

Envisioning Information

Author : Edward R. Tufte

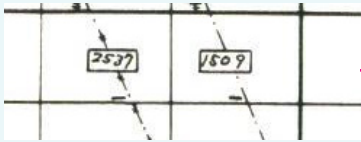
Publisher: Graphics Press Cheshire, Connecticut

- Envisioning Information, the middle volume in Tufte's "trilogy", focuses on rendering complex and often three-dimensional information in two-dimensional space; on "escaping flatland" as he says. "The world is complex, dynamic, multidimensional; the paper is static, flat."
- Tufte presents hundreds of examples of effective information presentation, in the form of diagrams, maps, charts, timetables and more.

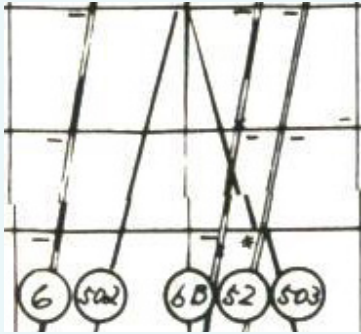
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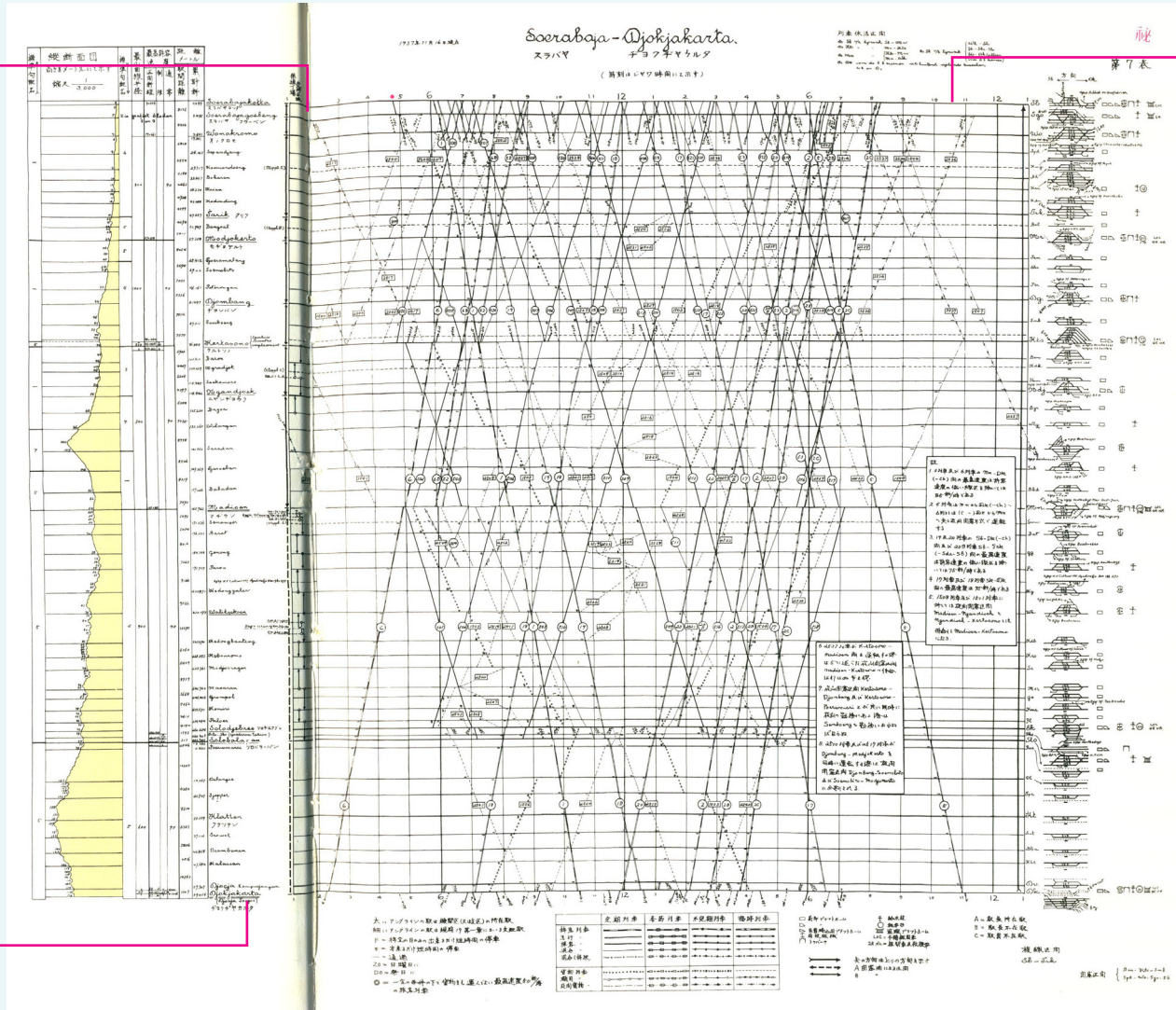
Diagonal lines from upper left to lower right show trains heading down.



