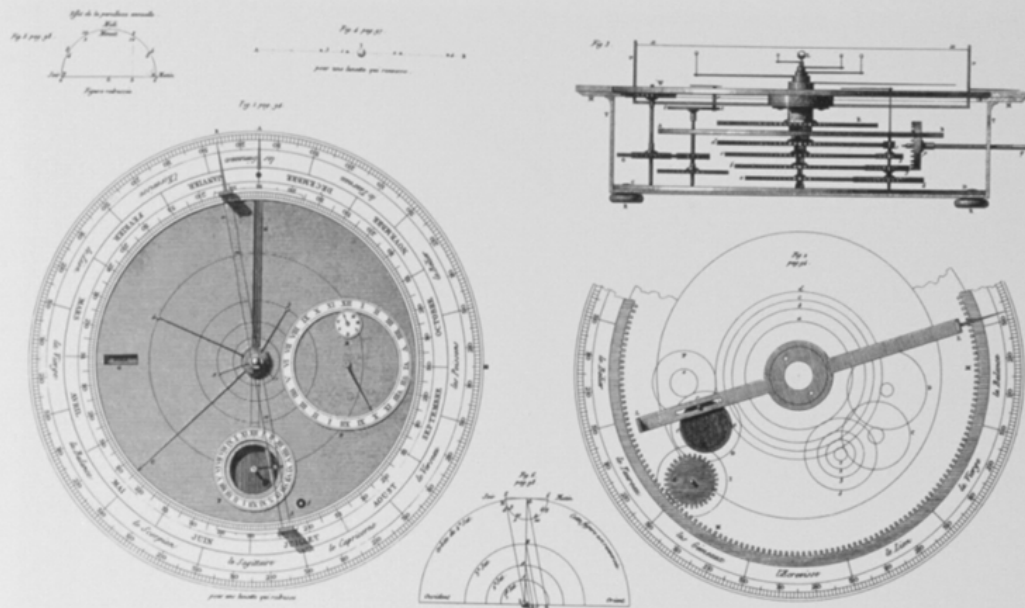
**DESIGN STRATEGIES THAT SHARPEN INFORMATION  
RESOLUTION OF PAPER AND VIDEO SCREEN.**

**TO INCREASE (1) THE NUMBER OF DIMENSIONS THAT  
CAN BE DISPLAYED ON A PLANE SURFACE AND (2)  
THE DATA DENSITY (AMOUNT OF INFORMATION PER  
UNIT AREA).**



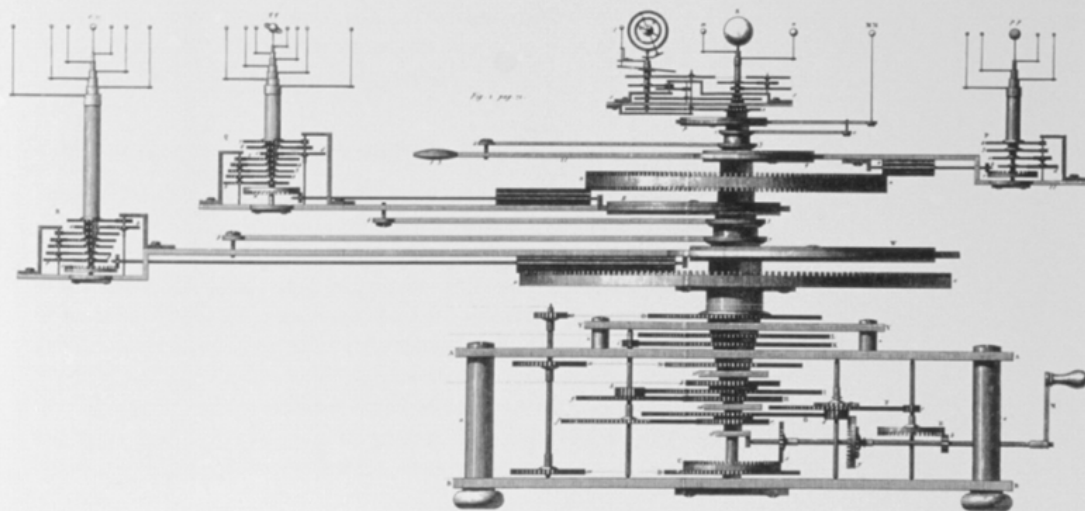
When the toad (*Bufo americanus* Le Conte) sheds its skin upon the occasion of a quarterly moulting, the suit leaves life's spaceland and collapses into flatland, not unlike our information displays.

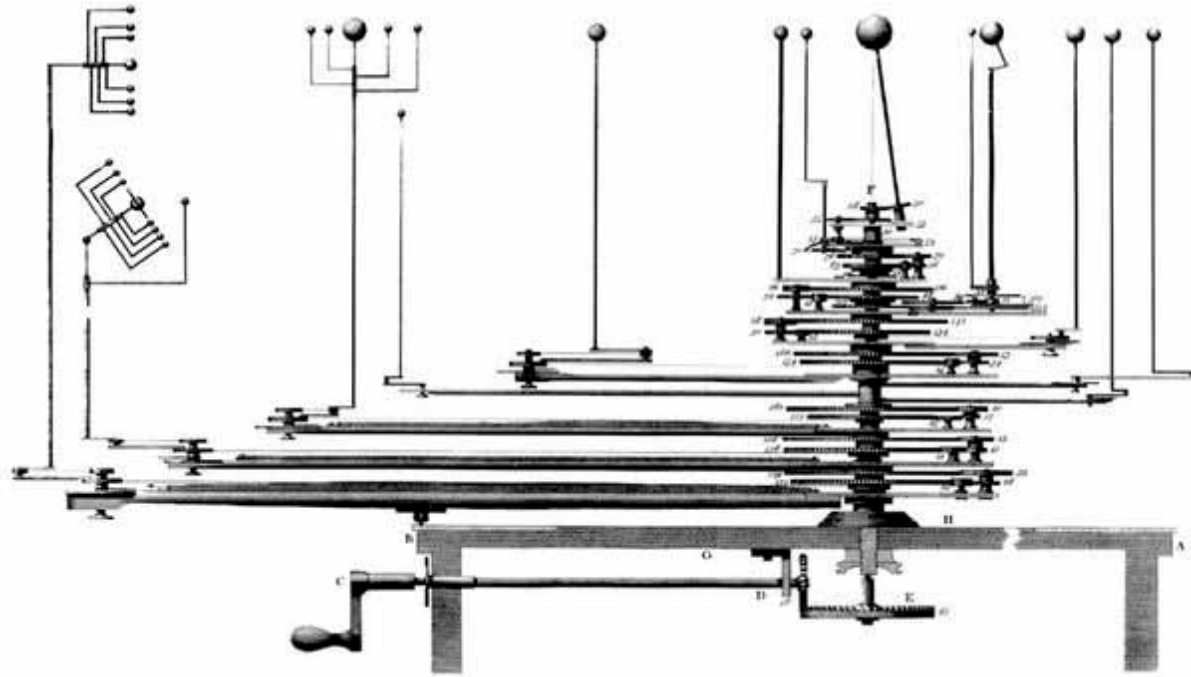




To animate flatland, Galileo and then others constructed Jovilabes, nomogram-like computation devices that recounted orbits of Jupiter's satellites (above). Mechanical models of the solar system in motion showed the interplay of Sun, Earth, and Jupiter, as our shifting vantage point and Jovian shadows masked Galilean satellites from Earth view.

Antide Janvier, *Des révolutions des corps célestes par le mécanisme des rouages* (Paris, 1812), plate VI and plate IV.





# ORRERIES

PRIDEFULLY OBVIOUS PRESENTATION





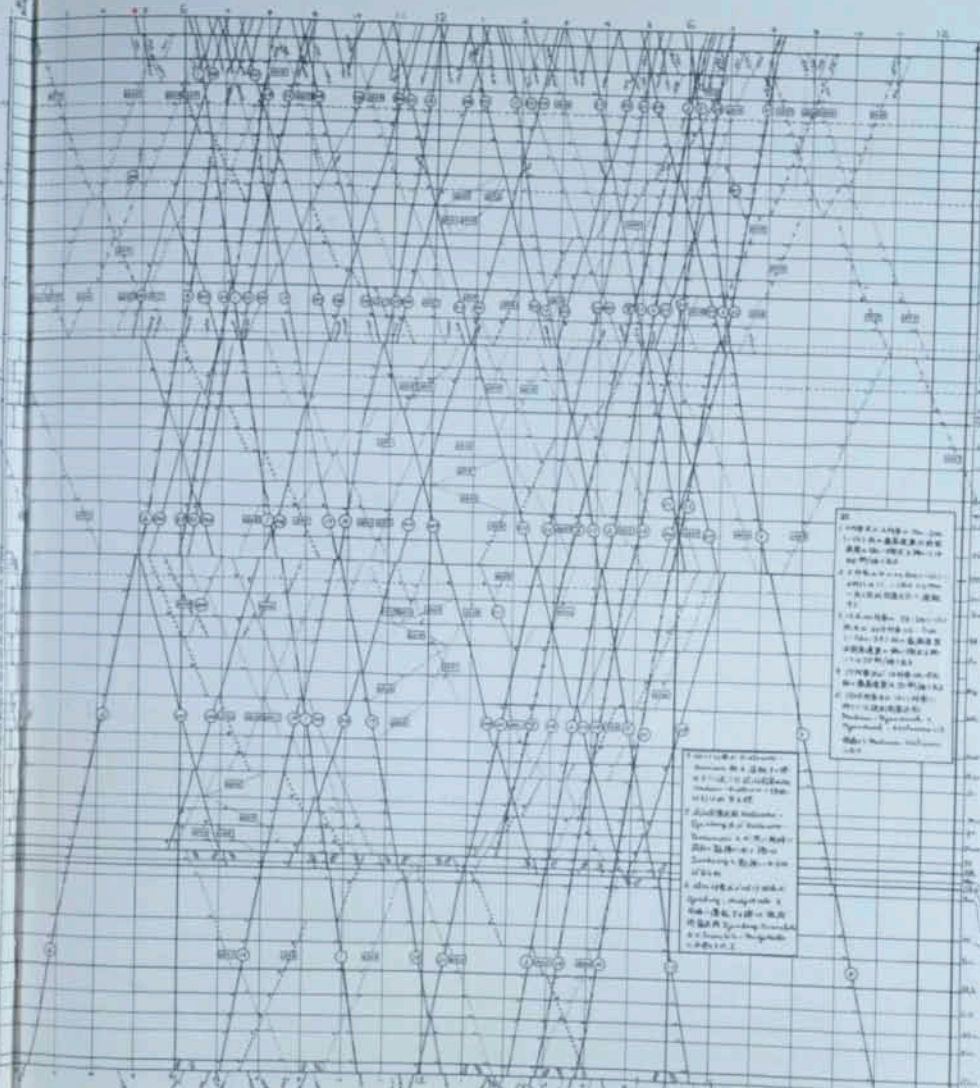
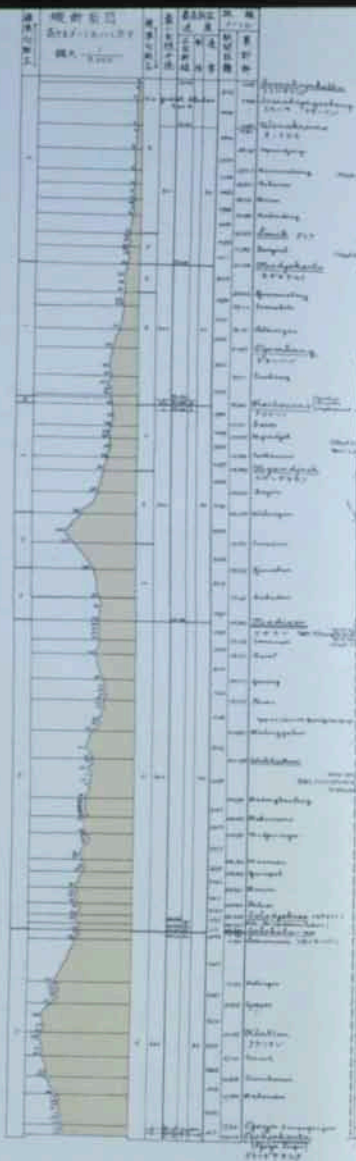
Surabaya - Djakarta.

スラバヤ - ジャカルタ

(圖例) (Legend)

凡例 (Legend)  
 1. 測量線 (Survey line)  
 2. 測量點 (Survey point)  
 3. 測量點之標高 (Elevation of survey point)  
 4. 測量點之距離 (Distance of survey point)  
 5. 測量點之方位角 (Azimuth of survey point)

能  
 第7表



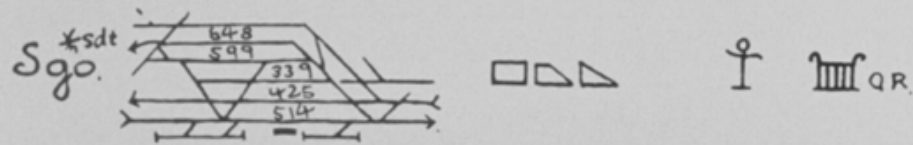
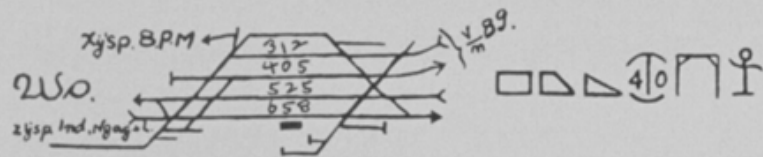
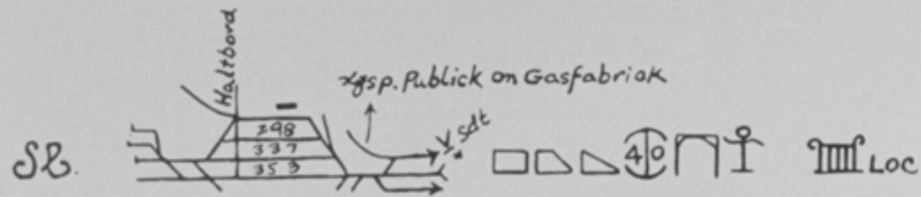
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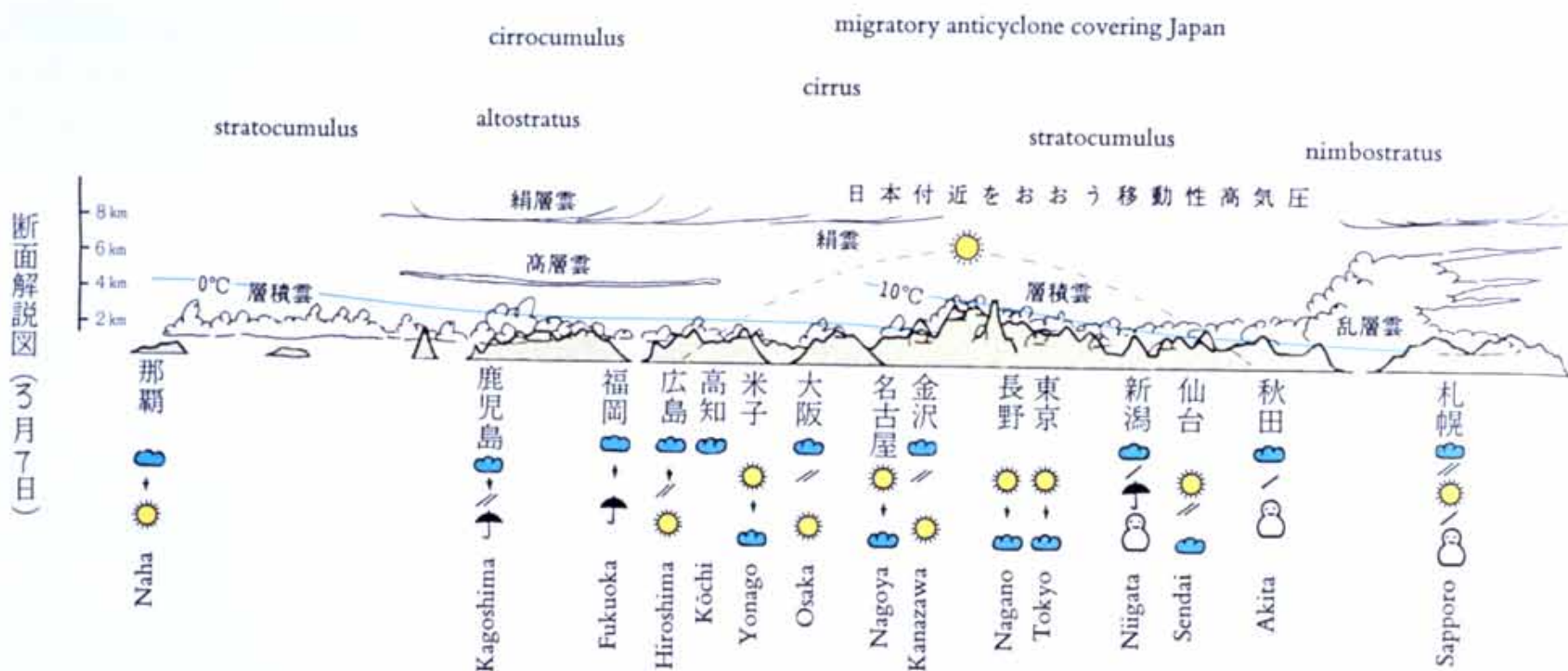
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測量線	測量點	測量點之標高	測量點之距離	測量點之方位角
1	1	100	100	100
2	2	200	200	200
3	3	300	300	300
4	4	400	400	400
5	5	500	500	500

凡例 (Legend)  
 1. 測量線 (Survey line)  
 2. 測量點 (Survey point)  
 3. 測量點之標高 (Elevation of survey point)  
 4. 測量點之距離 (Distance of survey point)  
 5. 測量點之方位角 (Azimuth of survey point)



- ▽ cargo unloading platform
- ▽ livestock loading platform
- ④ □ cargo unloading facilities
- i water supply pump tower
- ①② directional change platform
- Loc car repair platform
- Loc standby engines
- QR relief car
- Spd closed areas



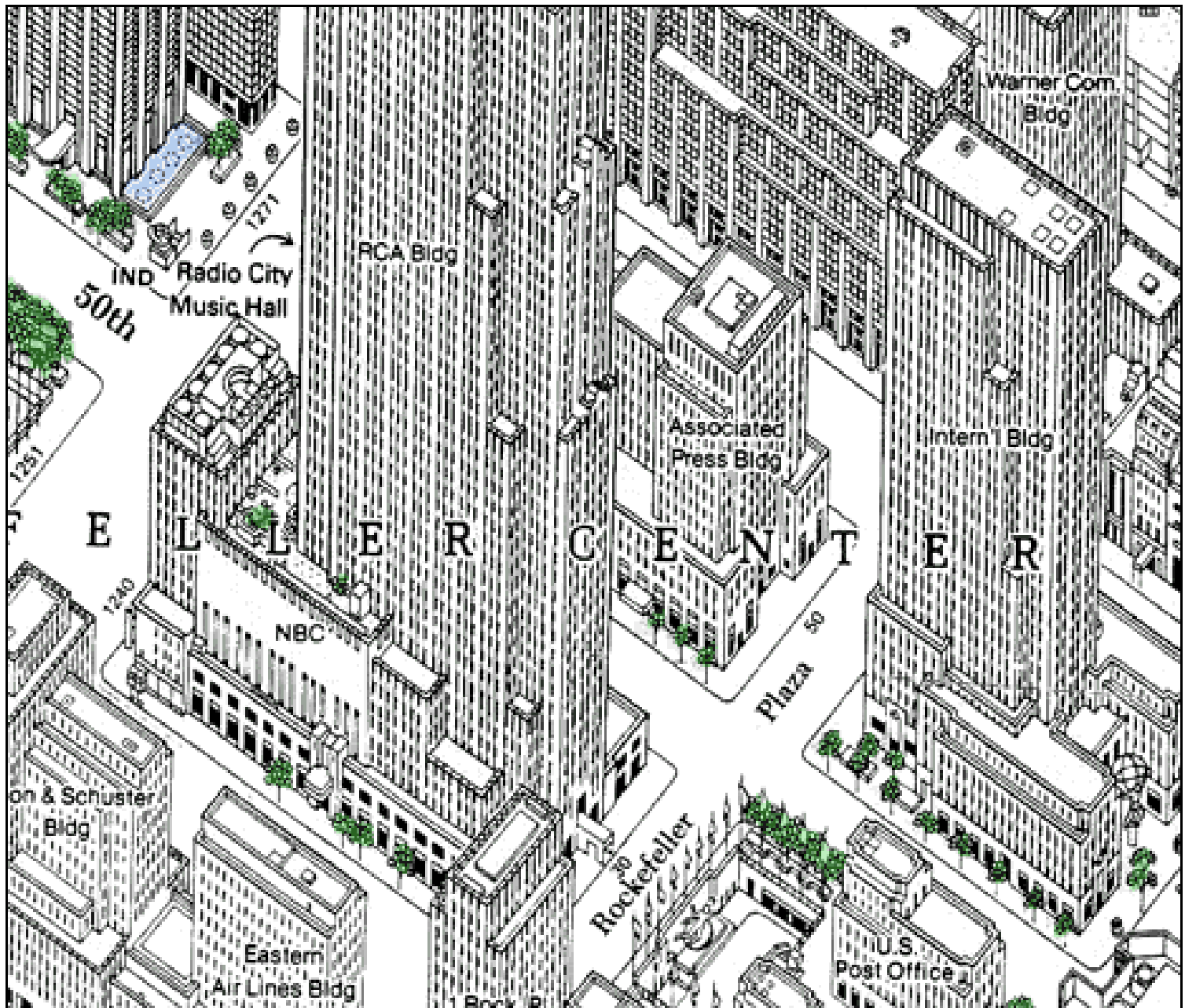
断面解説図 (3月7日)

HERE blue contours tracing out constant temperatures at 0° and -10° C stretch through the clouds in a side profile of Japan, an ocean-eye view. Forecasts for 15 areas annotate the cross-section of this unusual weather map from a daily newspaper. How easily the design reads, compared to traditional weather maps that commit both their visual dimensions

Redrawn from Akahata [Red Flag], Tokyo, March 7, 1985. English translation added here. Note the changing weather reported for some cities, for example, Sapporo at the far right of the map.

**MICRO/MACRO READINGS**

**A MOST UNCONVENTIONAL DESIGN STRATEGY IS  
REVEALED: TO CLARIFY, ADD DETAIL.**



IND Radio City Music Hall

50th

RCA Bldg

Warner Com Bldg

Associated Press Bldg

Intern'l Bldg

ROCKEFELLER CENTER

NBC

Plaza 50

on & Schuster Bldg

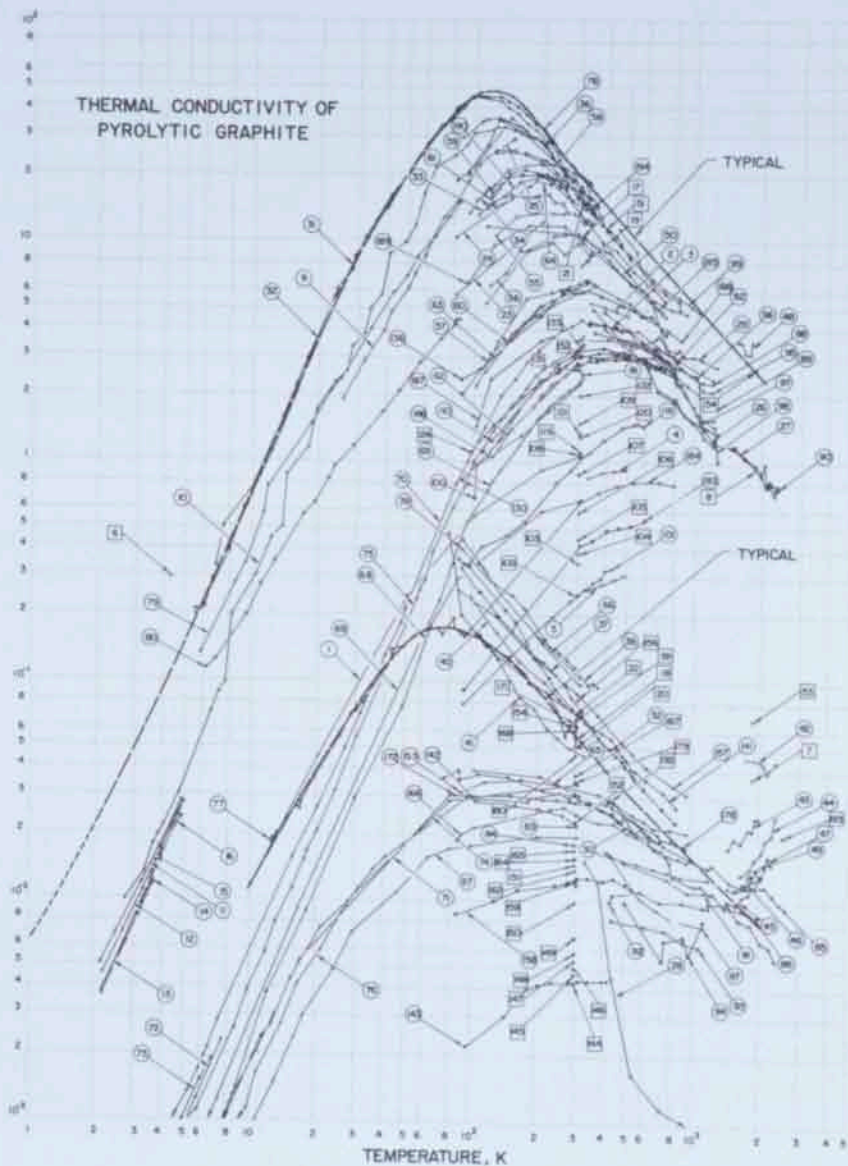
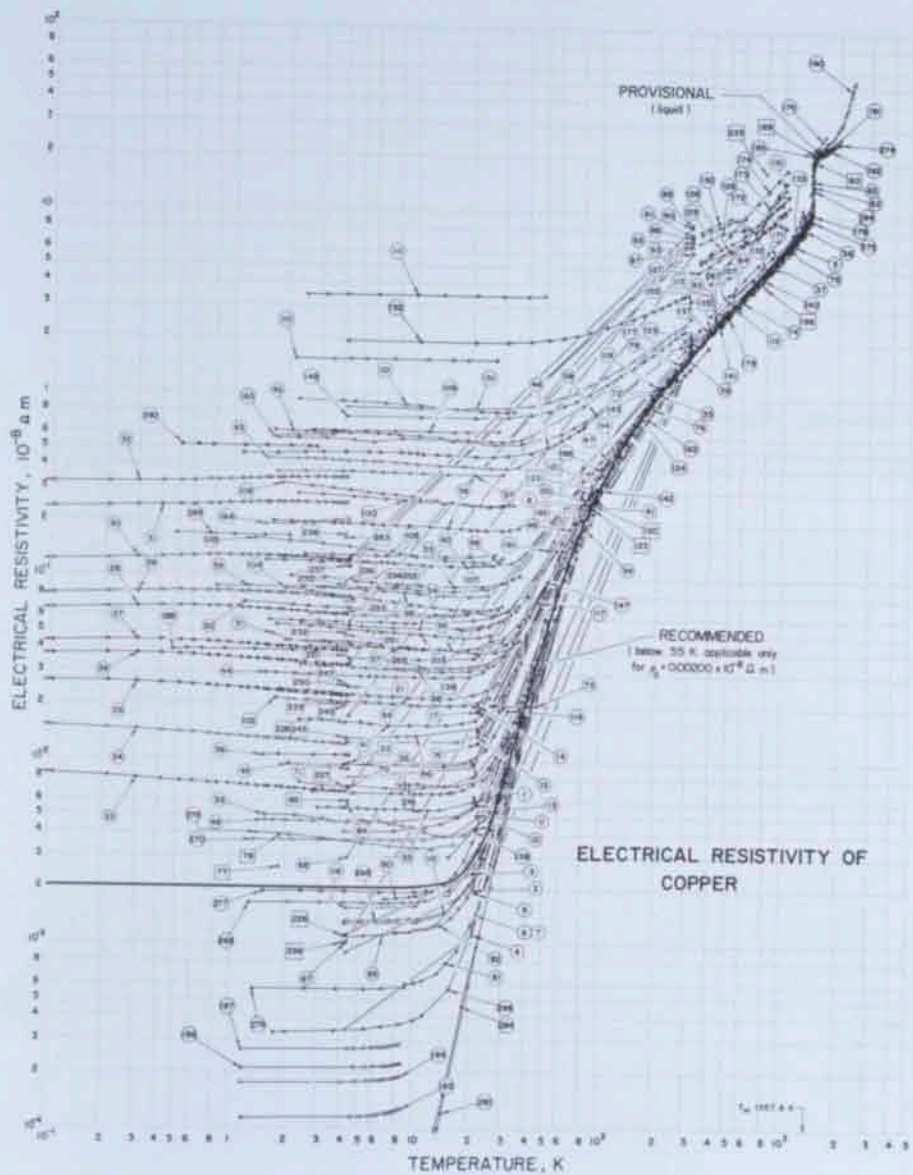
Rockefeller

Eastern Air Lines Bldg

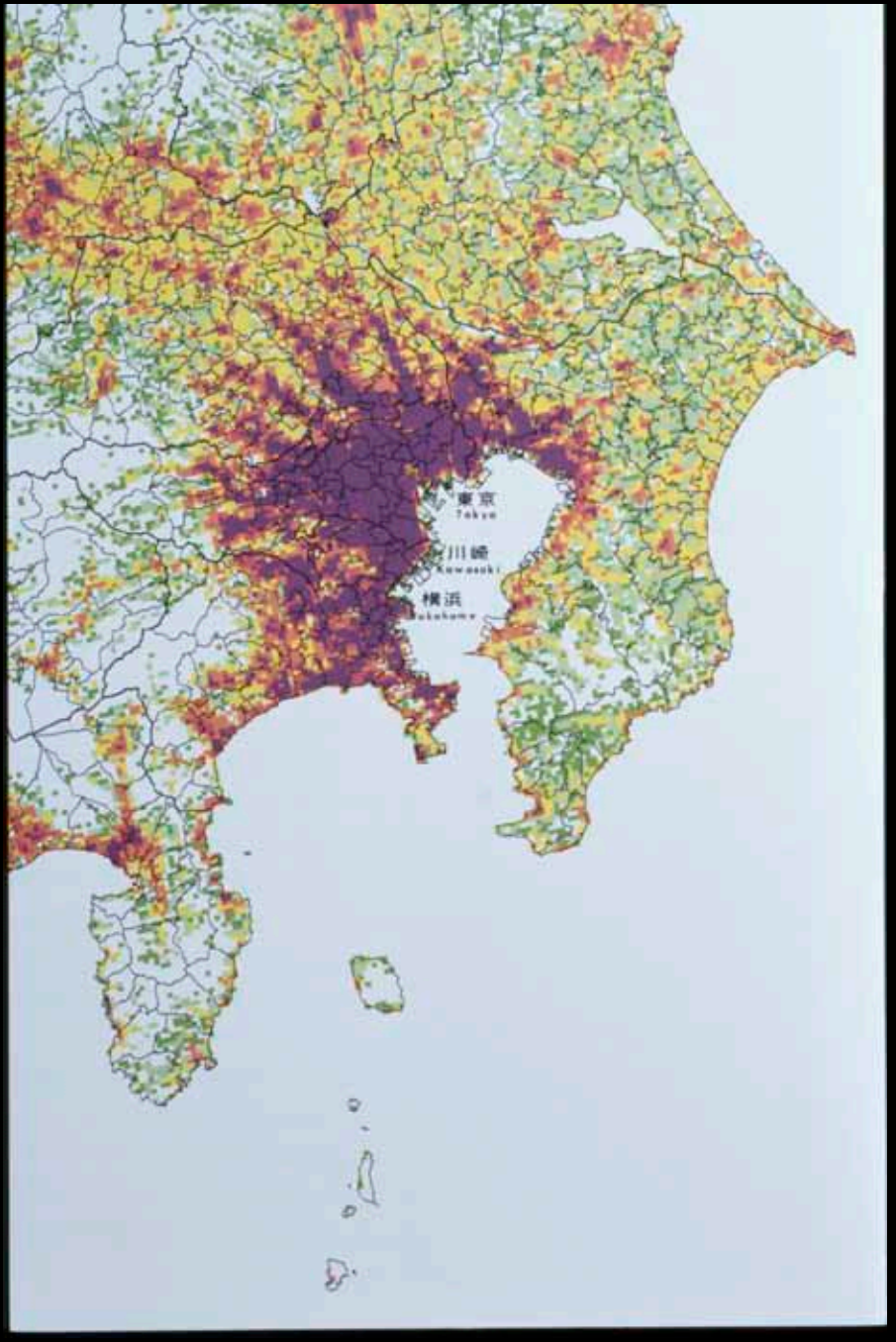
U.S. Post Office



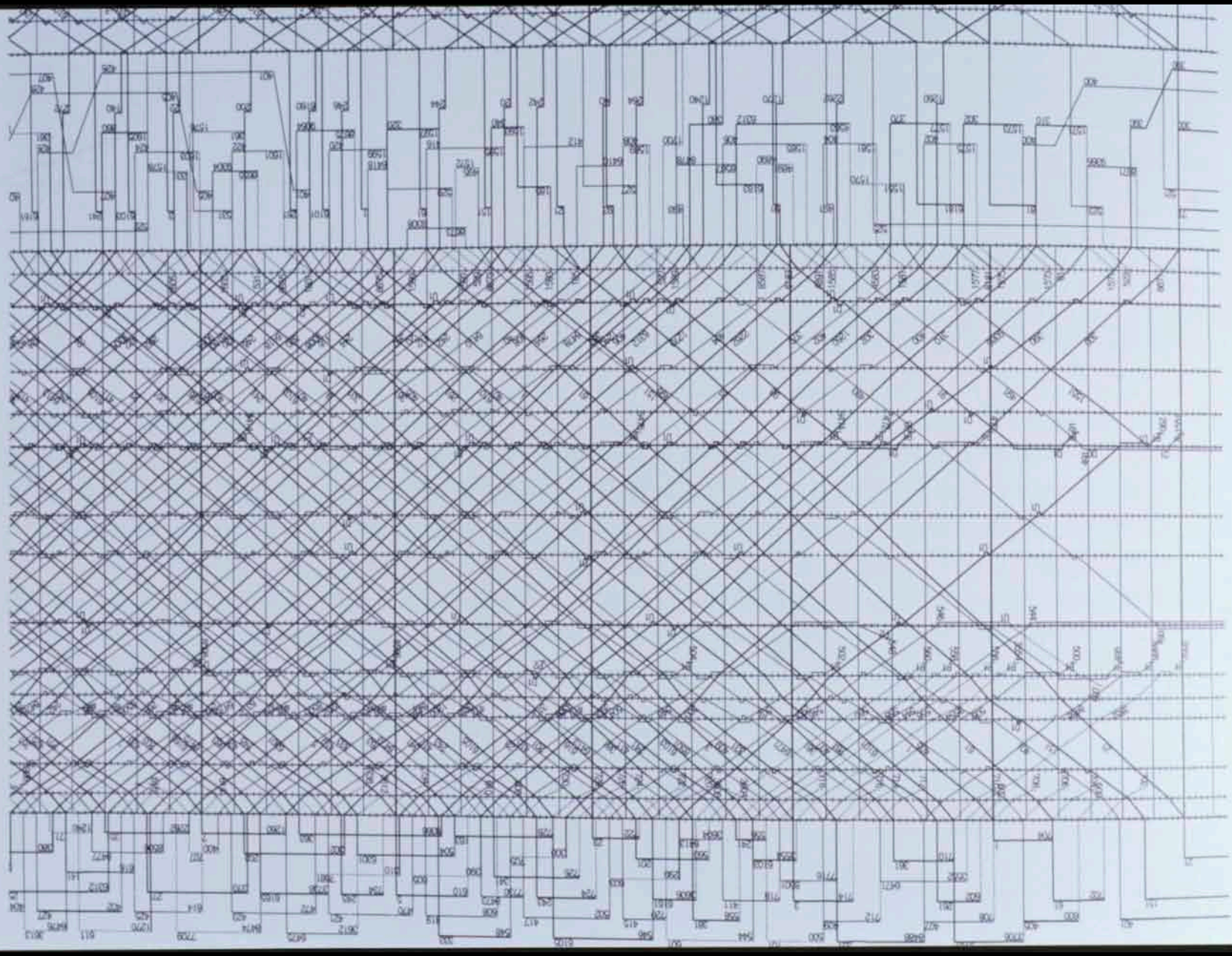


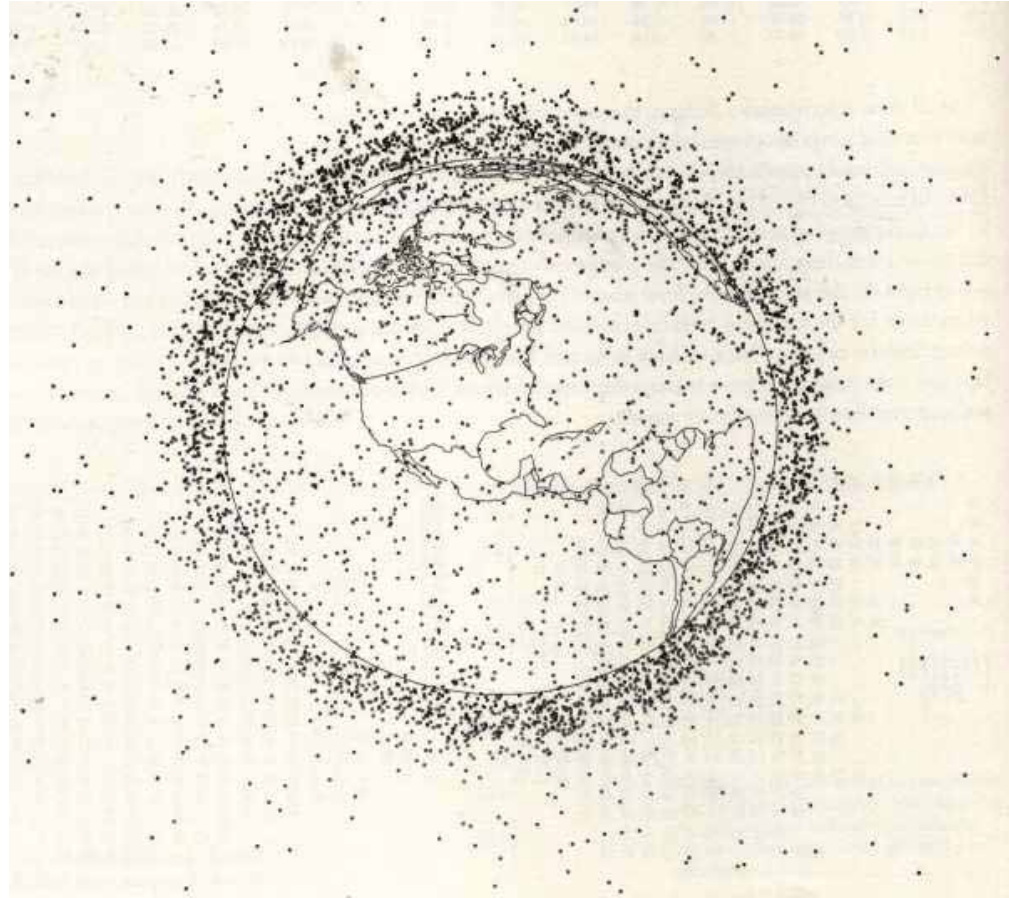


These multi-layered graphs report a cloudy relationship between



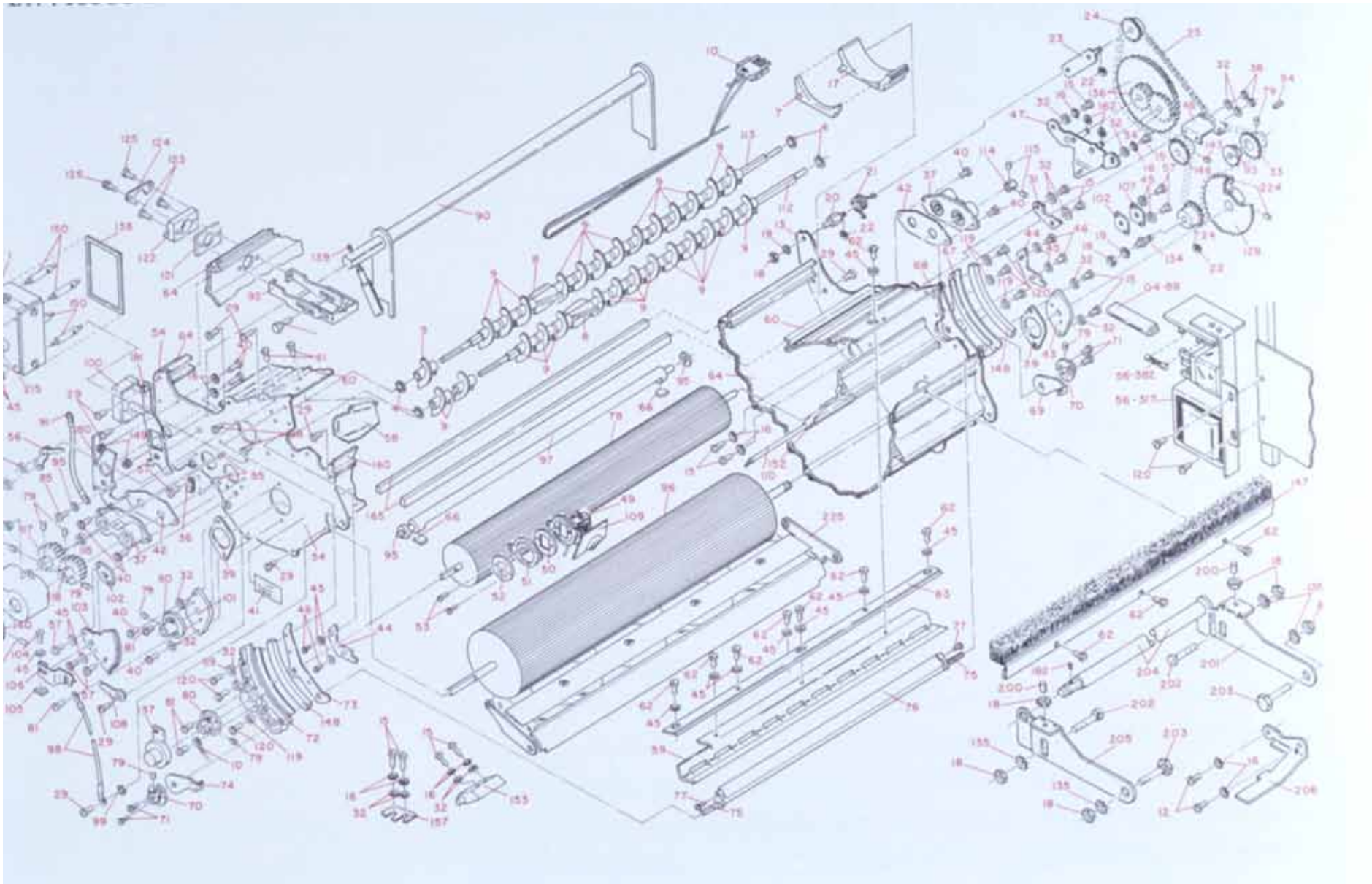




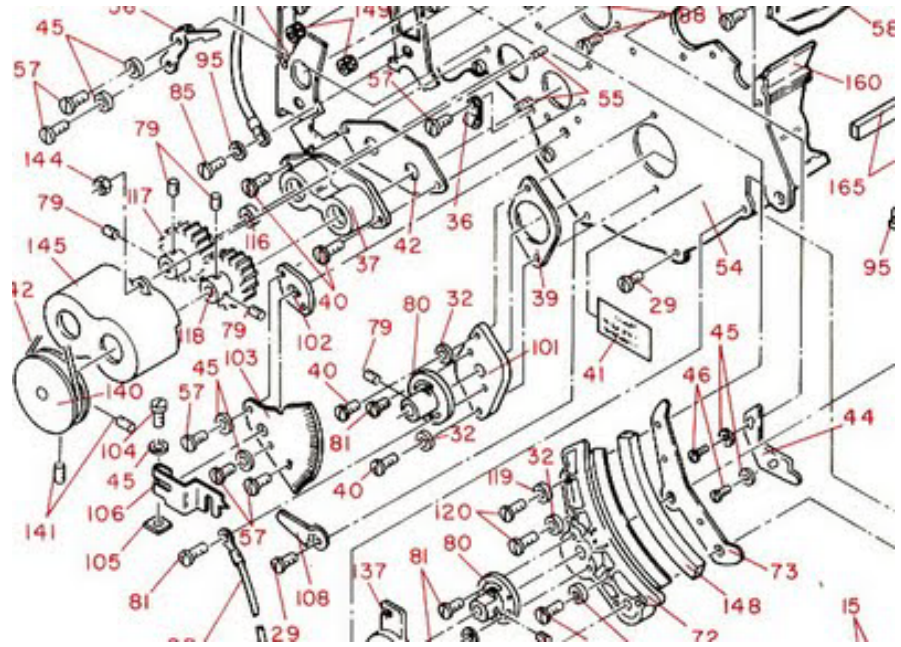


**LAYERING AND SEPARATION**

**AMONG THE MOST POWERFUL DEVICES FOR REDUCING NOISE AND ENRICHING THE CONTENT OF DISPLAYS IS THE TECHNIQUE OF LAYERING AND SEPARATION, VISUALLY STRATIFYING VARIOUS ASPECTS OF THE DATA.**



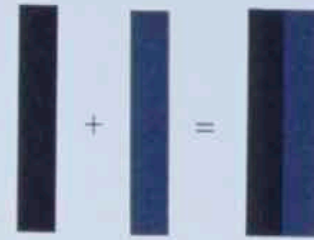




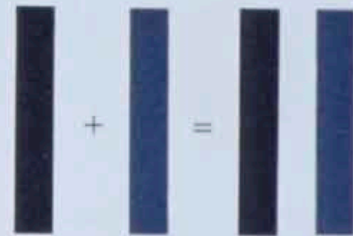
**JOSEF ALBERS, 1969.**

Here I have 2 equal strips of cardboard (1" x 6")

Here is one (vertical), here another (also vertical).  
Seeing one strip plus one strip, we count 2 strips:  
 $1 + 1 = 2$ .