Steeper lines are faster trains.



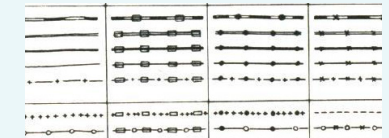
Each path contains the train number.



The time scale is read across the top.



X appears when trains going opposite directions pass by.

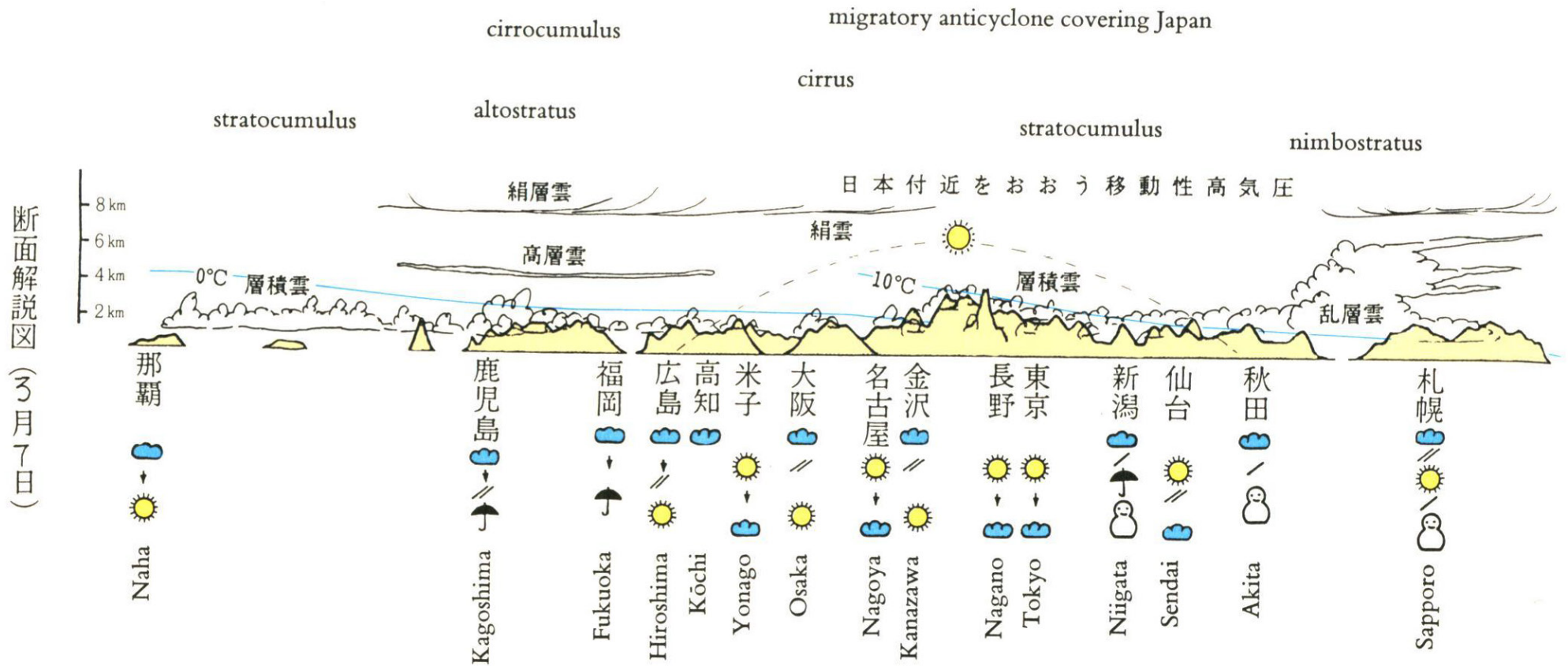


Different line type suggests different train route types.