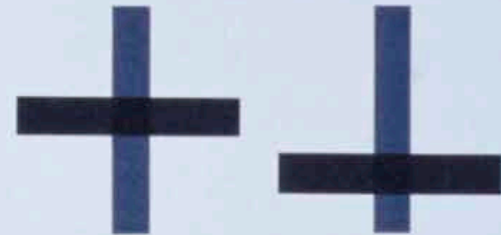


We recognize the equal width of the strips.  
Now, 1 width + 1 width (strips touching)  
equals 2 widths:  $1 + 1 = 2$ .



But now, separating them (both remain vertical)  
by 1 width — we count 3 widths  
(one of them negative) :  $1 + 1 = 3$ .

Of the 2 vertical strips,  
one crosses the other horizontally  
in their centers.



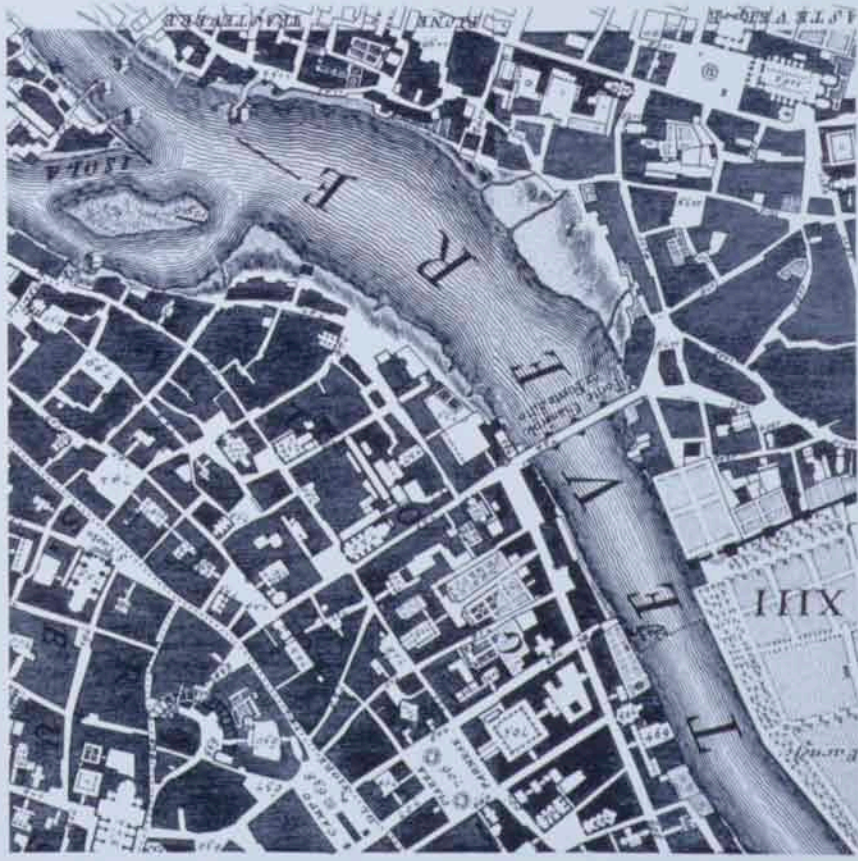
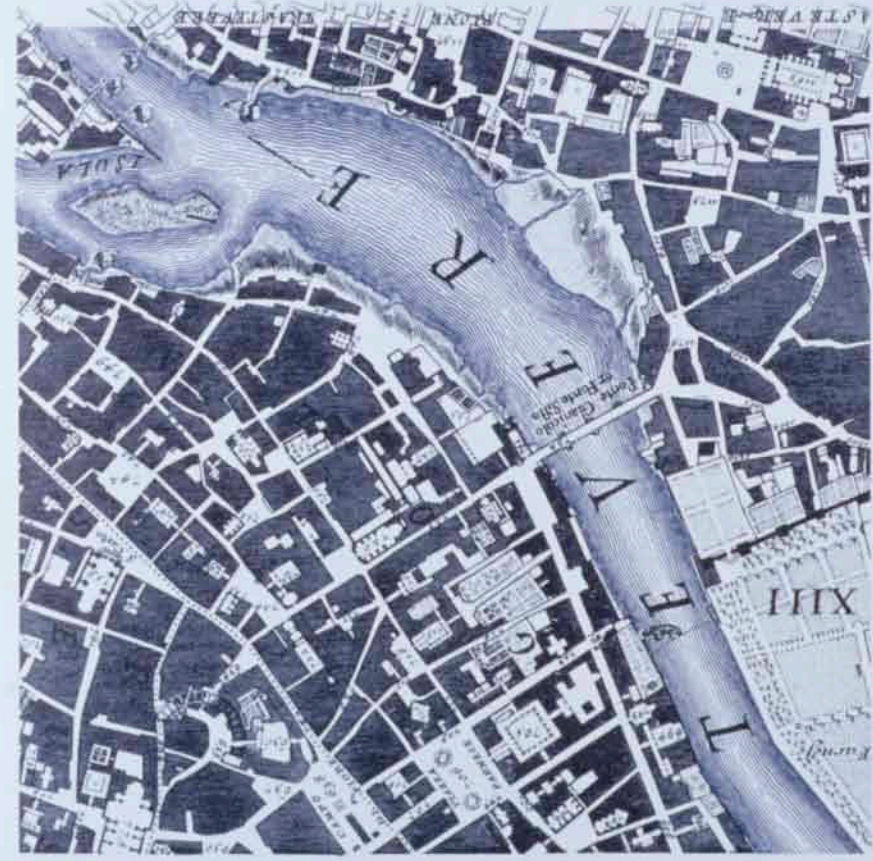
Result: 2 lines form a crossing  
thus producing 4 arms, as 4 extensions,  
to be read inward as well as outward.

We also see 4 rectangles, and with some imagination,  
4 triangles, 4 squares.



By shifting centers and angles,  
arms and the in-between figures become unequal.

All together: one line plus one line  
results in many meanings — *Quod erat demonstrandum*.



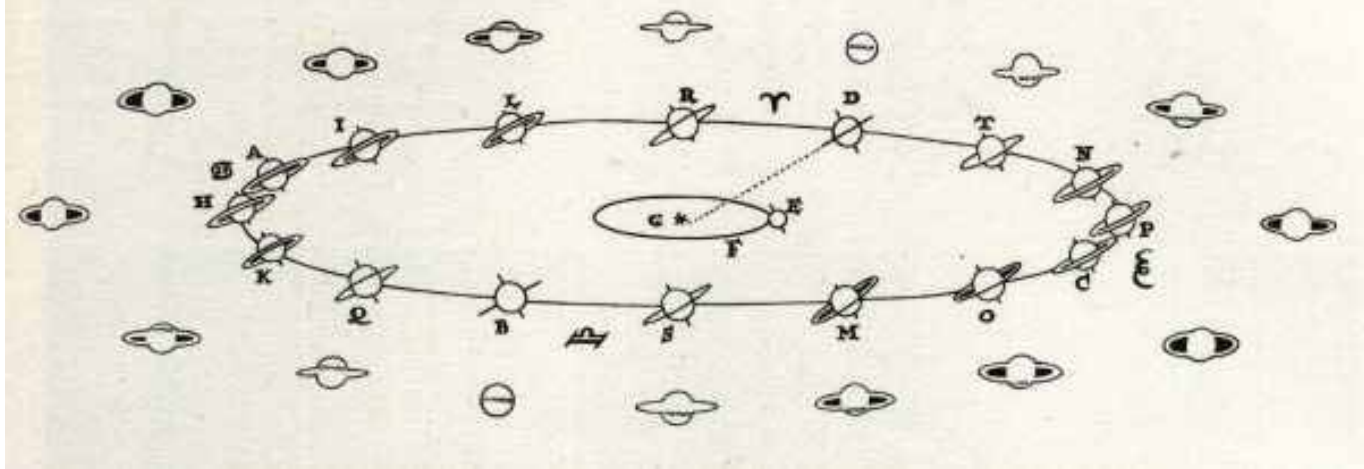
In the masterly 1748 Noll map of Rome, the river's heavy inking activates what should be a visually tranquil area, causing bridge names and a little boat to vibrate in a more prison, albeit a quiet one. Muting the river encoding calms vibration and brings names and other details forward, while retaining a symbolism of rippling water.<sup>5</sup> This redesign

<sup>5</sup> Giambattista Noll, *Pianta Grande di Roma* (Rome, 1748; from a facsimile edition by J. H. Aronson, Highmount, New York, 1984). Note the seemingly English word "or" in the names under the bridge, a result of the 18th-century custom of contracting the Italian *o*ra, meaning now, at this time cur-

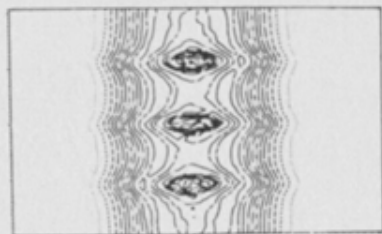
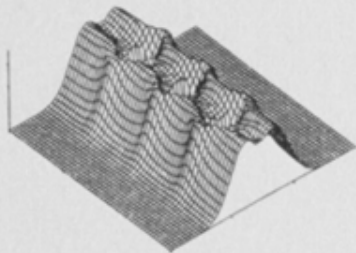
**SMALL MULTIPLES**

AT THE HEART OF QUANTITATIVE REASONING IS A SINGLE QUESTION: COMPARED TO WHAT? SMALL MULTIPLE DESIGNS, MULTIVARIATE AND DATA BOUNTIFUL, ANSWER DIRECTLY BE ENFORCING COMPARISONS OF CHANGES, OF THE DIFFERENCES AMONG OBJECTS, OF THE SCOPE OF ALTERNATIVES. FOR A WIDE RANGE OF PROBLEMS IN DATA PRESENTATION, SMALL MULTIPLES ARE THE BEST SOLUTION.

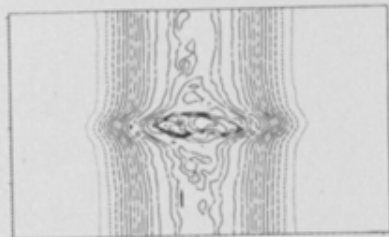
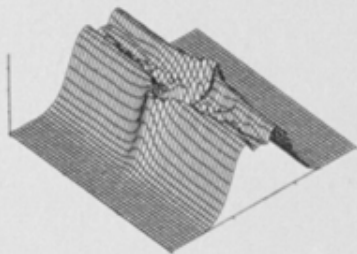
# 4 Small Multiples



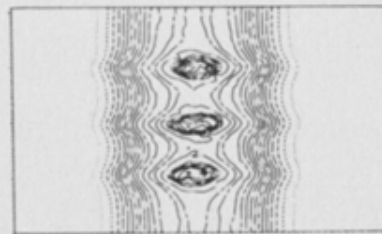
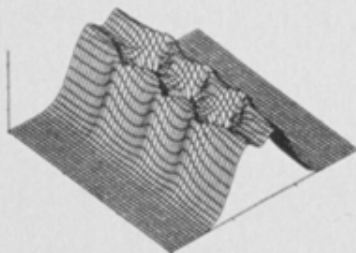
T=250



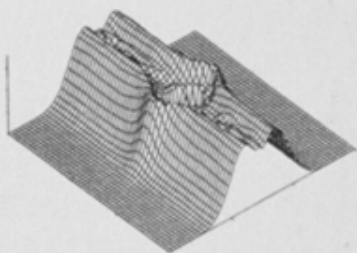
T=500



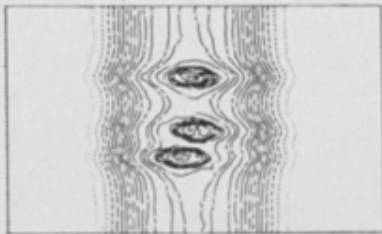
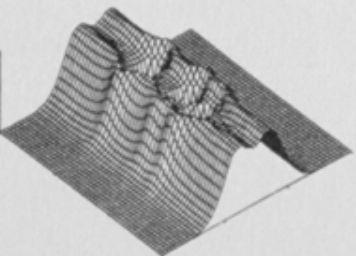
T=300



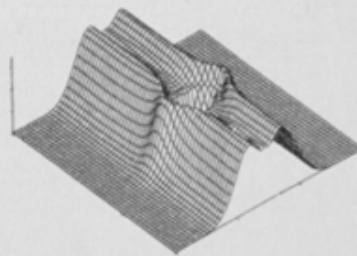
T=550



T=350



T=700









**COLOR AND INFORMATION**

**TO LABEL: COLOUR AS NOUN**

**TO MEASURE: COLOUR AS QUANTITY**

**TO IMITATE REALITY: COLOUR AS REPRESENTATION**

**TO ENLIVEN OR DECORATE: COLOUR AS BEAUTY**



TO LABEL: COLOUR AS NOUN

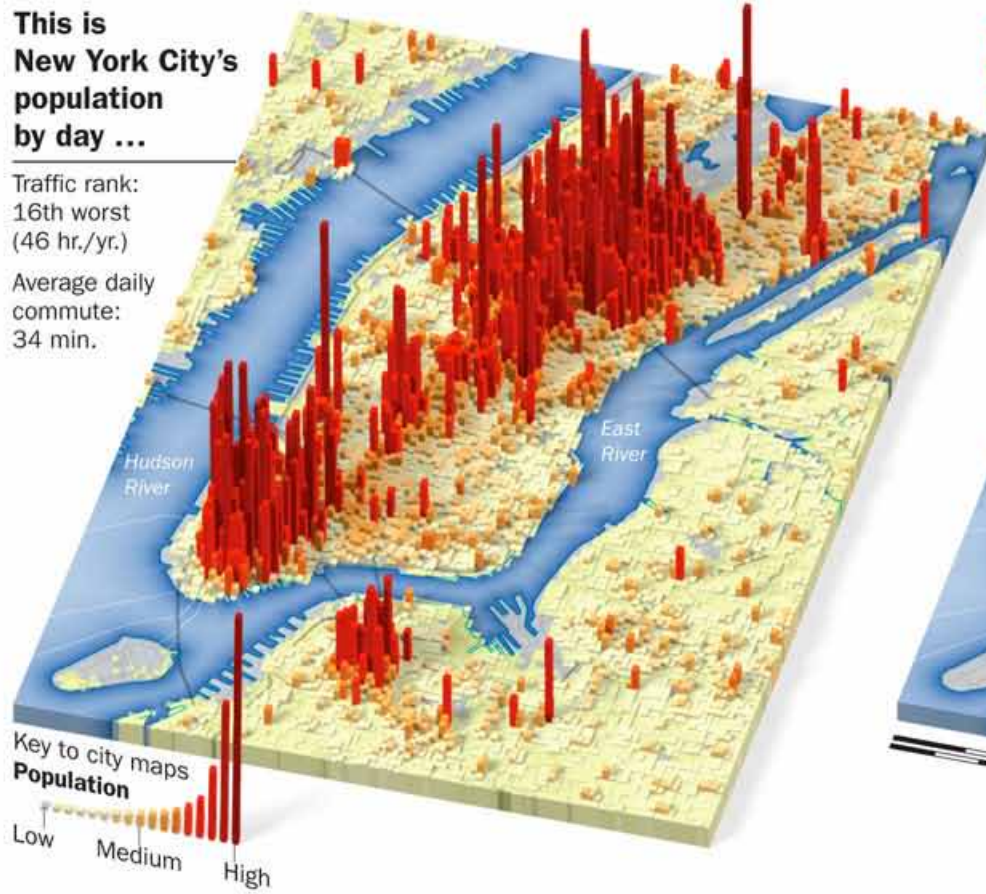
TO MEASURE: COLOUR AS QUANTITY

TO IMITATE REALITY: COLOUR AS REPRESENTATION

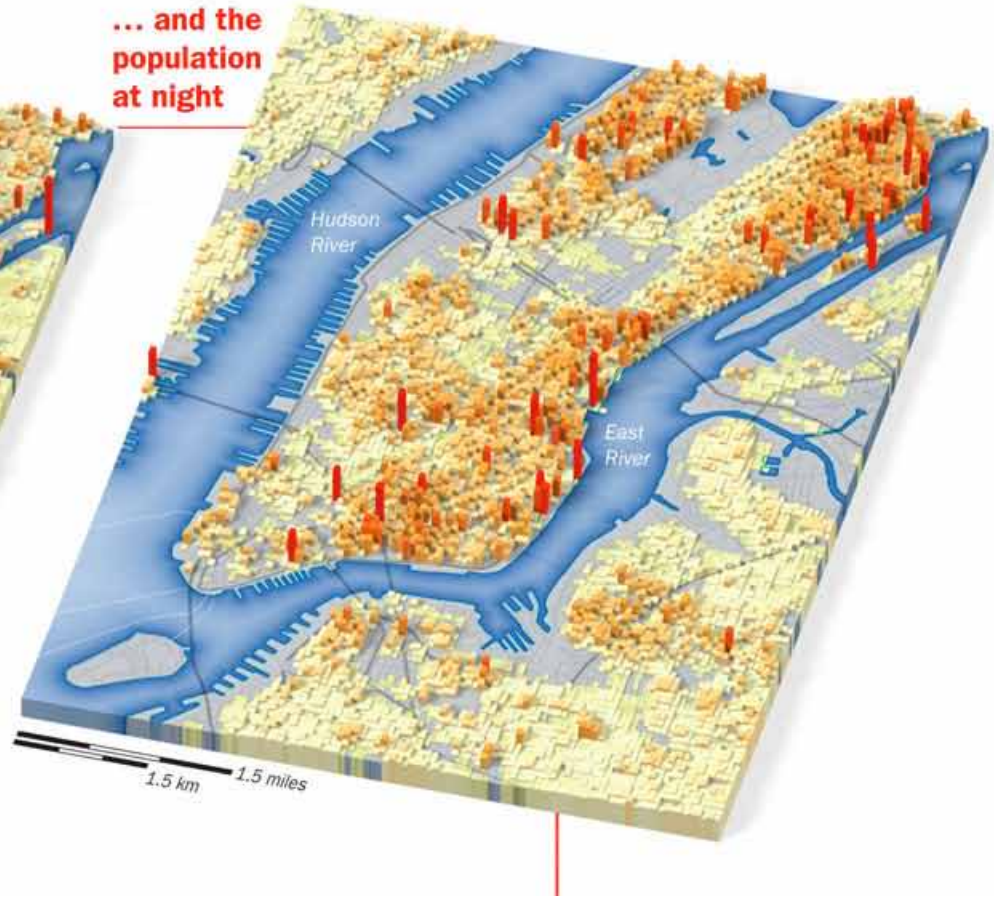
TO ENLIVEN OR DECORATE: COLOUR AS BEAUTY

**This is  
New York City's  
population  
by day ...**

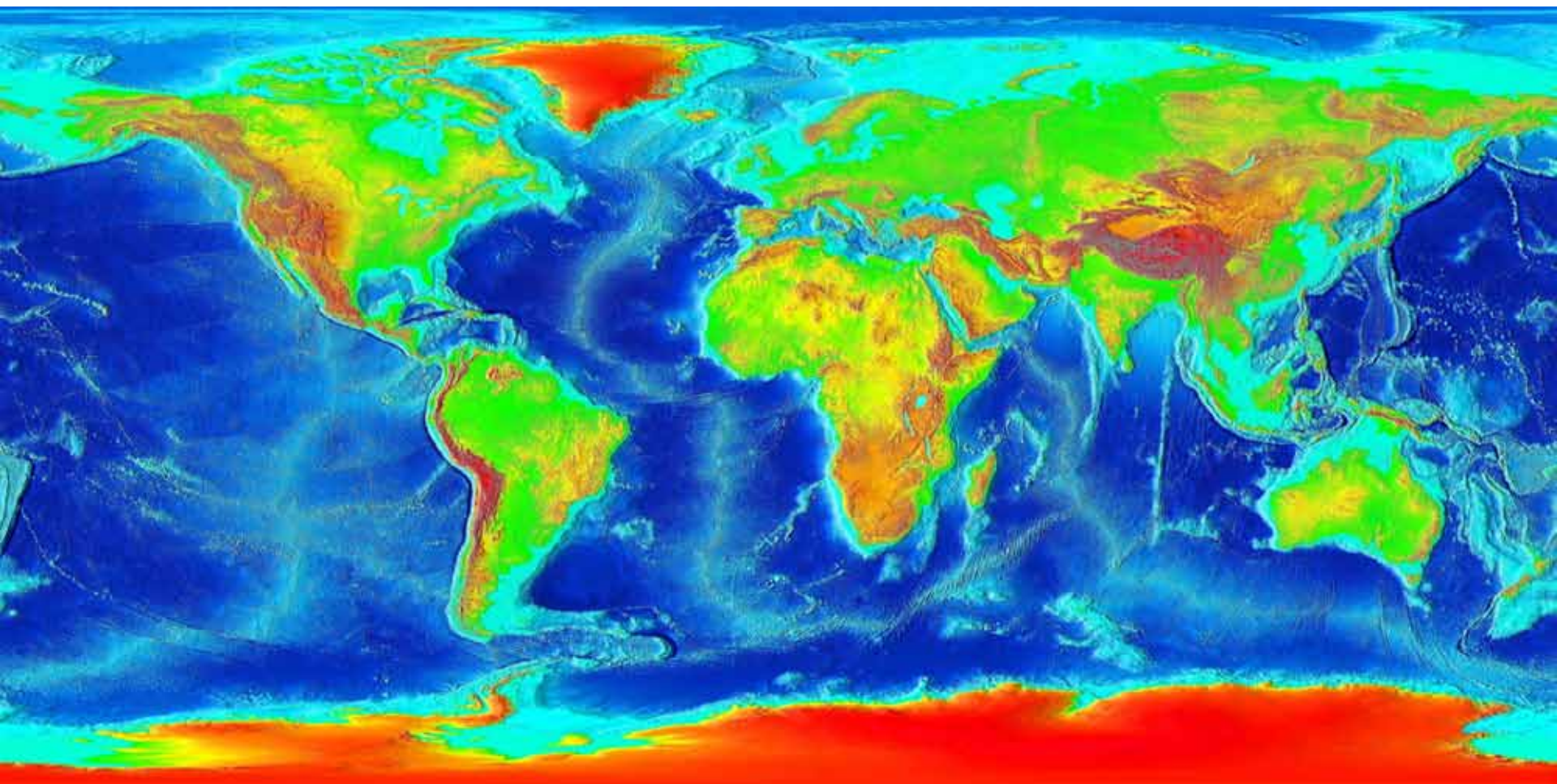
Traffic rank:  
16th worst  
(46 hr./yr.)  
Average daily  
commute:  
34 min.



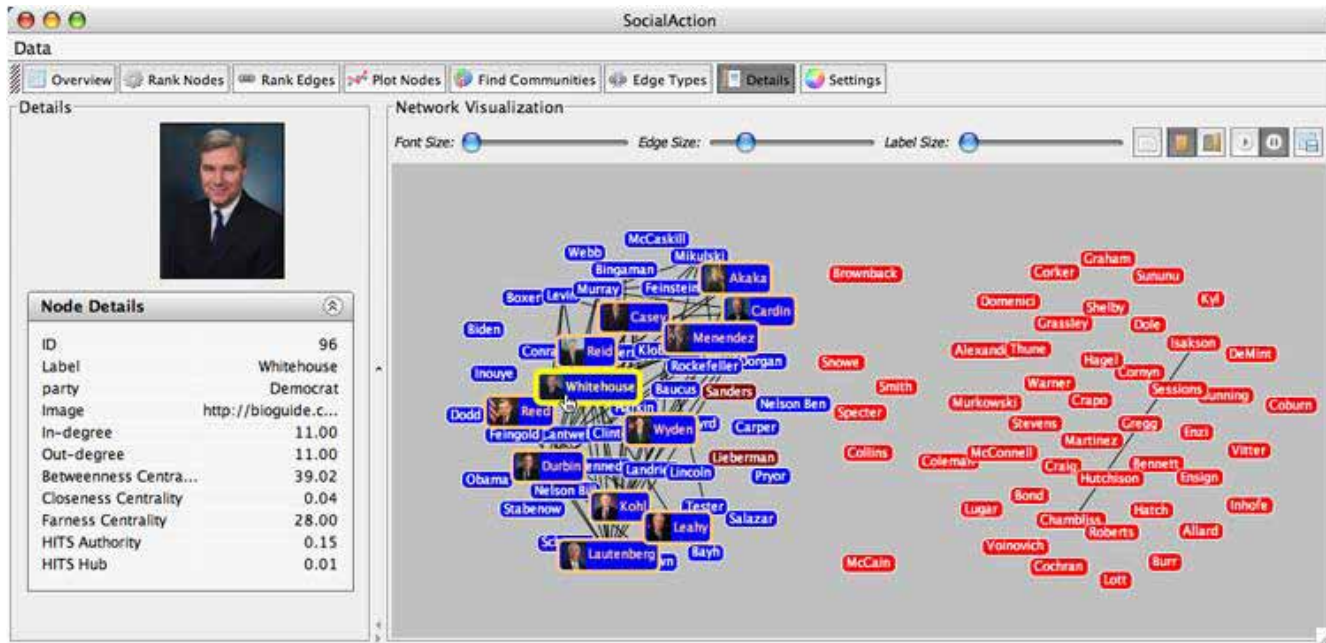
**... and the  
population  
at night**





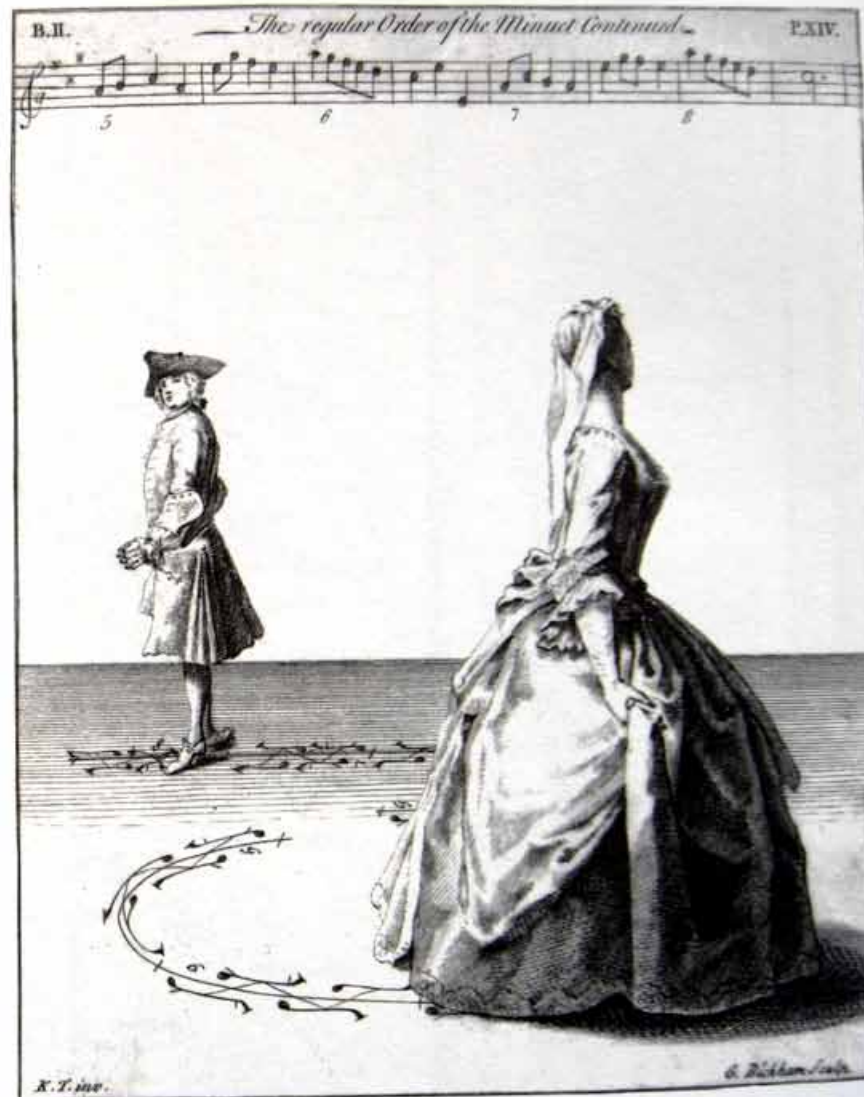






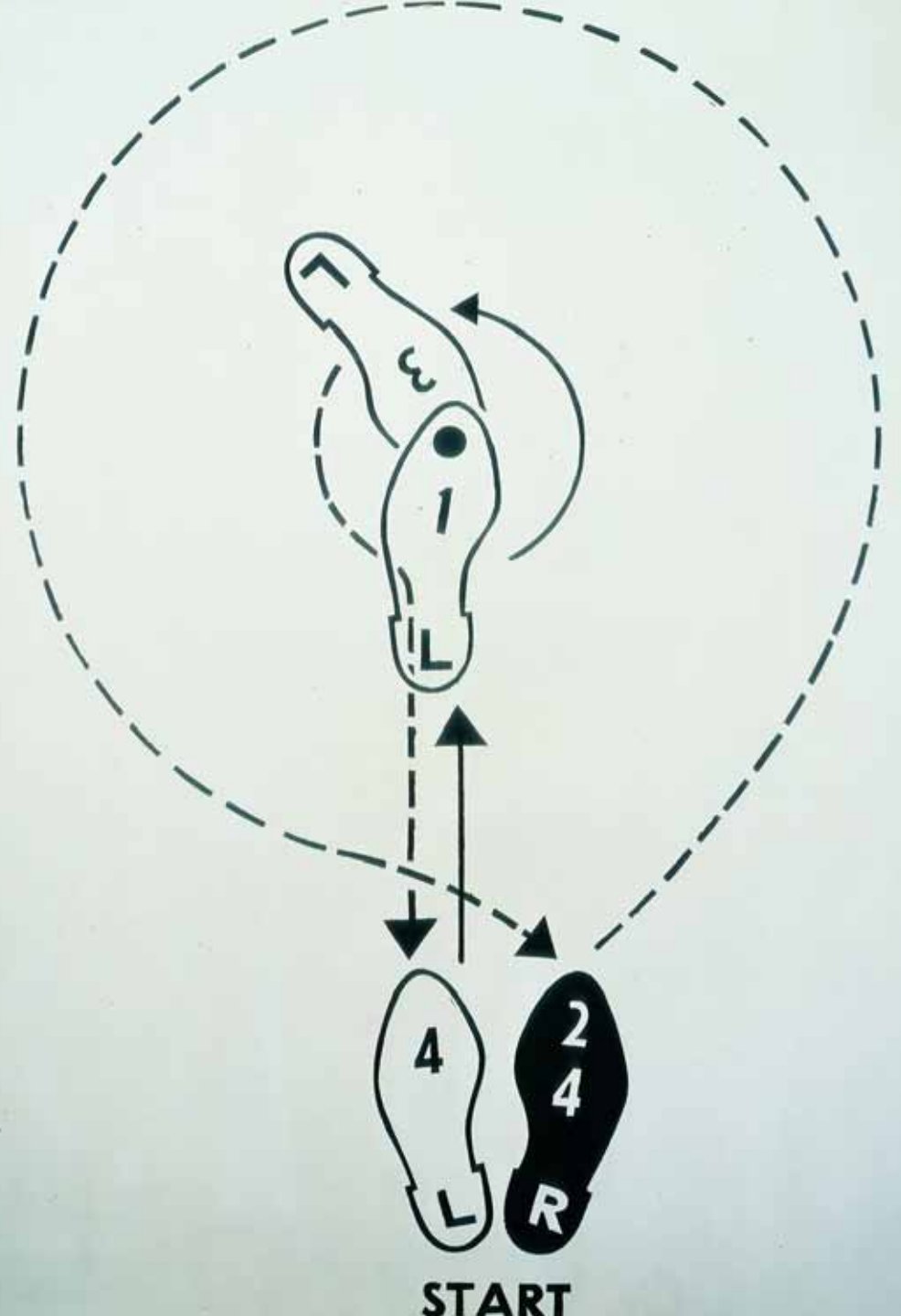
# NARRATIVE OF SPACE AND TIME

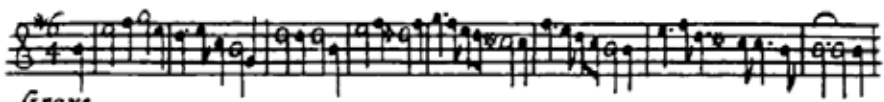
**DANCE NOTATION: HOW TO REDUCE THE THE  
MAGNIFICENT FOUR-DIMENSIONAL REALITY OF TIME  
AND THREE-SPACE INTO LITTLE MARKS ON PAPER  
FLATLANDS.**