Java Railroad Line : Soerabaja Djokjakarta

Drawn: November 1937

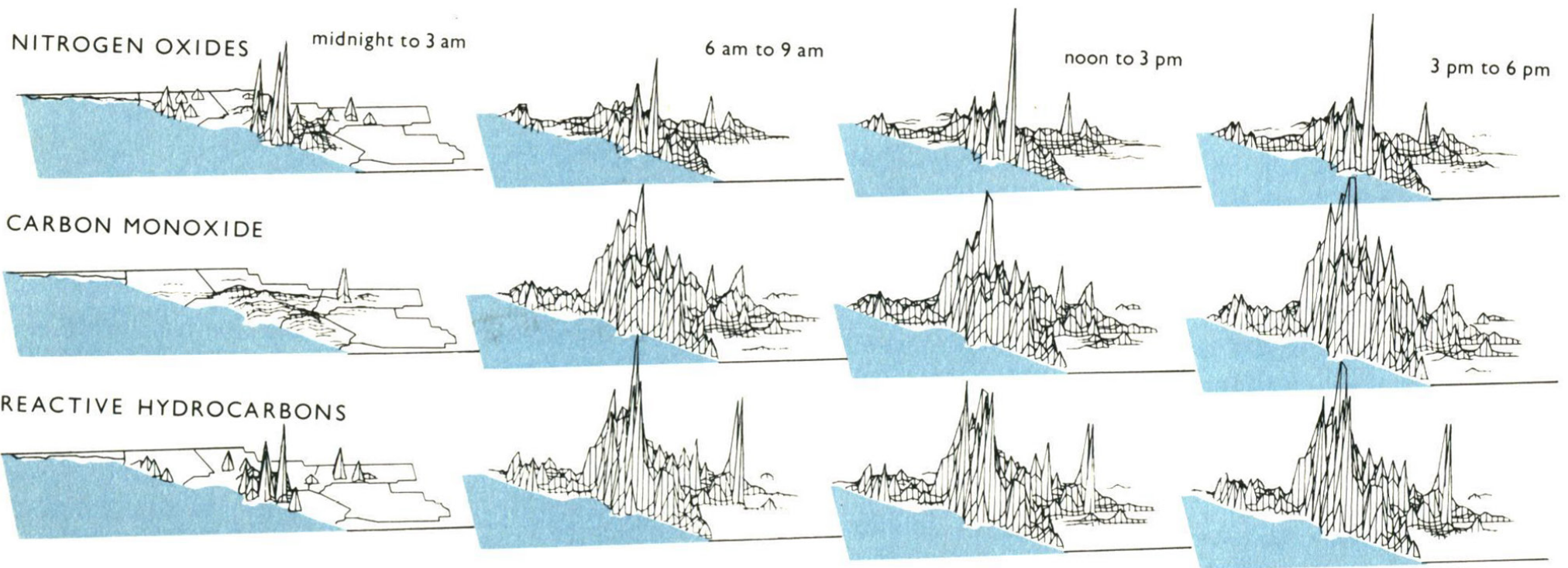
"This 24 hour railroad plan abstractly traces out multiple paths through space and time in a four dimensional tour with a dozen other variables carried along."