*Dance Notation: Commotion and Order*

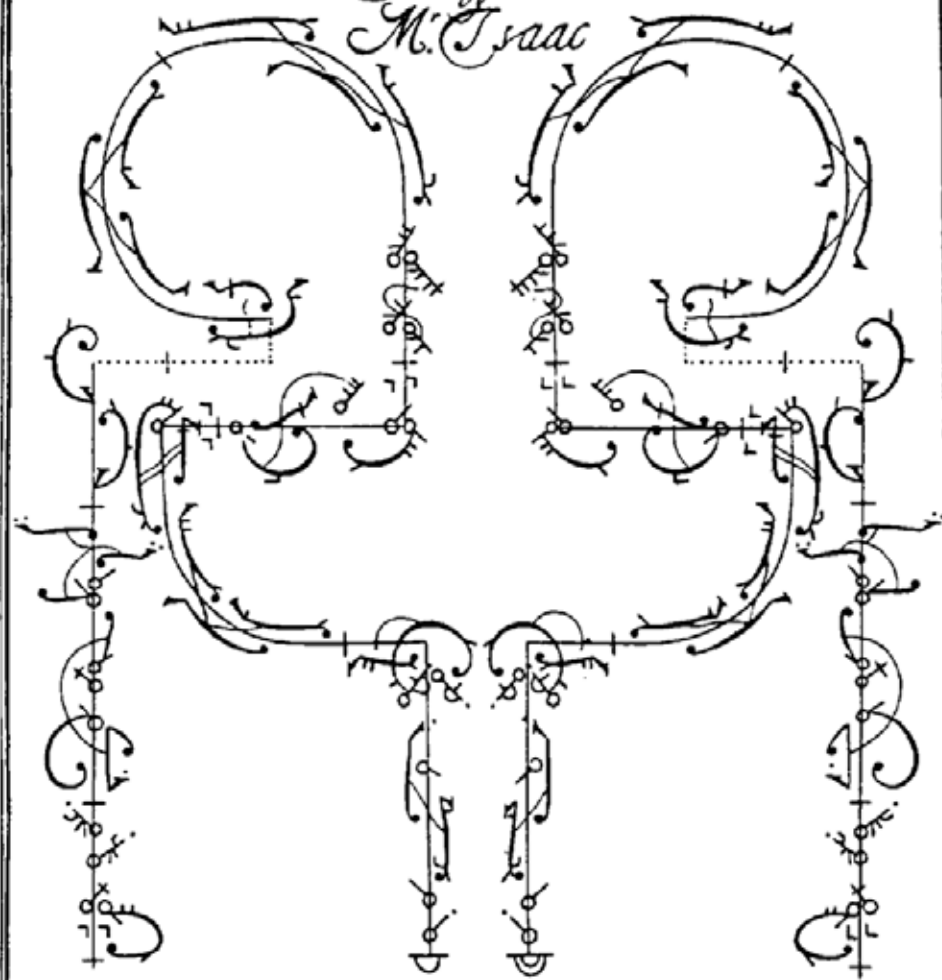






*Grave*

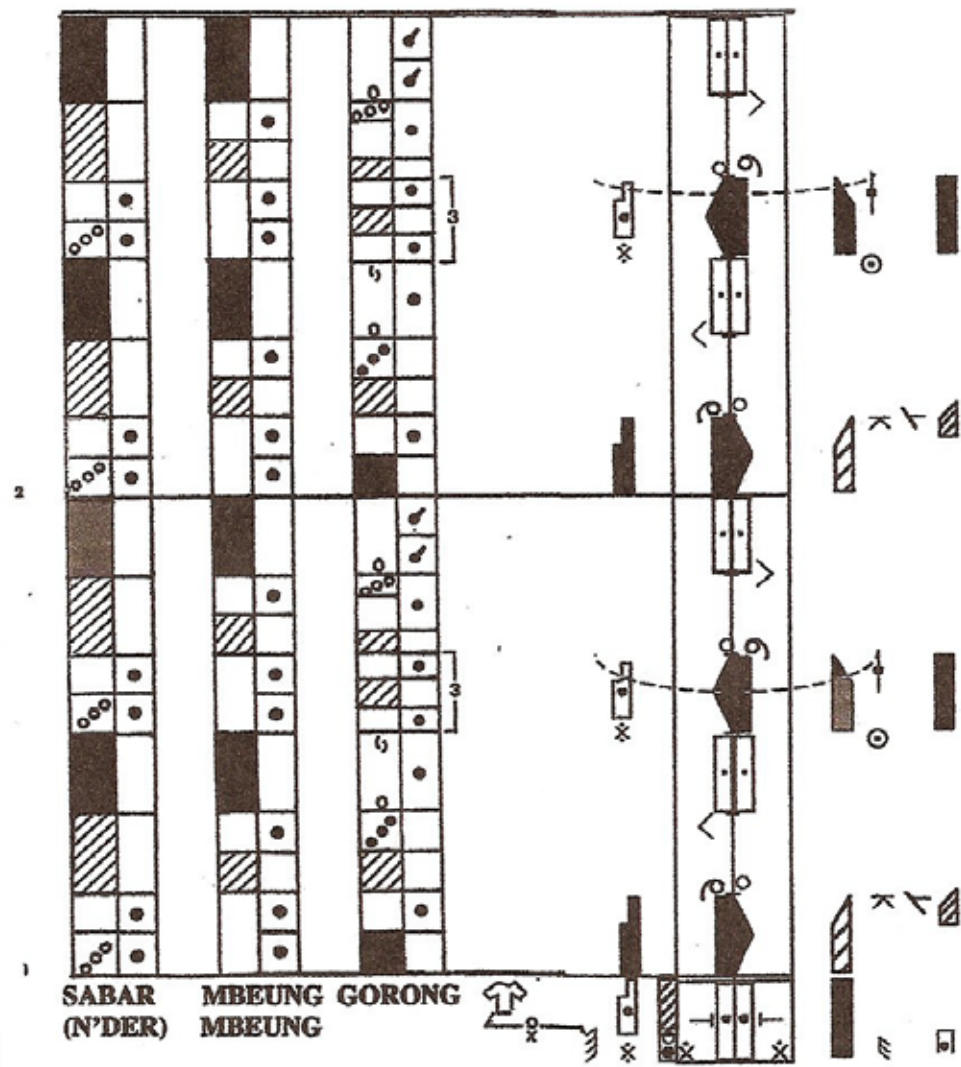
*The  
Pastorall  
by  
M. Isaac*



*1<sup>st</sup> Couplet..*

# SABAR

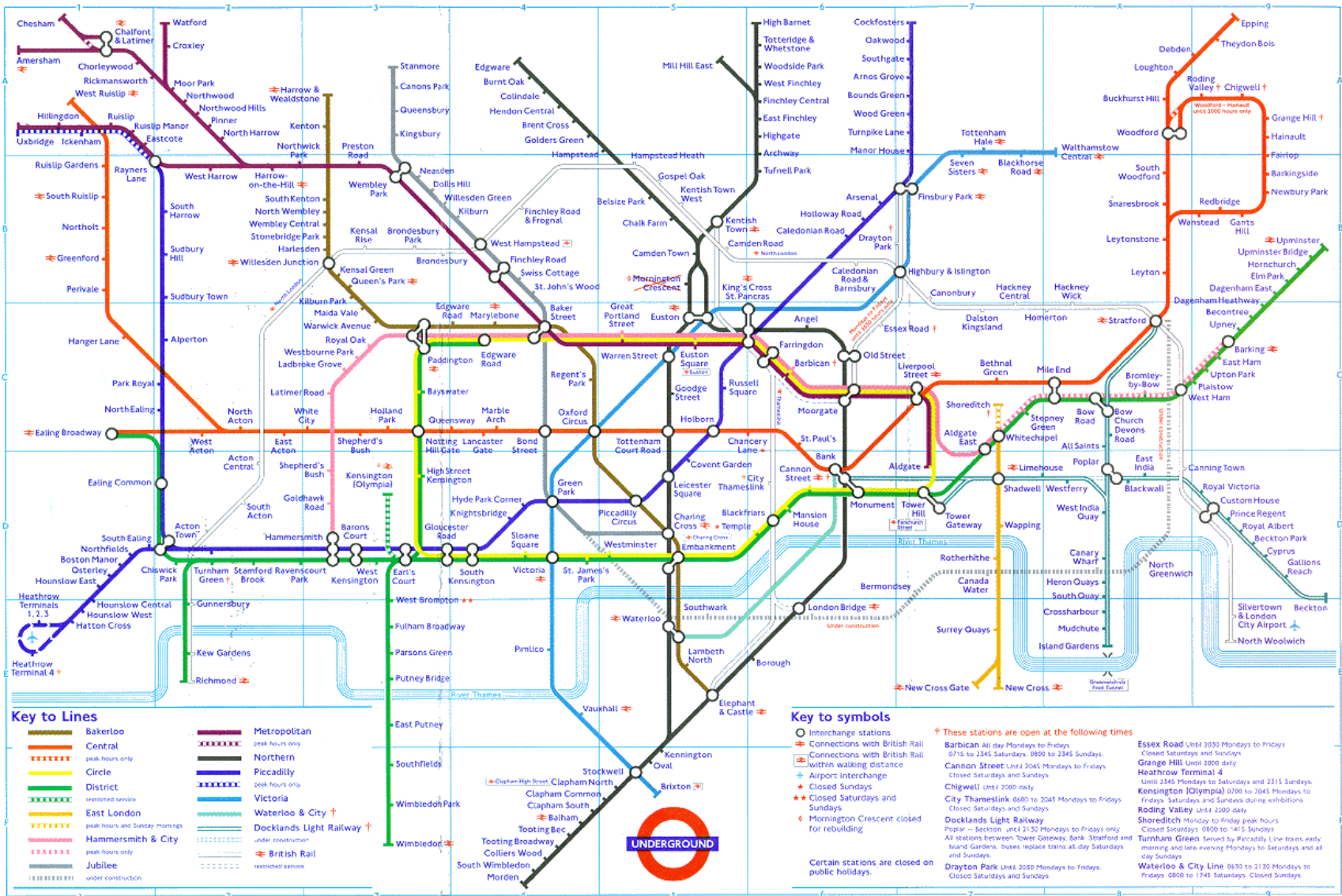
SENEGAL

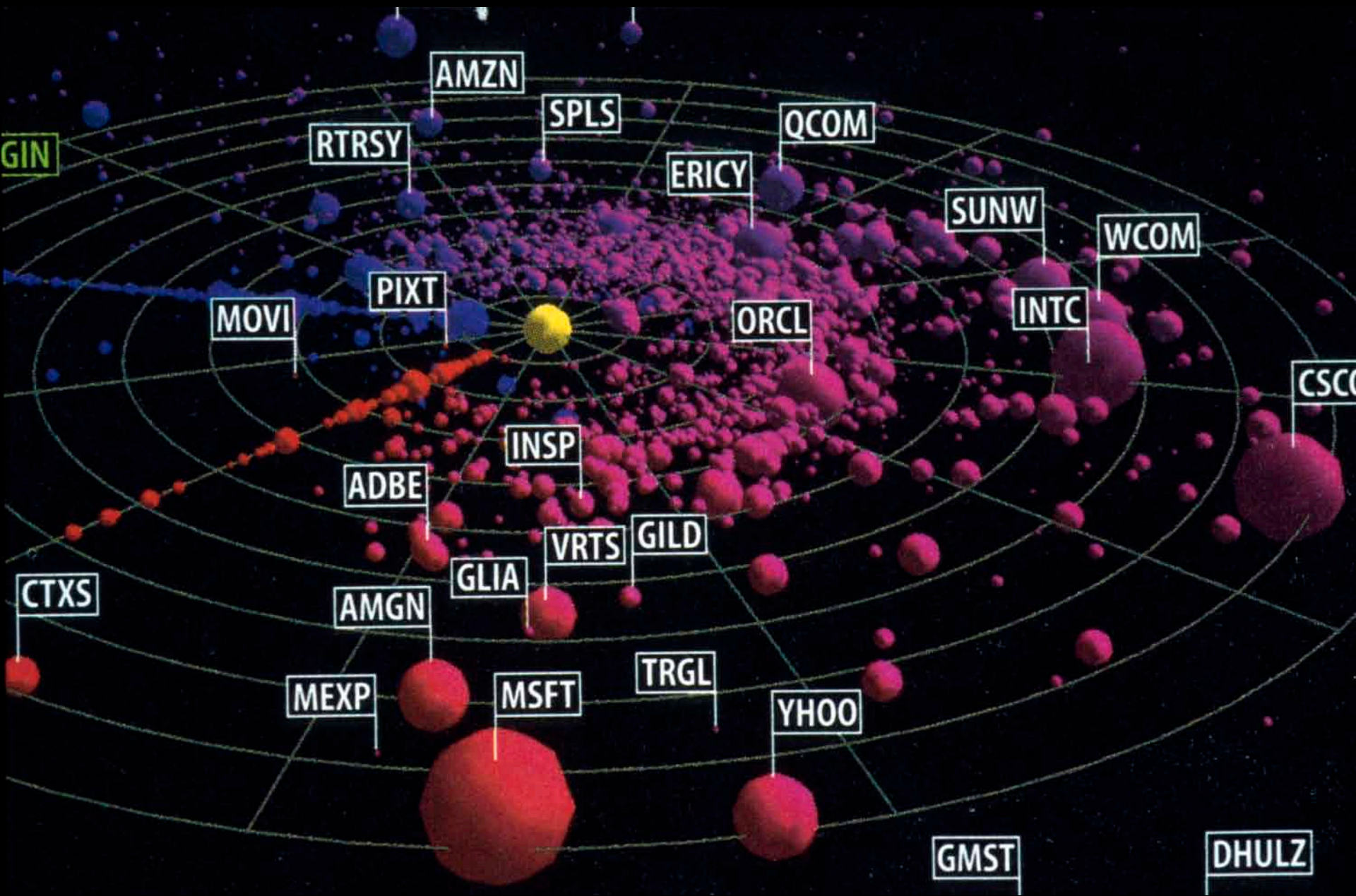


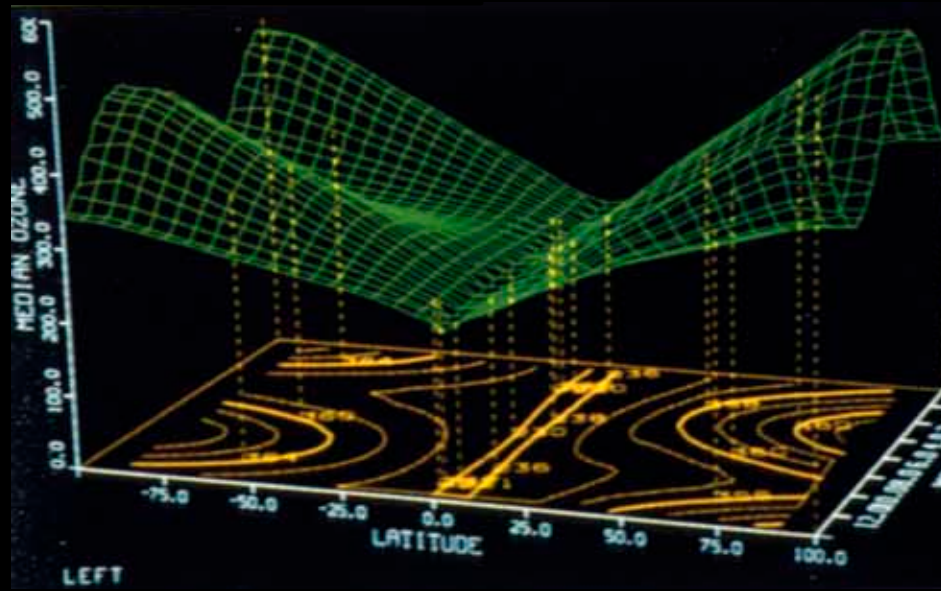
12  
8

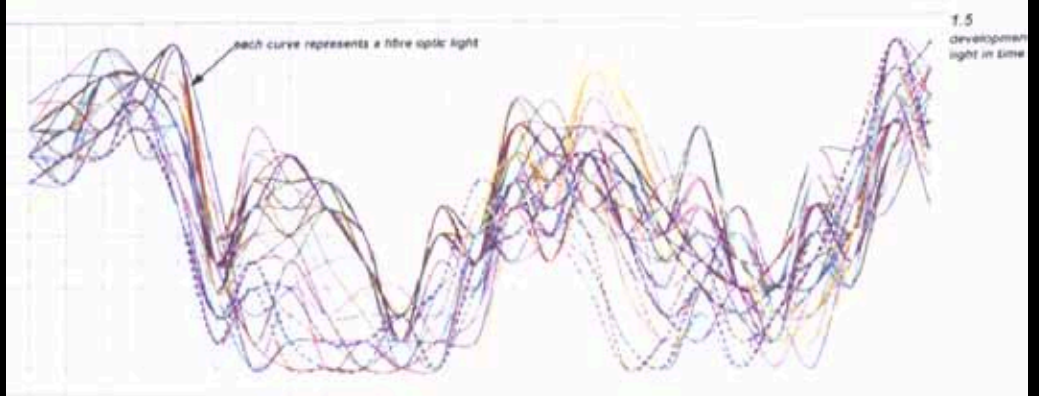


**ADDITIONAL SAMPLES**

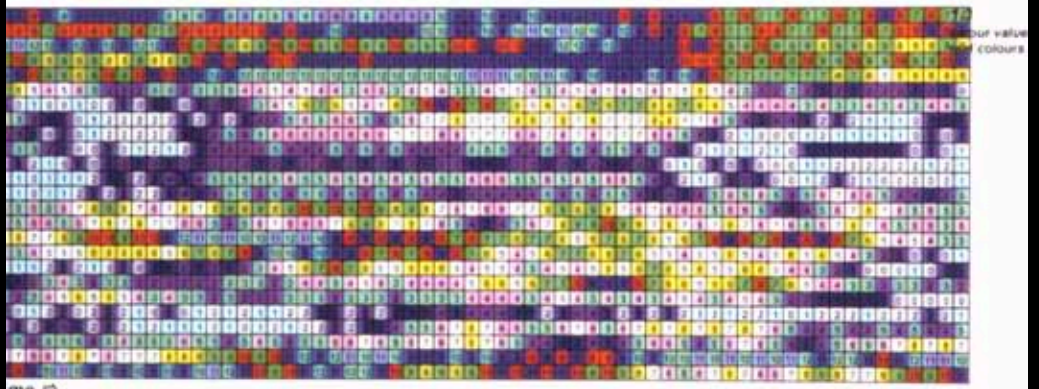








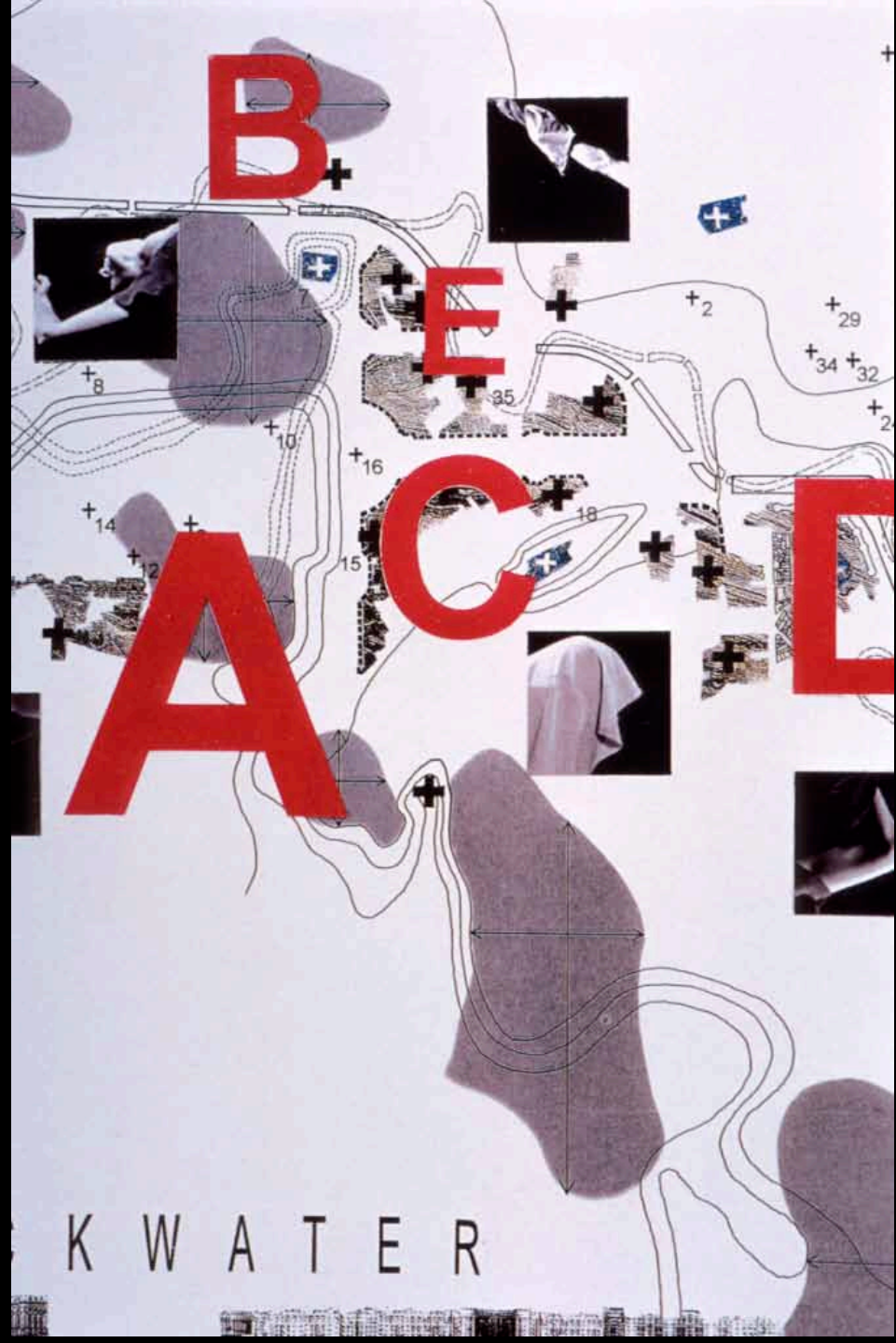
time ↗



time ↗







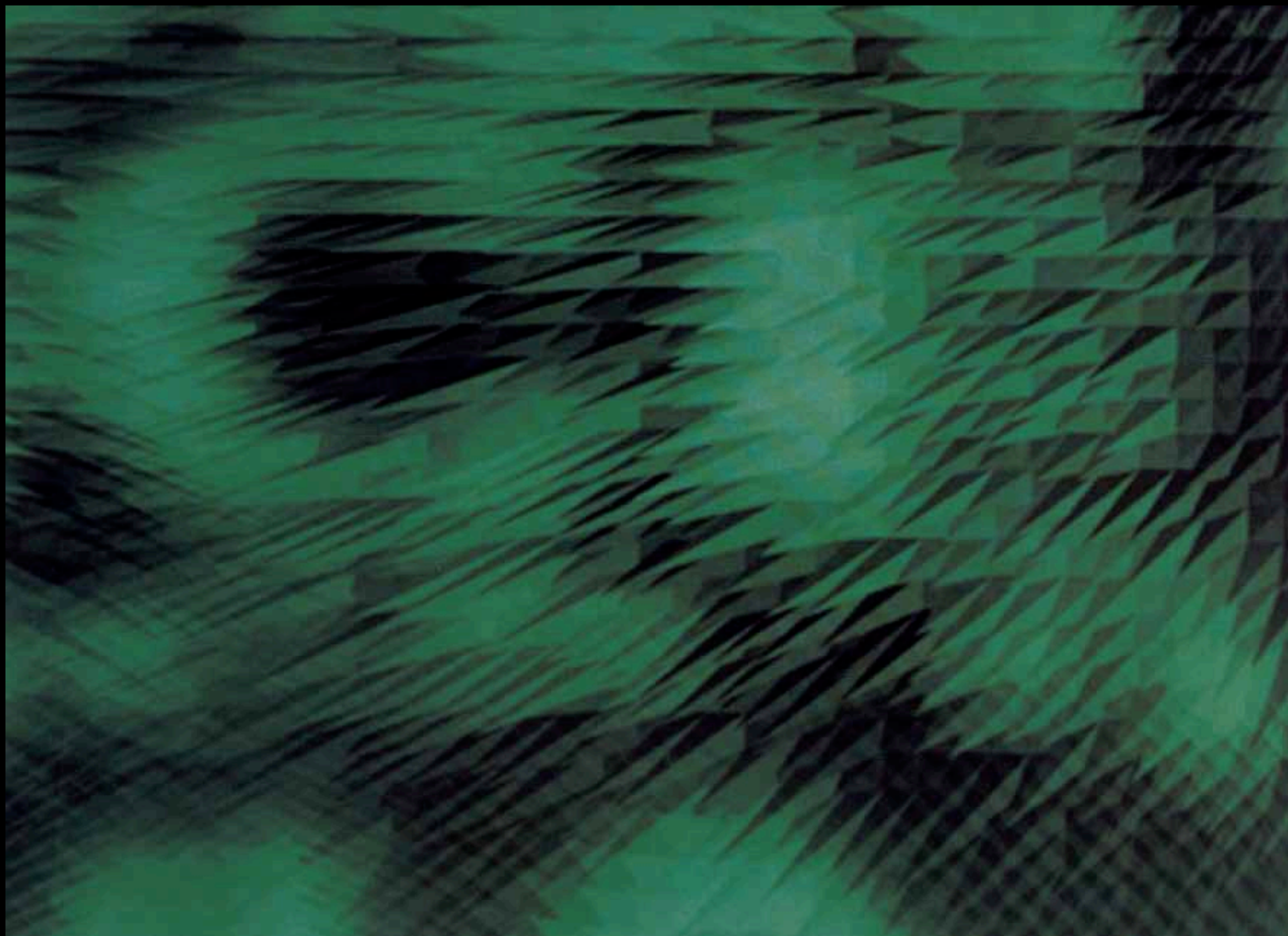
**B**

**E**

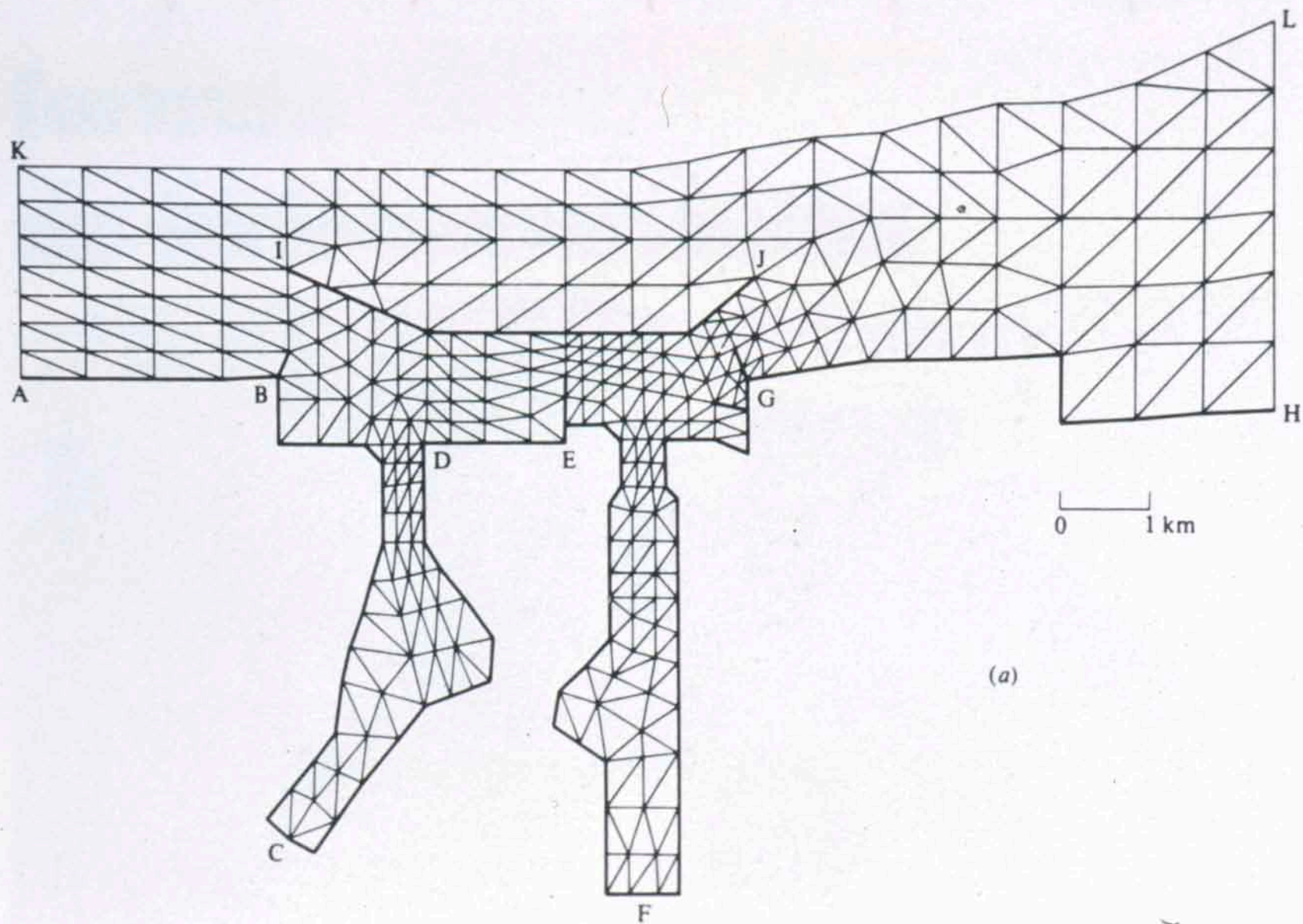
**A C**

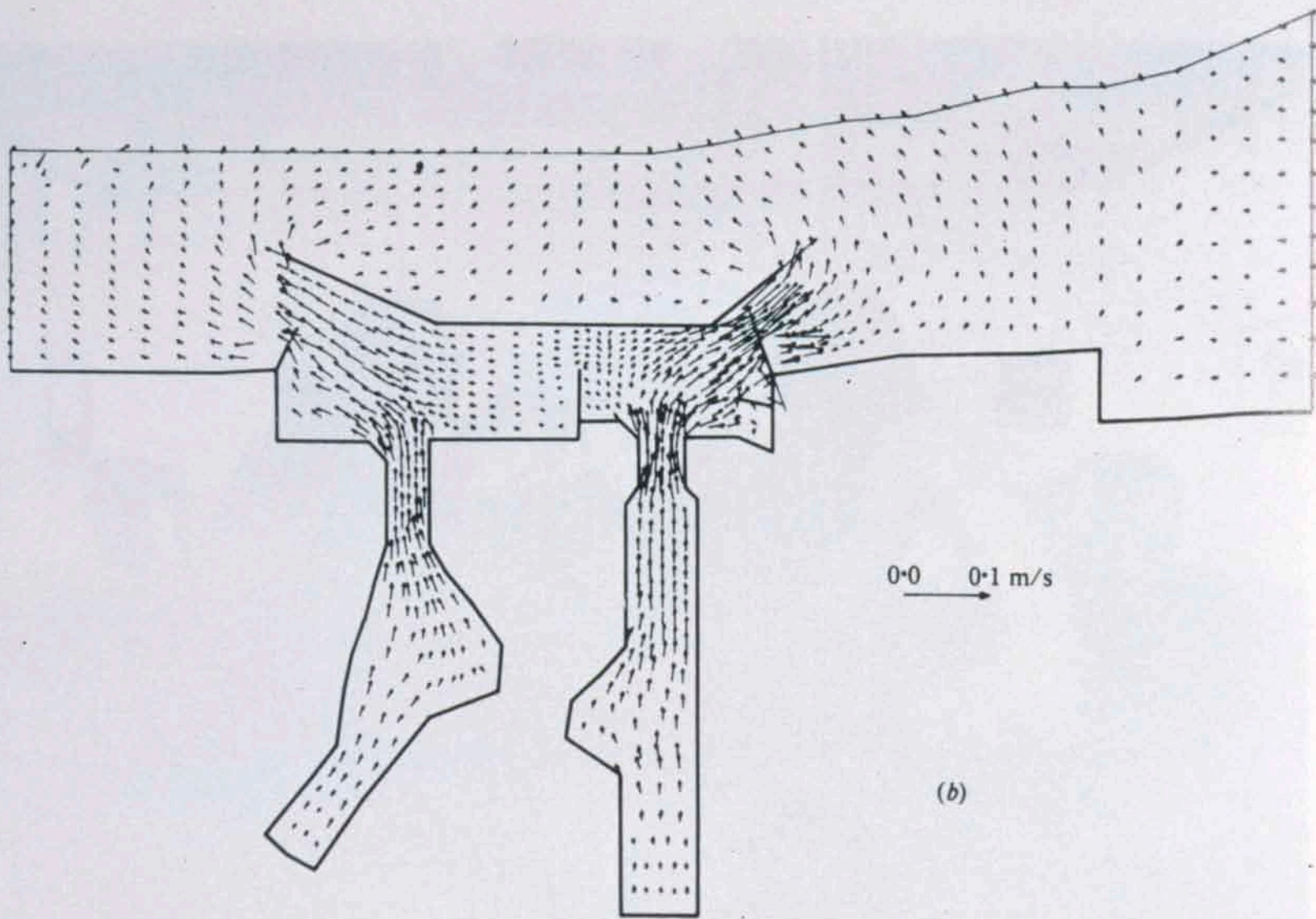
**D**

K W A T E R

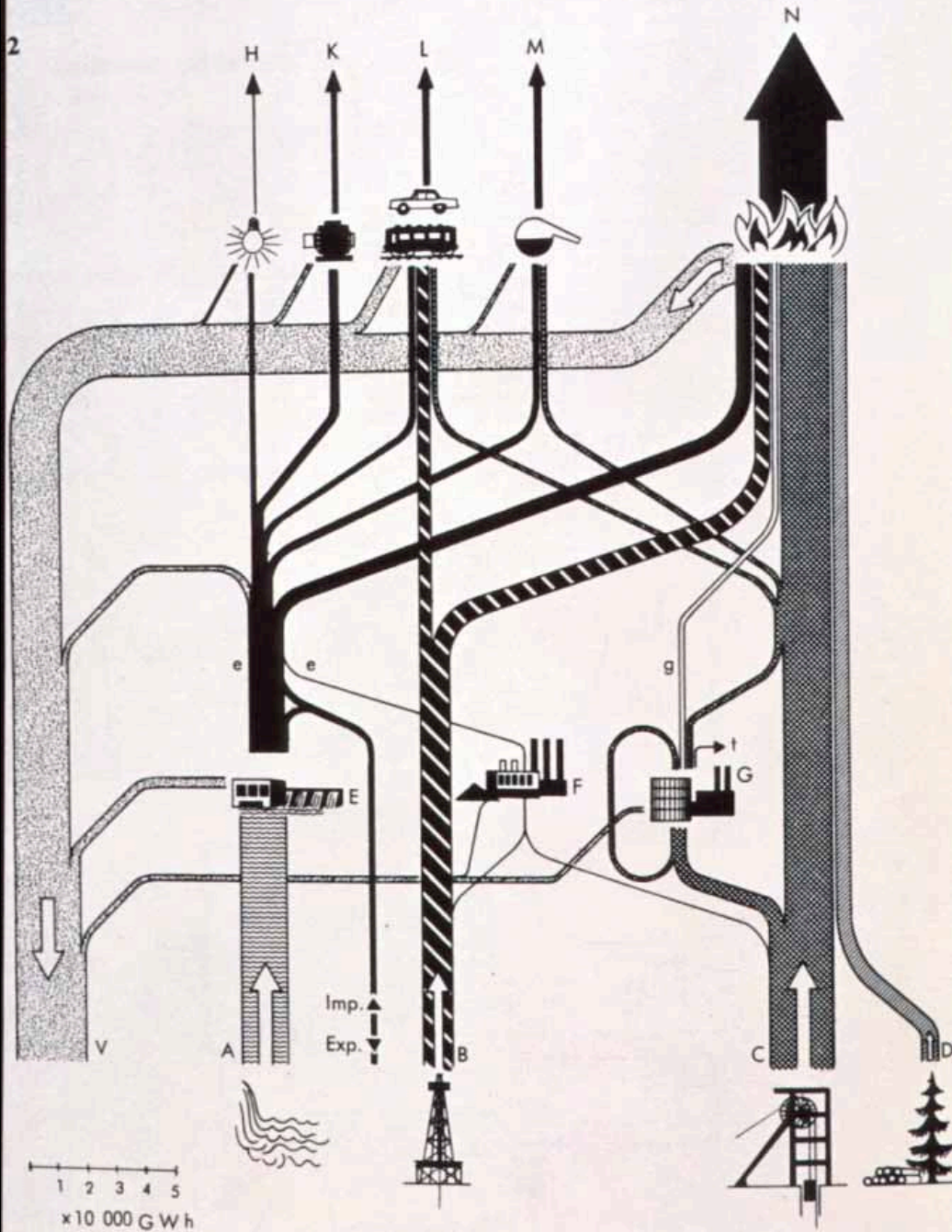








2



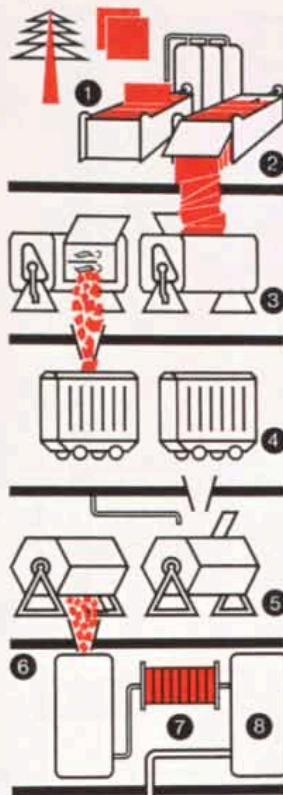
**Schéma de fabrication  
de la rayonne et de la  
FIBRANNE de VISCOSE**

**RAYONNE de VISCOSE**

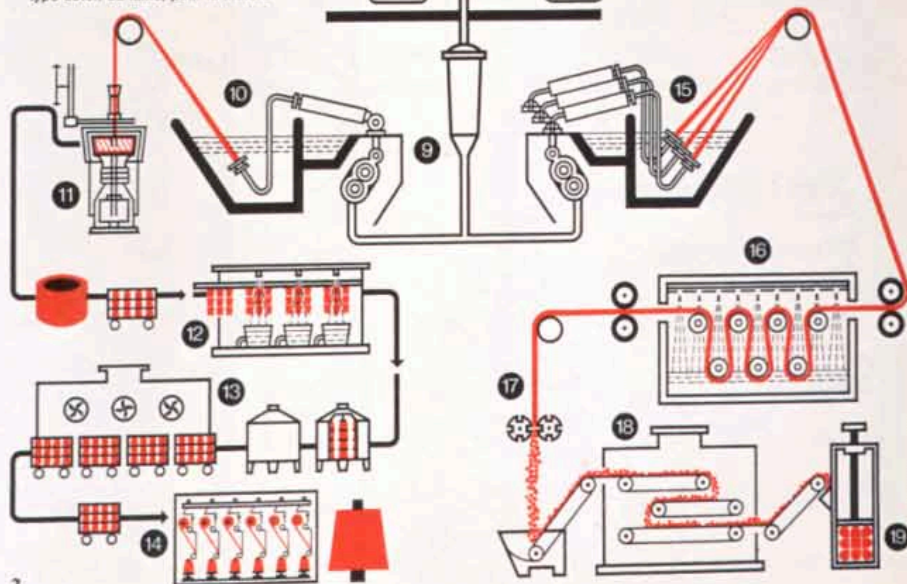
- 1 Produit de base: cellulose obtenue à partir du bois
- 2 Préparation de l'alcali-cellulose par trempage des feuilles de cellulose dans la soude caustique
- 3 Déchiquetage des feuilles pressées d'alcali-cellulose
- 4 Mûrissement de l'alcali-cellulose en cave
- 5 Transformation de l'alcali-cellulose en xanthate de cellulose par action du sulfure de carbone
- 6 Dissolution du xanthate de cellulose dans la soude caustique. Formation de la viscosse
- 7 Filtrage de la viscosse
- 8 Mûrissement de la viscosse
- 9 Dégazage sous vide de la viscosse
- 10 Filature de la rayonne par coagulation de la viscosse en bain acide
- 11 Retardage en un seul fil des brins sortis de la filière et formation des gâteaux dans le pot-turbine
- 12 Désacidification, désulfuration et ensimage des gâteaux de filature
- 13 Séchage et conditionnement des gâteaux de filature
- 14 Bobinage pour la transformation ultérieure

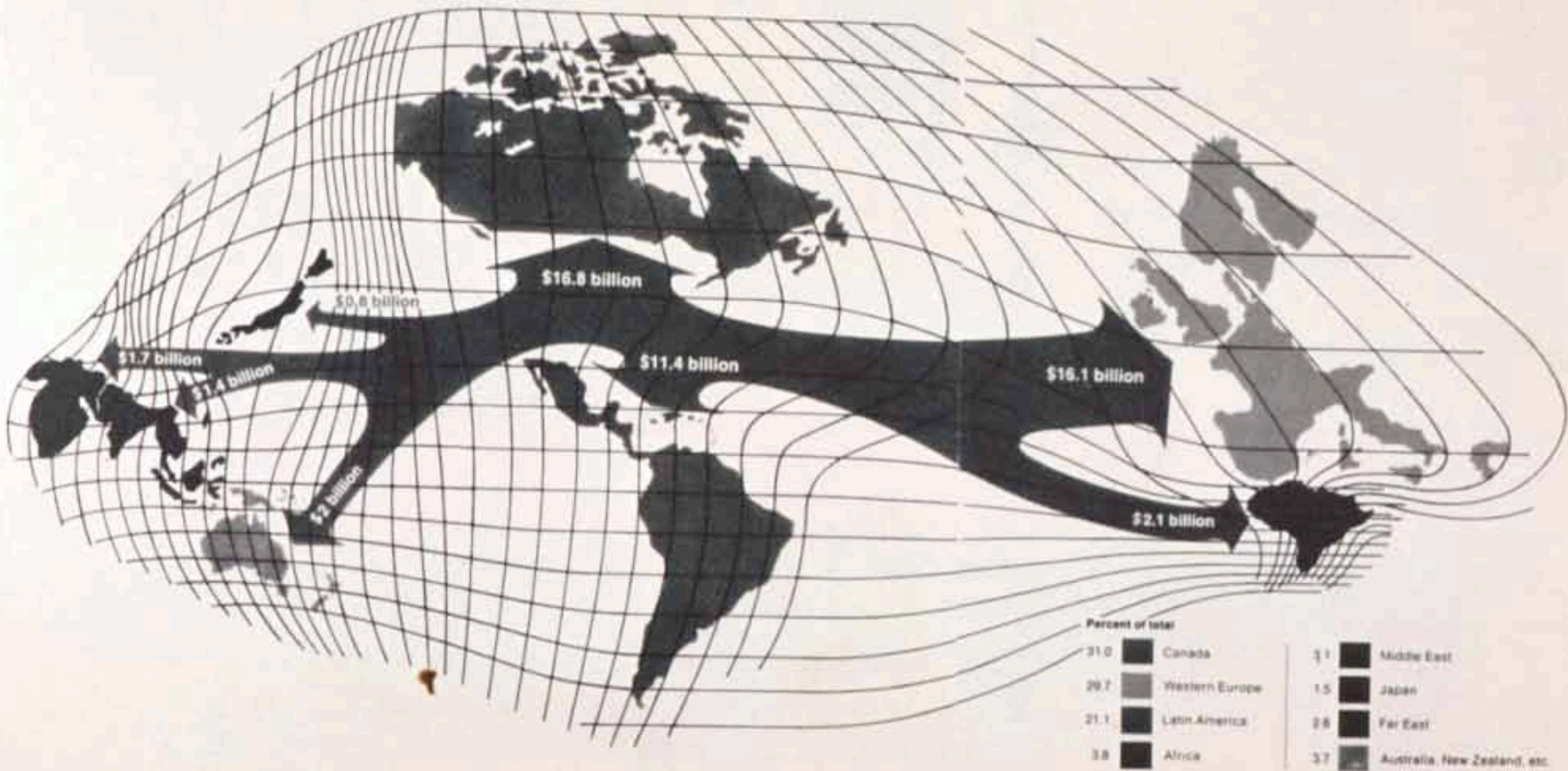
**FIBRANNE de VISCOSE**

- 15 Filature de la FIBRANNE (analogue à celle de la RAYONNE) sous forme de grosses mèches continues
- 16 Désacidification, désulfuration et ensimage de la mèche continue
- 17 Coupage de la mèche en fibres discontinues de longueurs désirées. Formation de la FIBRANNE
- 18 Séchage de la FIBRANNE
- 19 Présentation finale de la FIBRANNE, type coton ou laine, pour la filature

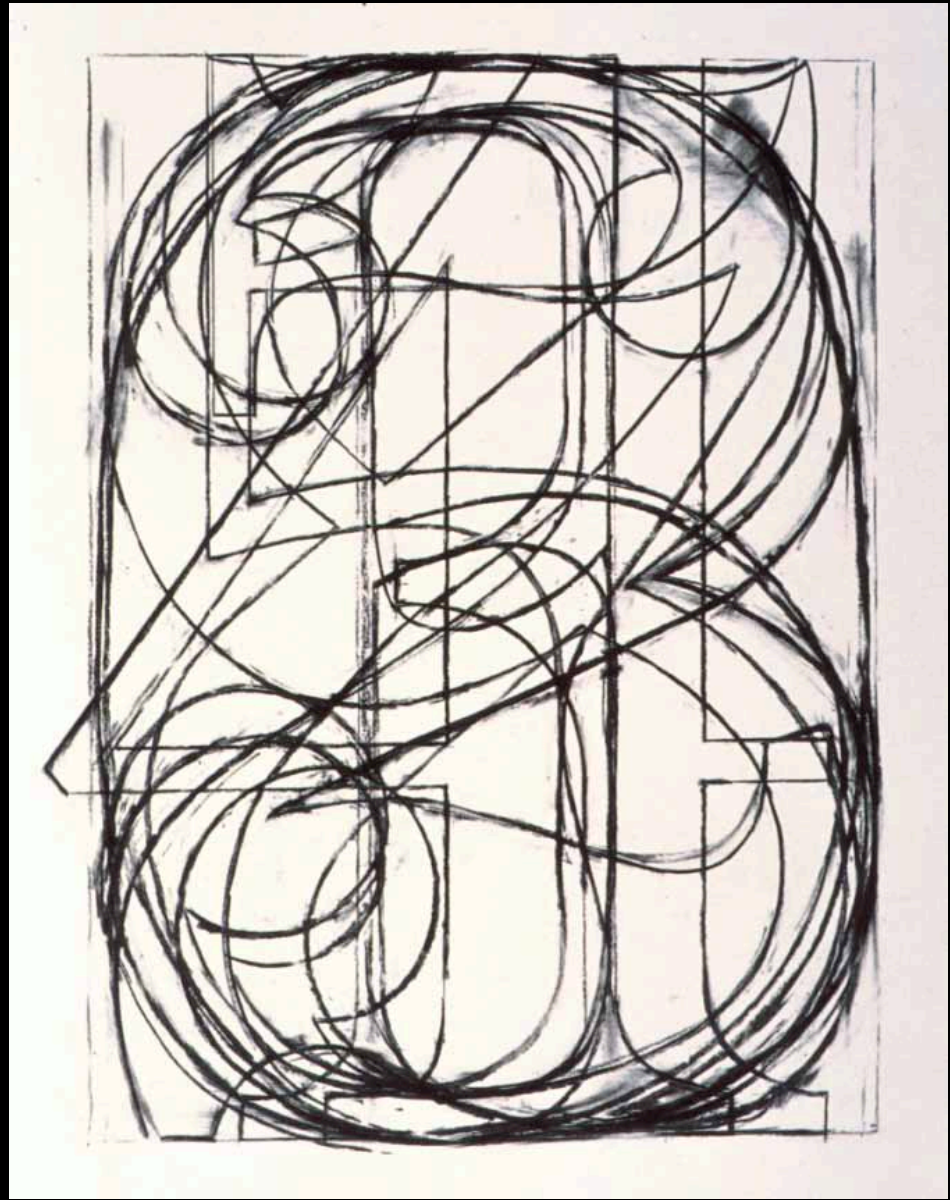


PONTESA® = marque déposée par la VISCOSE SUISSE, Emmenbrücke, pour tout produit contrôlé, fabriqué avec sa viscosse et répondant à ses standards.



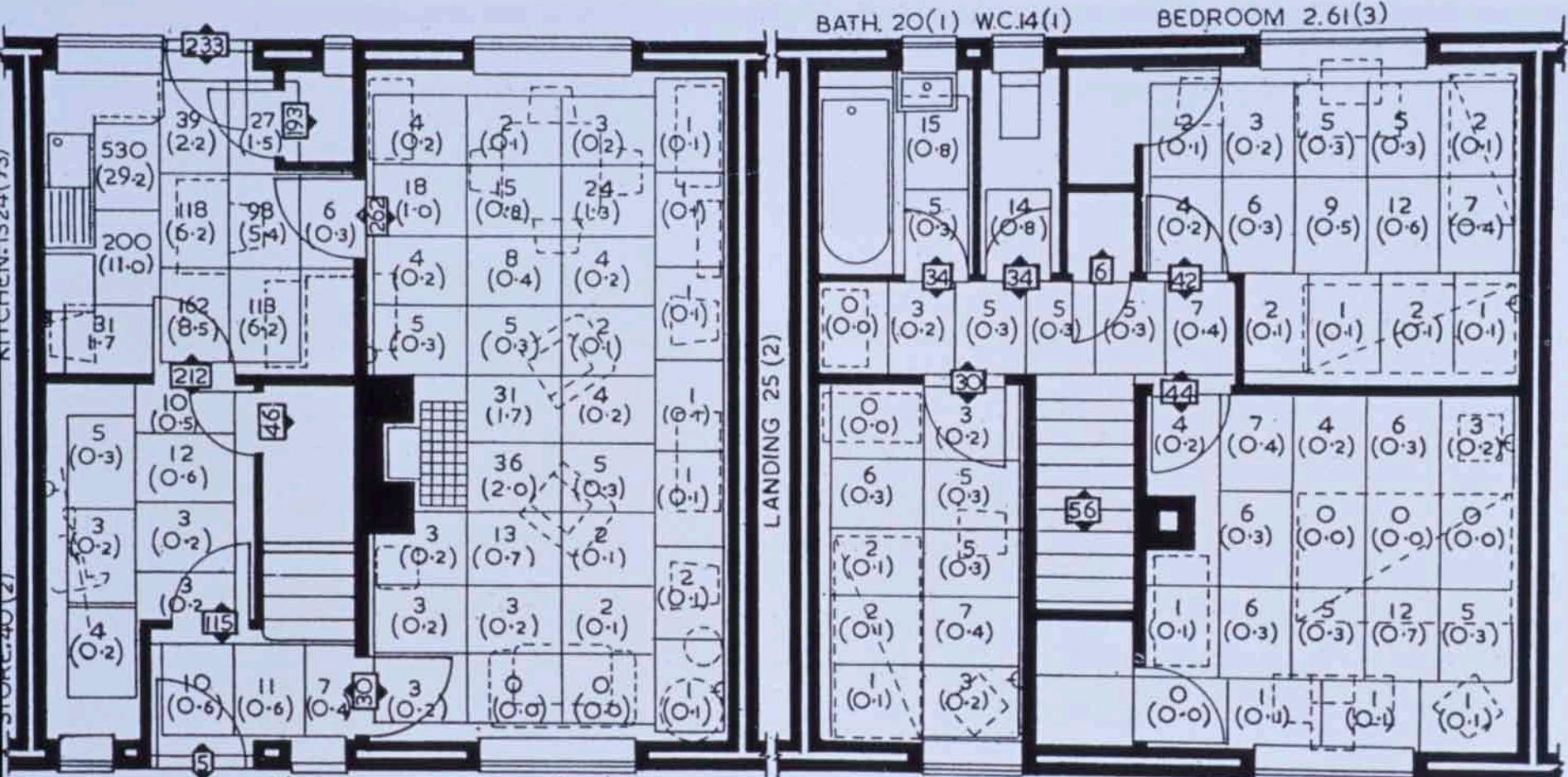






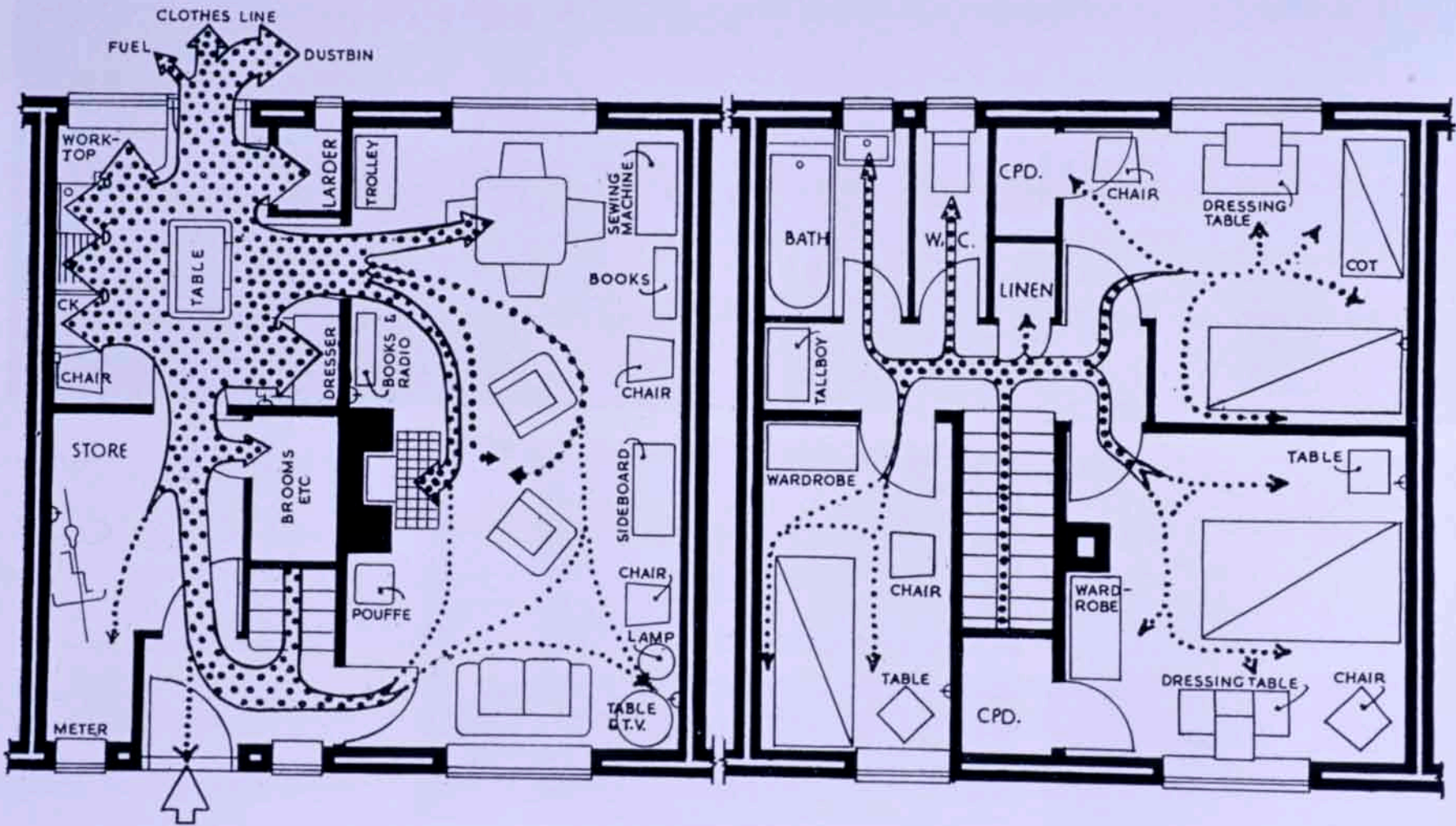
KITCHEN: 1324 (73)

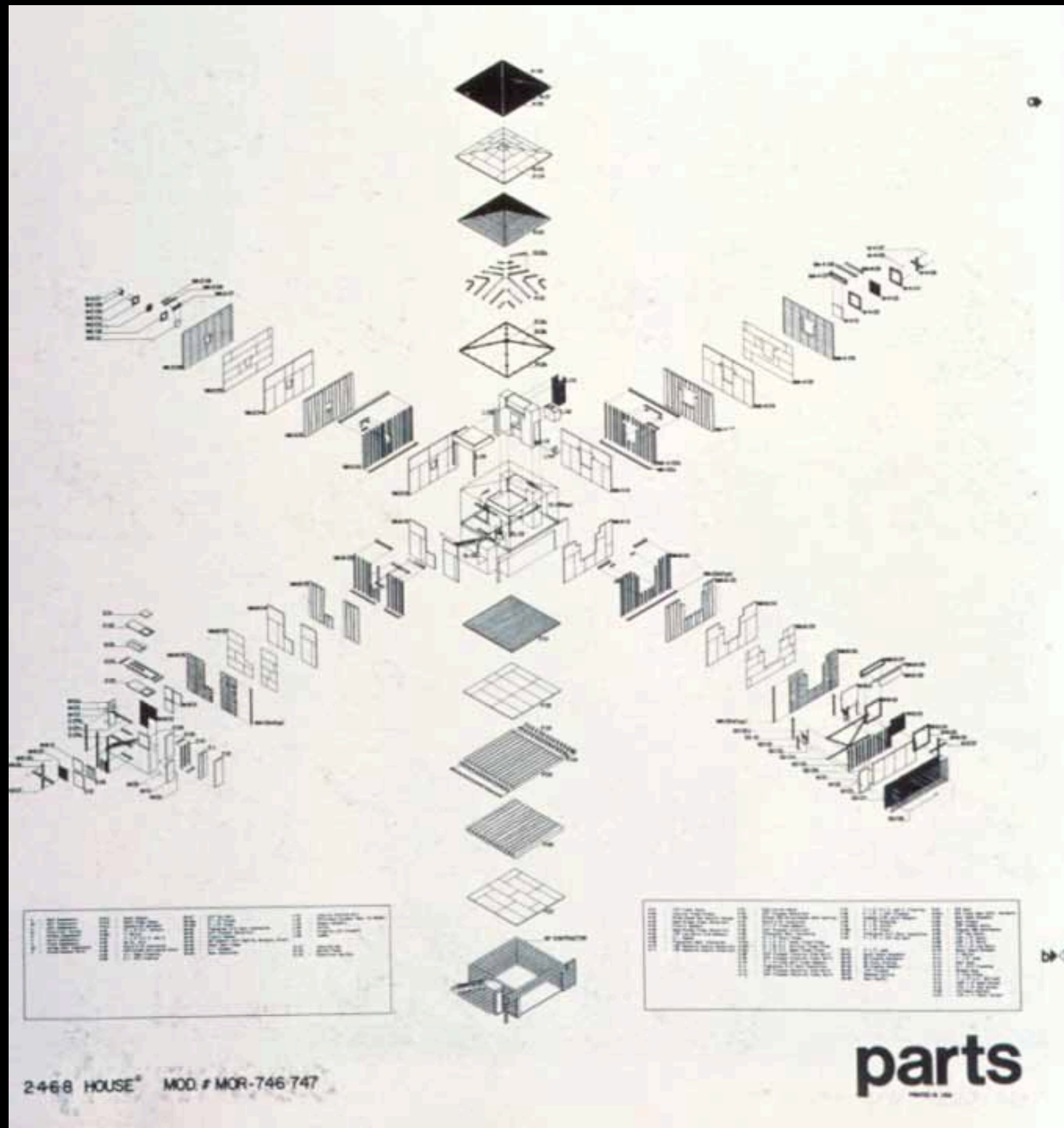
STOR: 40 (2)