Weather Map: Redrawn from Akahata (Red Flag), Tokyo

Original Drawn: March 1985

“ Here gray contours tracing out constant temperatures at 0 and -10 C stretch through the clouds in a side profile of Japan. “



Development of a Second-Generation Mathematical Model for Urban Air Pollution

Drawn: November 1982

"The graphic reports four times daily the levels of three pollutants fuming over southern California"

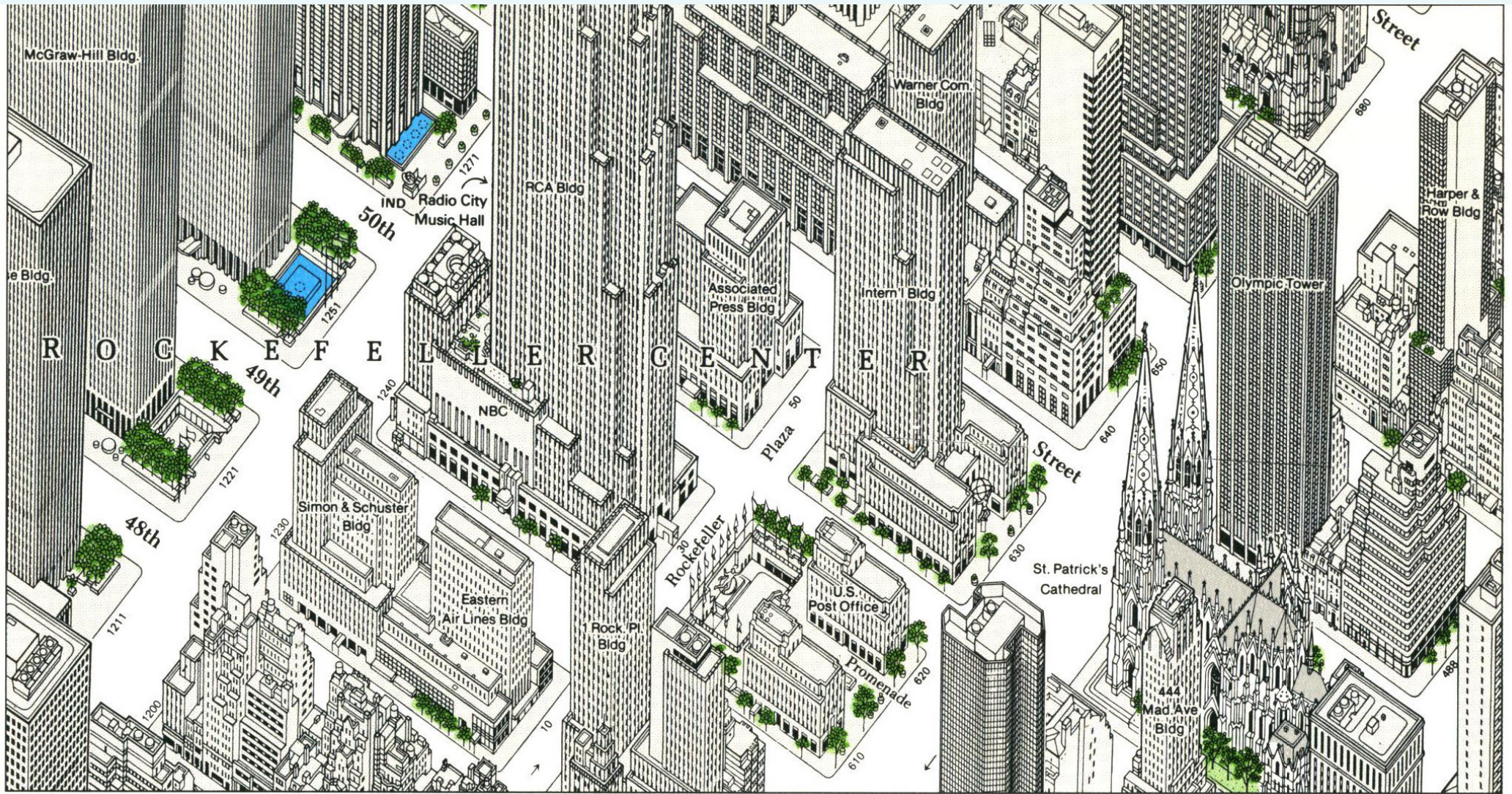
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		夜	☂	☁	☁	☆	☁	☆	☆	☆	☆	☆	☆	☁	☆	☆	☆	☆	☁	☆	☆	☆	☆	☂	☆	☁	☆	☂	☁	☁		
	55年	昼	☁	☁	☂	☀	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁	☁
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气温旬間			2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	2 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	3 -5	4 -4	4 -4	4 -4	4 -4	4 -4	4 -4	
旬間			☀ 43%	☁ 14%	☂ 4%	☁ 39%									☀ 55%	☁ 10%	☂ 6%	☁ 29%								☀ 40%	☁ 16%	☂ 4%	☁ 40%			