**KEY:** - MINUTES: 14    PERCENTAGES: (6-2)    TOTALS: KITCHEN 1324 (73)    ENTRIES AND EXITS **262**





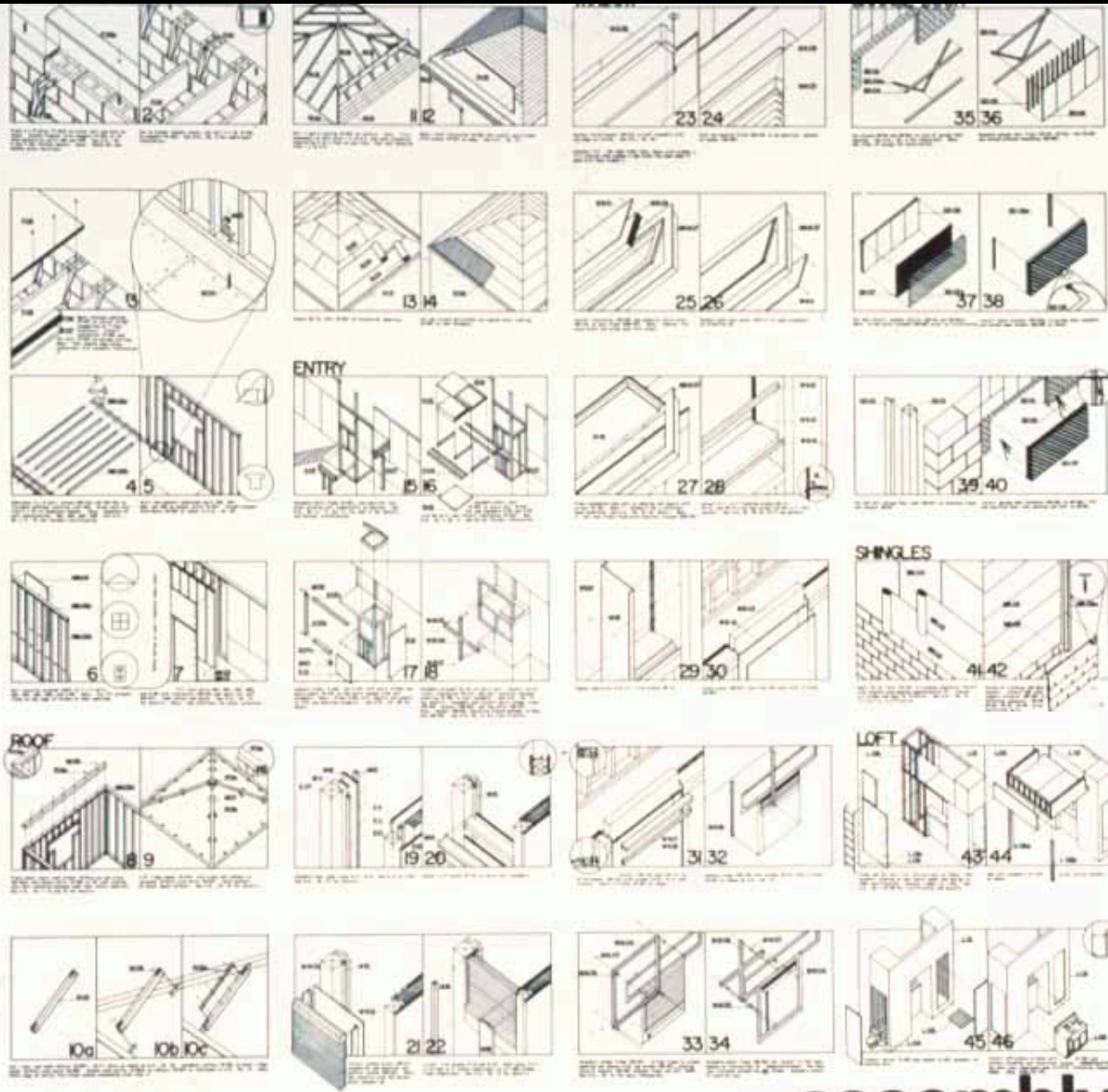


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2468 HOUSE<sup>®</sup> MOD # MOR-746 747

**parts**



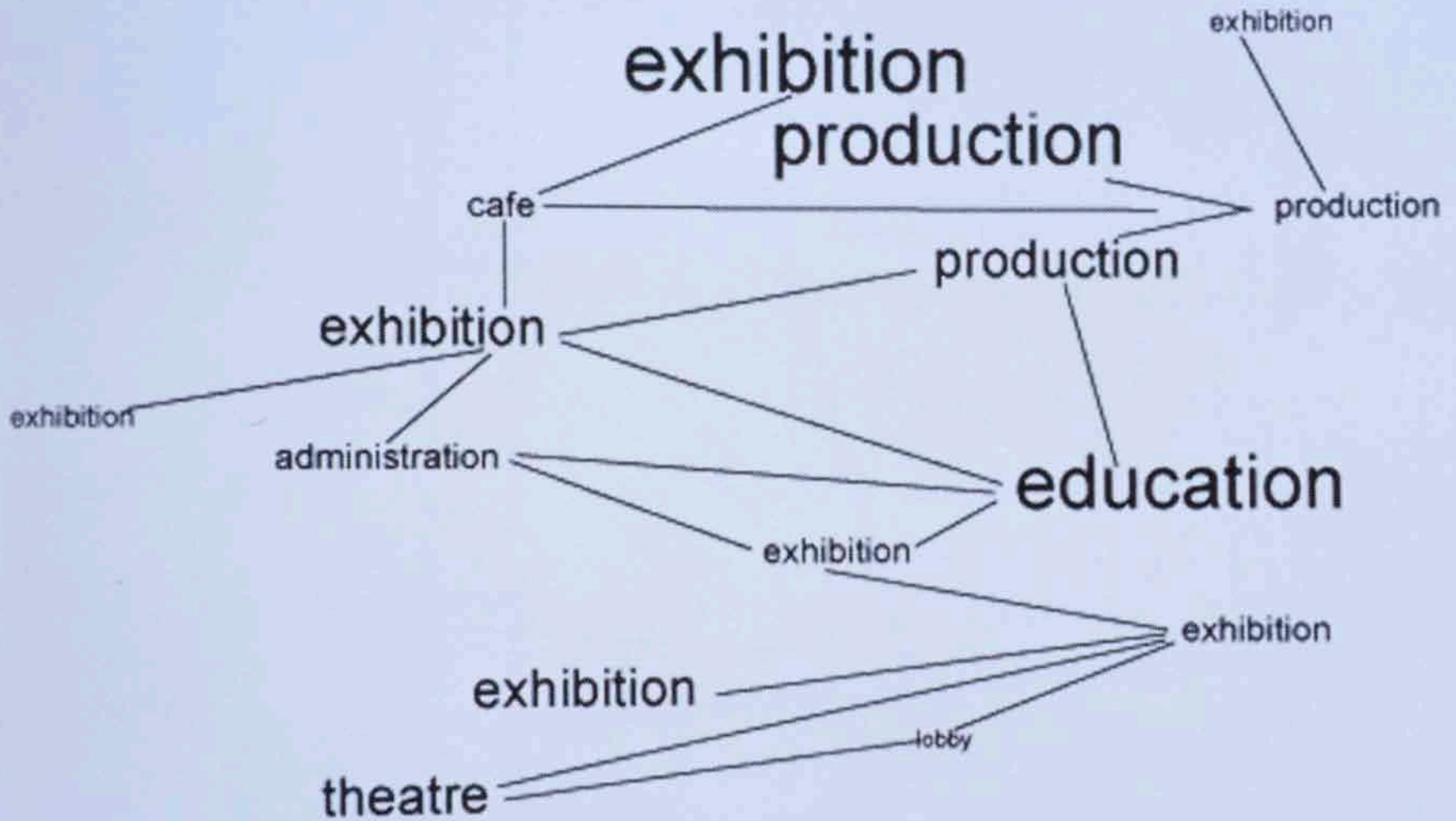
2-46-B HOUSE® MOD. # MOR-746-747

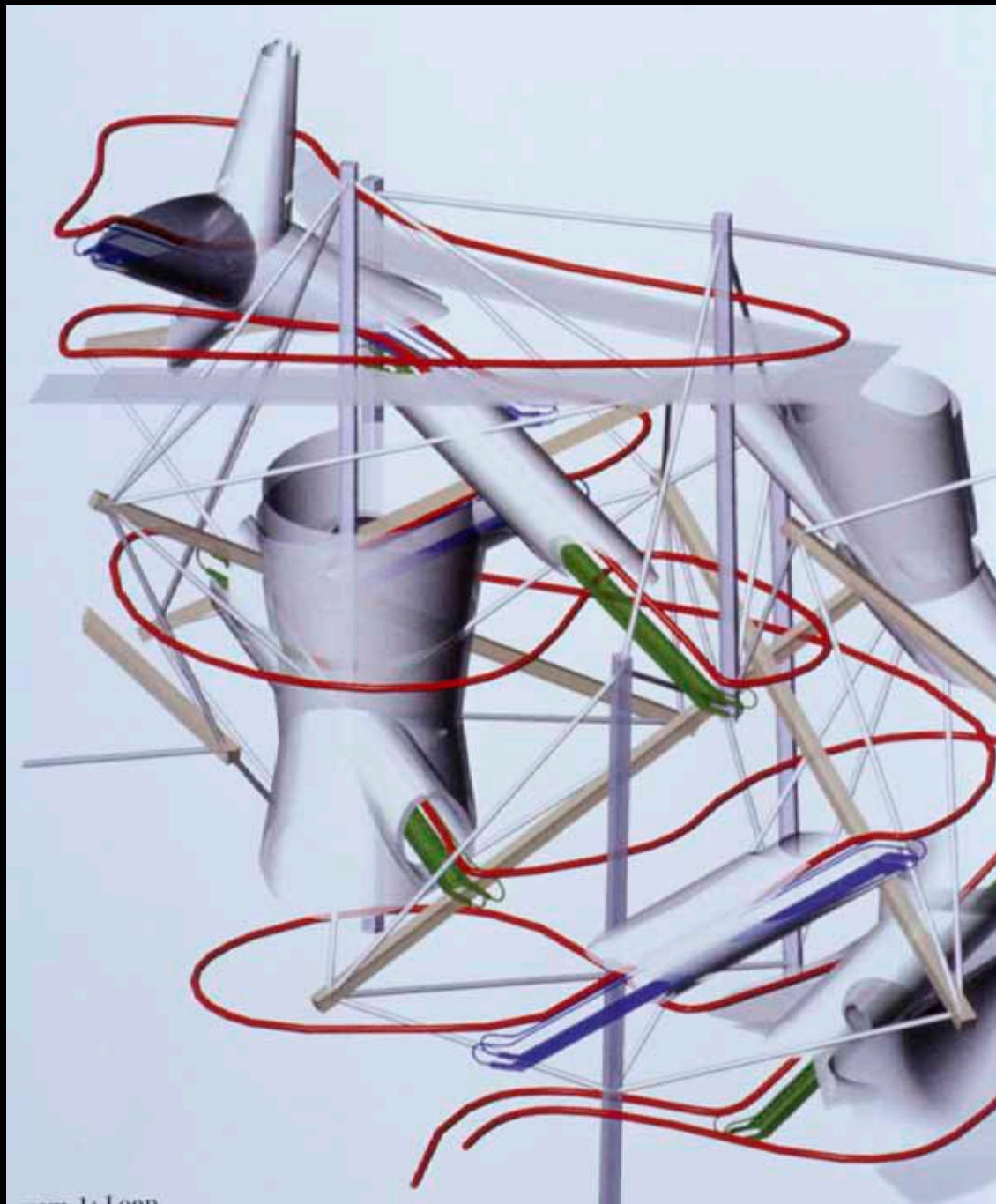
**assembly**





**PRESTON SCOTT COHEN**







Phase 1



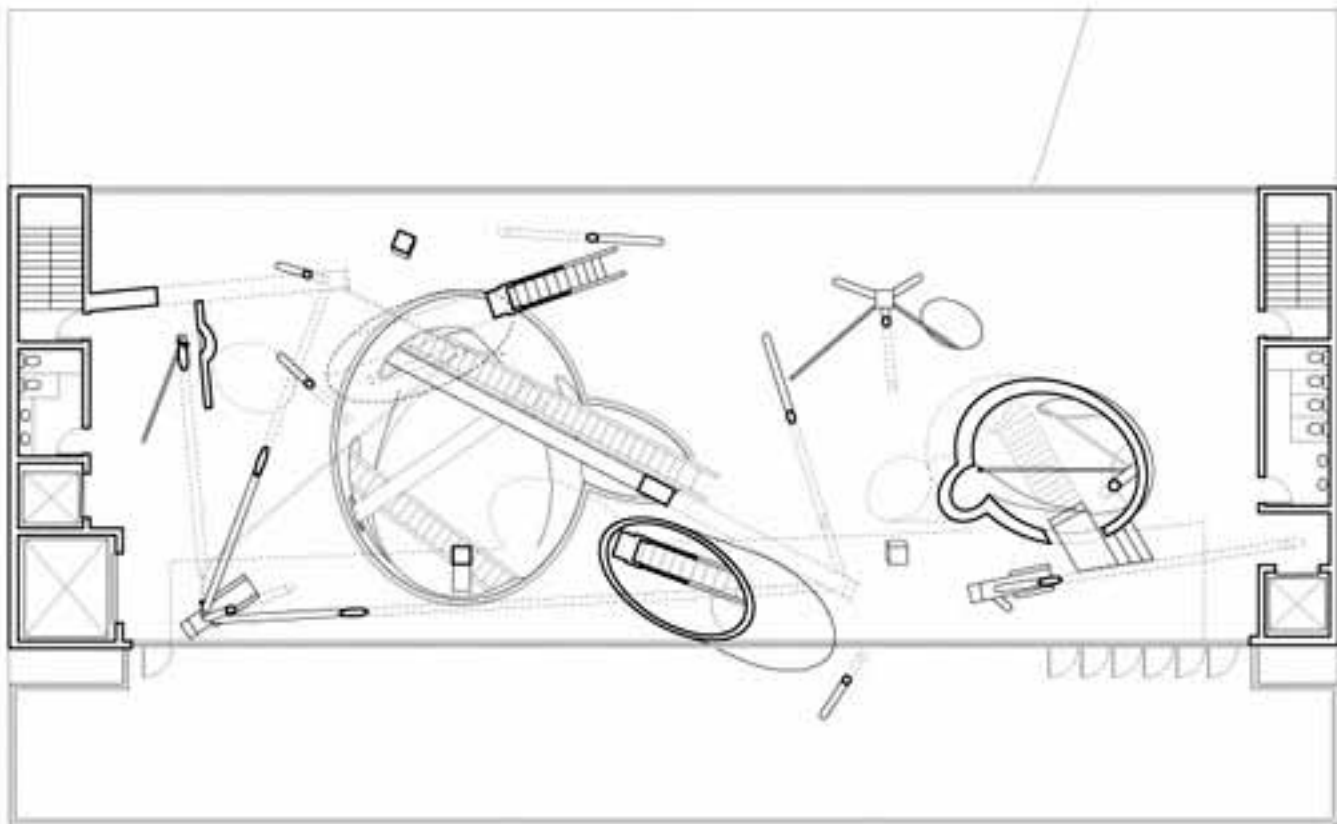
Phase 2



Phase 3



- exhibition
- tenant
- production
- education
- cafe
- support
- theatre
- core
- administration

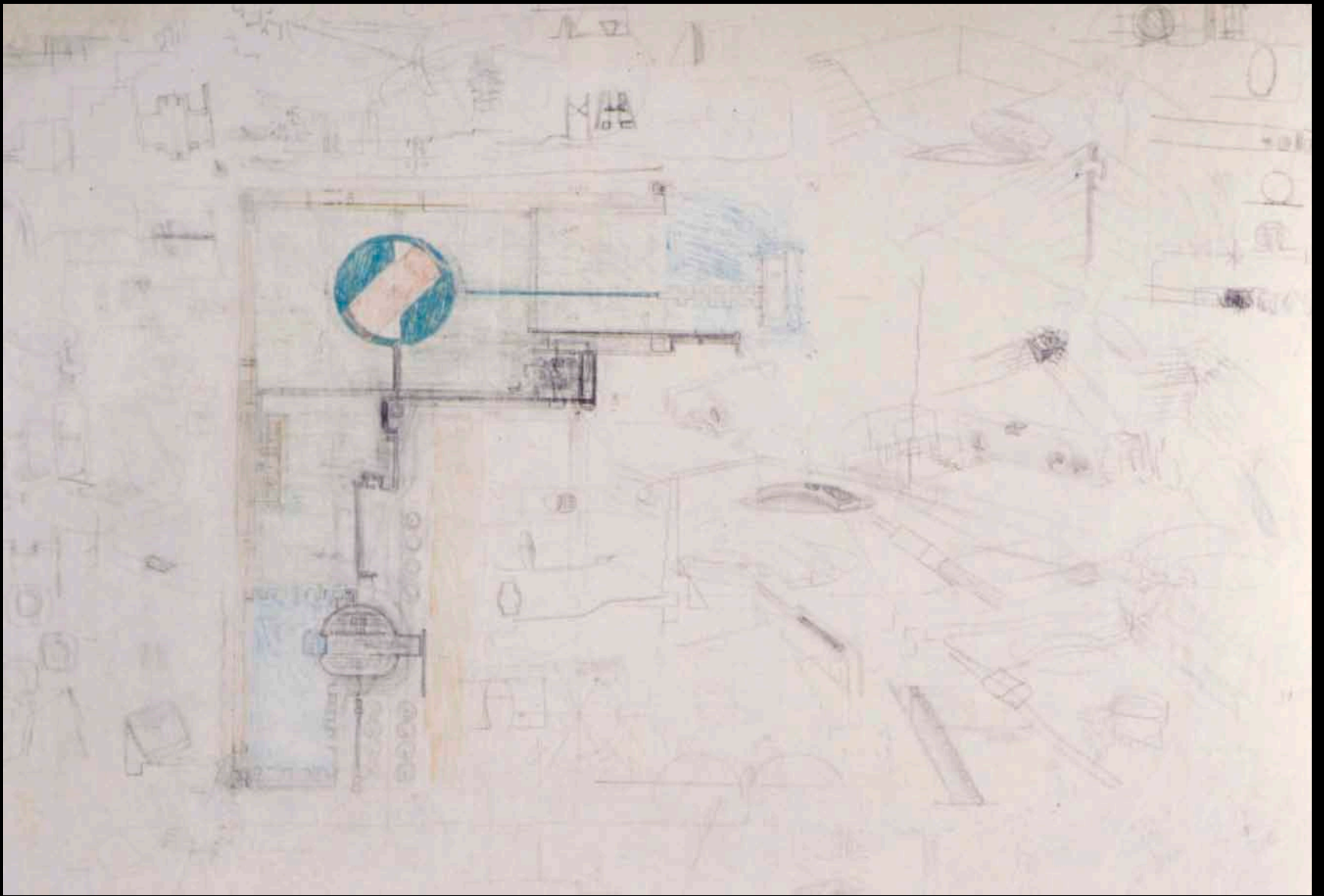


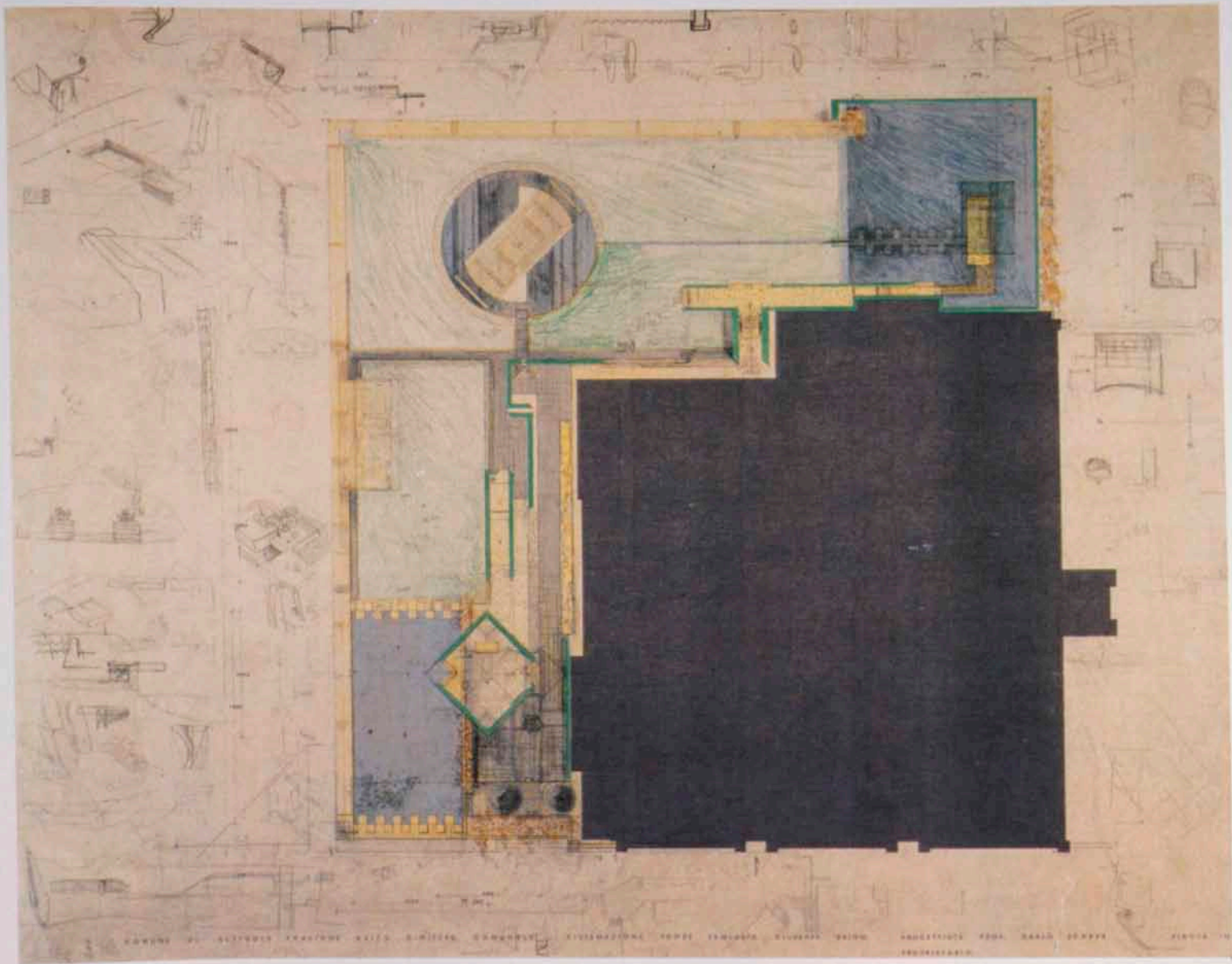




**CARLO SCARPA**

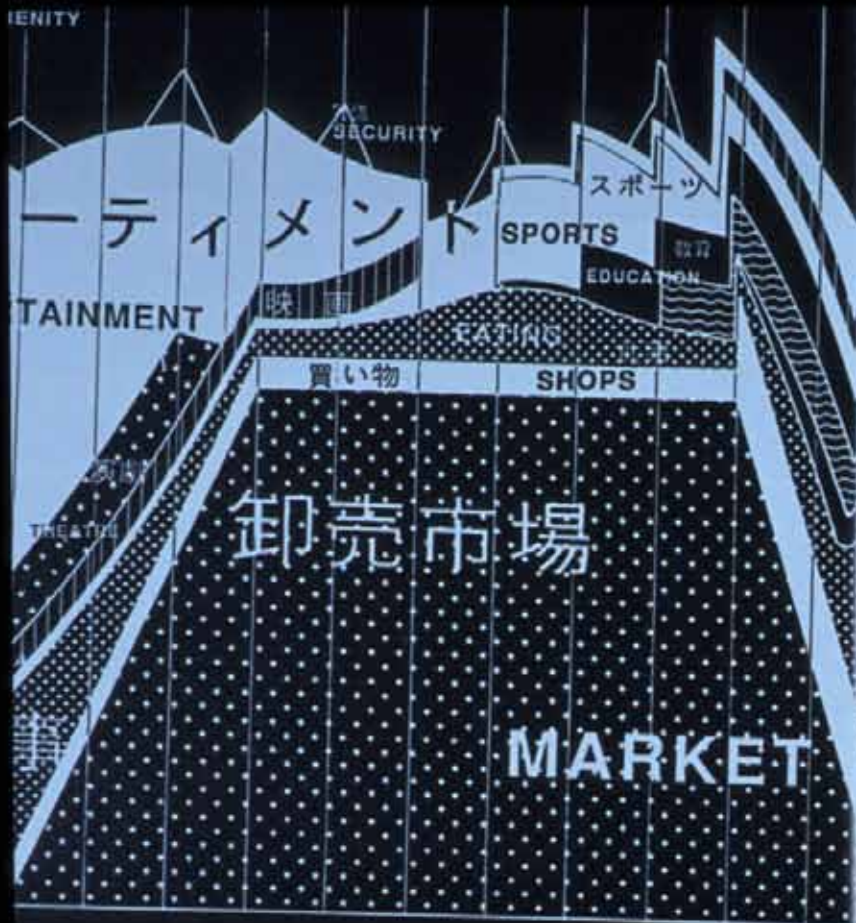






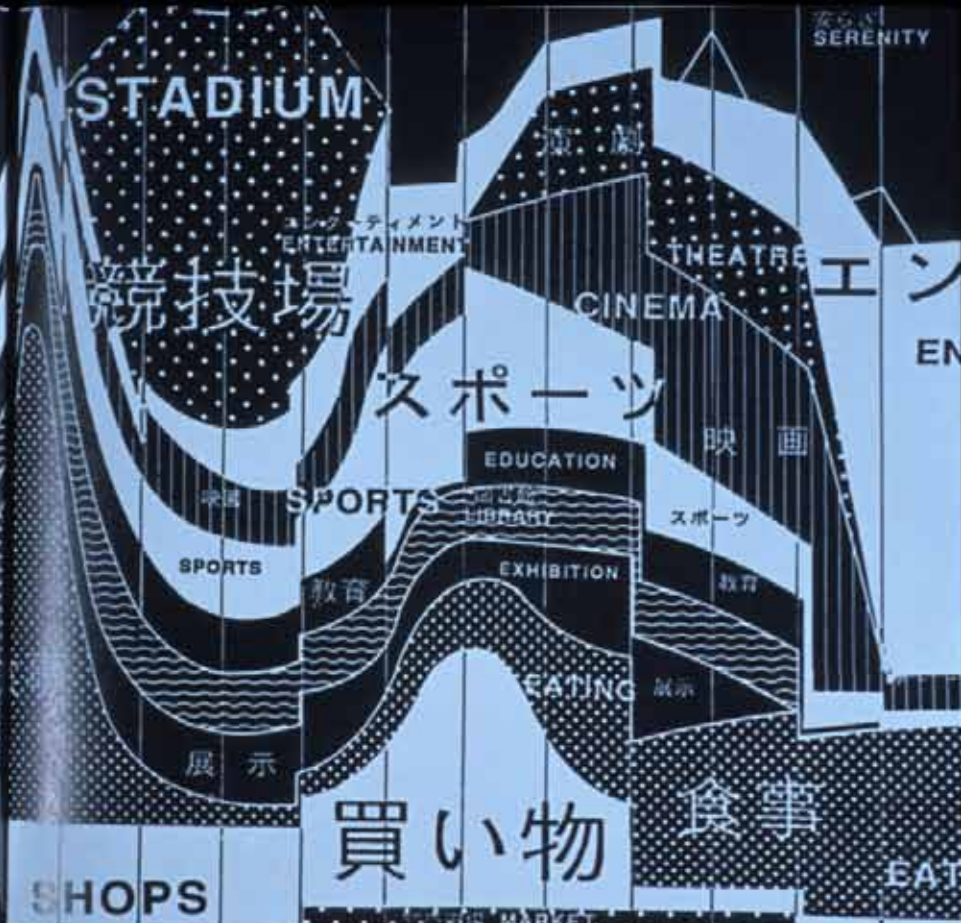


**REM KOOLHAAS: OMA**



2 3 4 5 6 7 8 9 10 11

グラムの構成  
E OF PROGRAMS  
—— 平日  
- - - 休日



13 14 15 16 17 18 19 20 21 22 23 24

IT BECAME OBVIOUS THAT WE WOULD HAVE TO INVENT PROGRAMS TO FILL THE REST OF THE DAY, WHICH WOULD ACHIEVE MAXIMUM USE OF THE EXISTING INFRASTRUCTURE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

テイメント  
TAINMENT

宗教  
RELIGION

エンター  
ENTER

劇場  
THEATRE

競技場  
STADIUM

劇場  
THEATRE

映画  
CINEMA

映画  
CINEMA

SPORTS

スポーツ

卸売市場  
MARKET

図書館  
LIBRARY

図書館  
LIBRARY

LIBRARY

MARKET

EXHIBITION

展示

ING

EATING

食事

EAT

買い物  
SHOPS

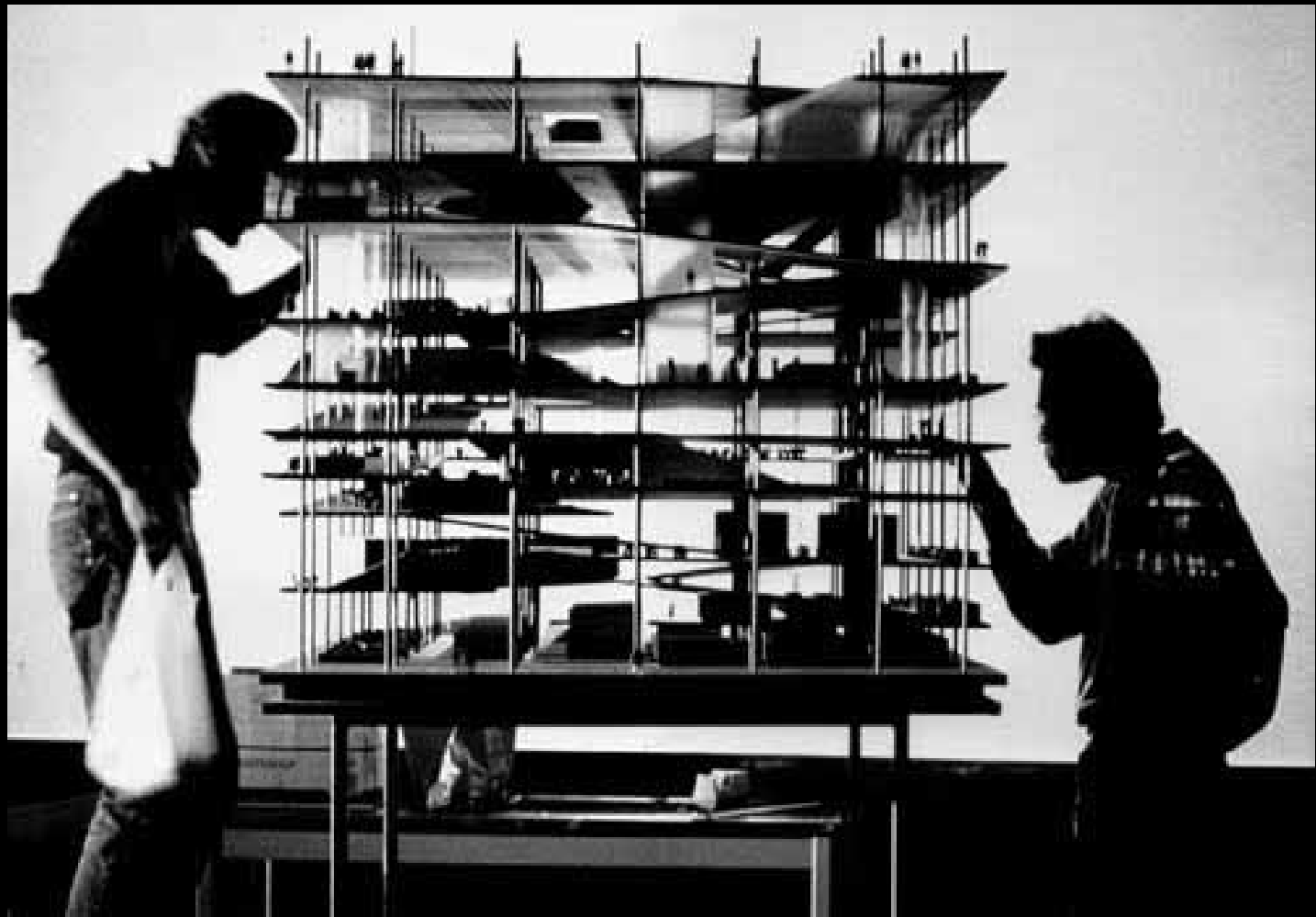
SHOPS

SHOPS

買い物

セキュリティ  
SECURITY

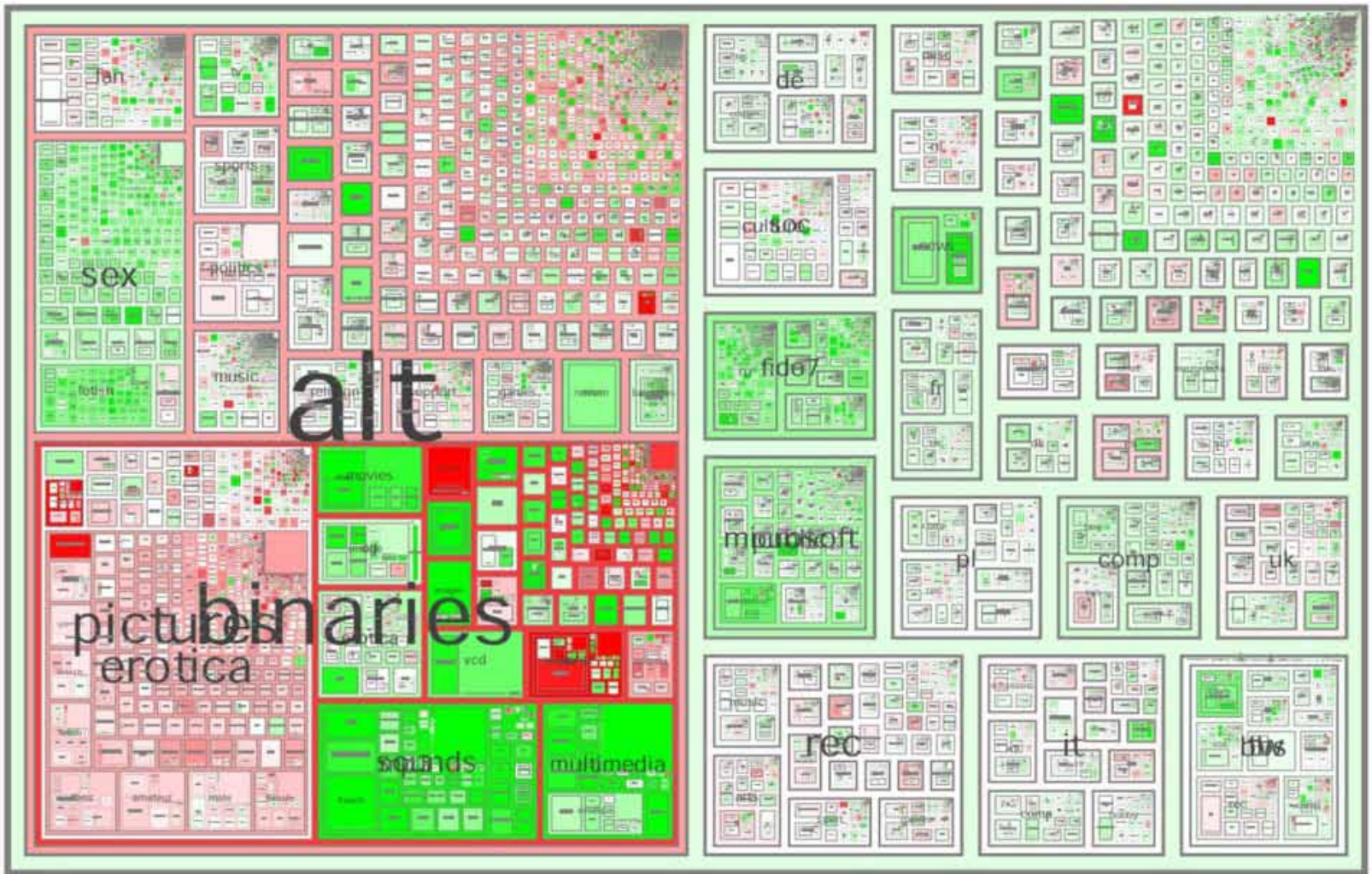
セキュリティ  
SECURITY





**COOP HIMELBLAU**

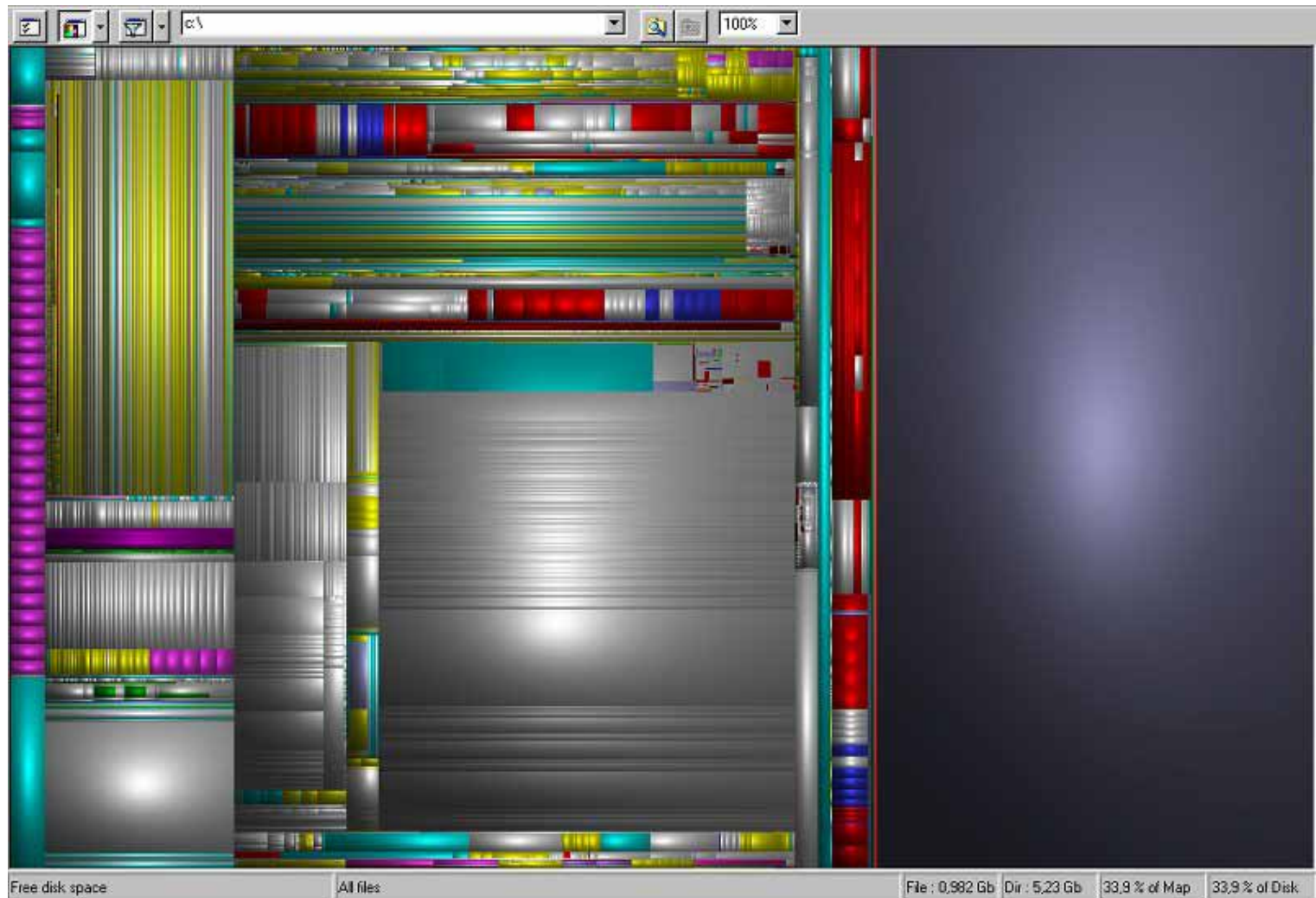




# TREE MAPS

<http://smartdatacollective.com/Home/16512>



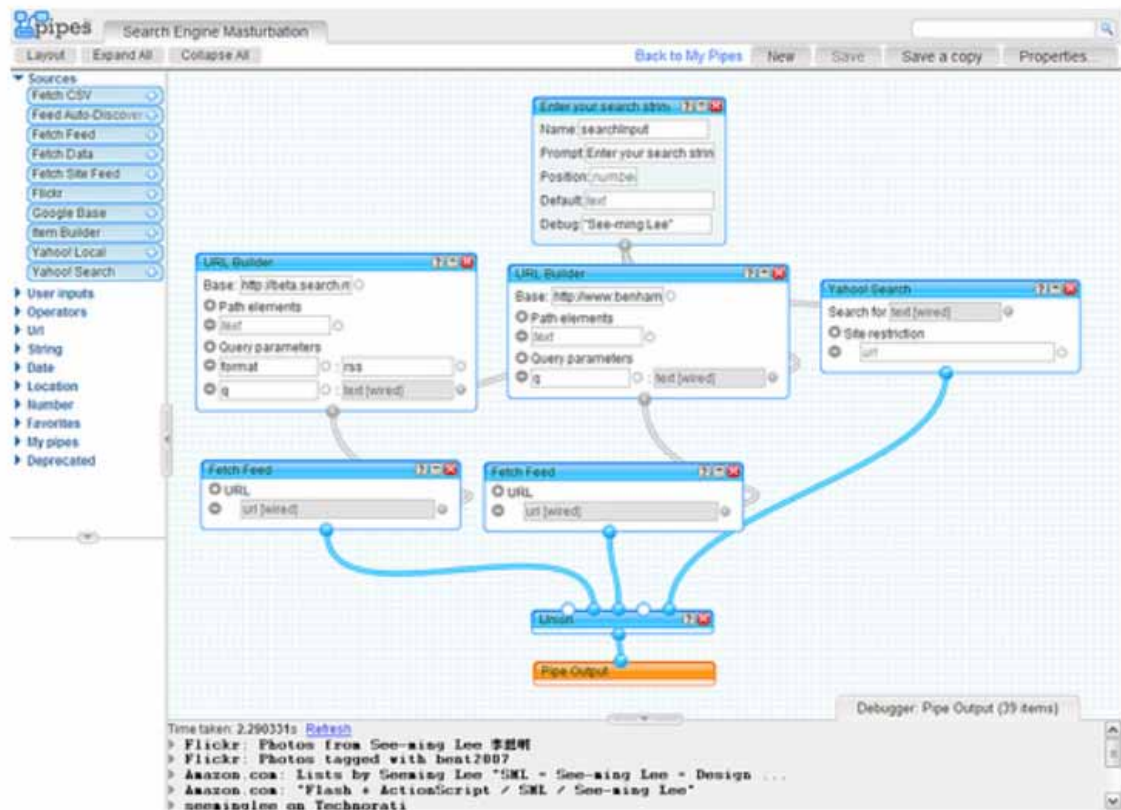


# TREE MAPS

<http://www.smartmoney.com/map-of-the-market/>



# GAPMINDER



## Yahoo Pipes: Search Engine Masturbation: Source / 2007.09.13 / SML

[Search Engine Masturbation](#) = Google Search + Live Search + Yahoo Search + RSS

### Concept

Instead of daily vanity/ego search, create a Yahoo Pipe to search simultaneously using Google, Live and Yahoo and turn them into an RSS feed. In other words, instead of turning yourself into a bot to monitor the bots' activities, spend your time to create relevant content be indexed instead!

1. SML Flickr: SEM: Service
2. SML Flickr: SEM: Run Pipe
3. SML Flickr: SEM: Run Pipe: See-ming Lee

[SML Pro Blog: Yahoo Pipes: Search Engine Masturbation](#)

[SML Wiki: Search Engine Masturbation](#)

# YAHOO PIPES

# BRATH, R.

Brath R. Metrics for effective information visualization. IEEE Symposium on Information Visualization 1997. p. 108-11.

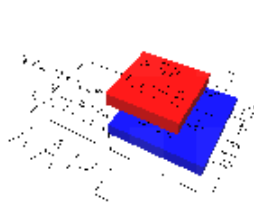


Fig. 1. Representation. Very specific but easy to understand mapping of data attributes to different visual objects.

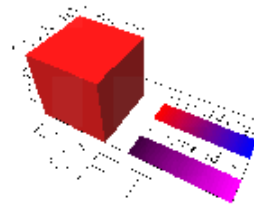


Fig. 2. Representation. General but difficult to understand mapping of data to 5 different properties of a cube.

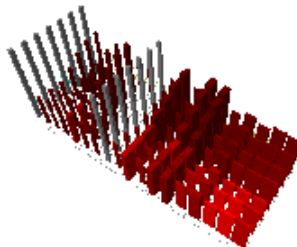


Fig. 3. Occlusion. There is a lot of partial occlusion, but sufficient redundancy in the representation for comprehension.

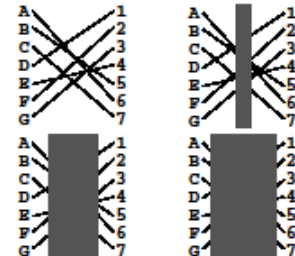


Fig. 4. Occlusion. Increasing partial occlusion obscures the relationships.

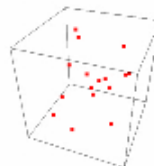


Fig. 5. Reference Context. Scatter points are difficult to locate..

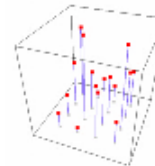


Fig. 6. Reference Context. Drawing lines from scatter point to plane locates the points.

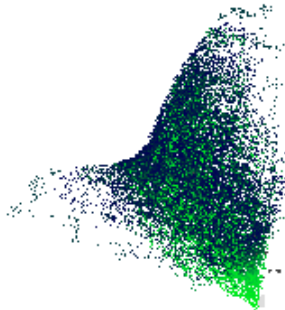


Fig. 7. Reference Context. Scatter points are difficult to locate in 3D space – the depth is not known

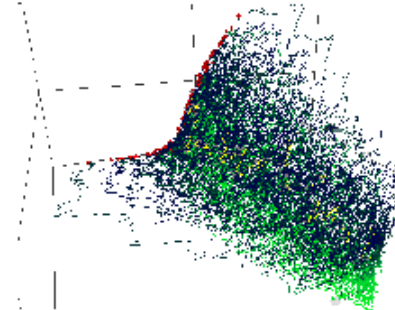


Fig. 8. Reference Context. Drawing lines from scatter point to scatter point as a set of series helps to visually locate the points and establish the field.



# SONIFICATION AND DEMO