- ☀ sunny day
- ☁ night
- ☂ cloudy
- ☂ rain
- ☁ snow

Weather Chart: Redrawn, Tokyo

Original Drawn: March 1984

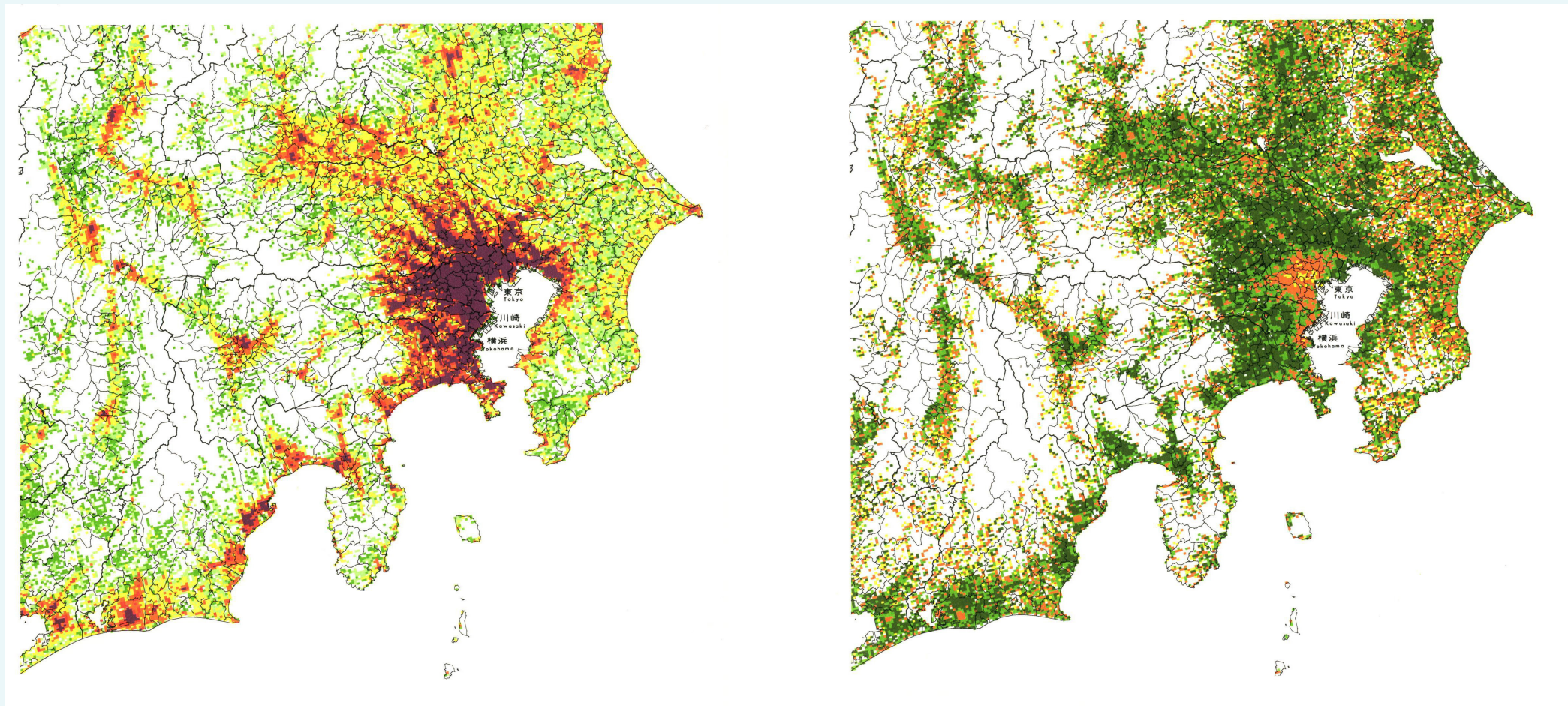
“ This weather history extends the technique, partitioning data by town, year, month, day, and day and night. ”



Isometric Map of Midtown Manhattan. The Manhattan Map Company

Drawn: November 1989

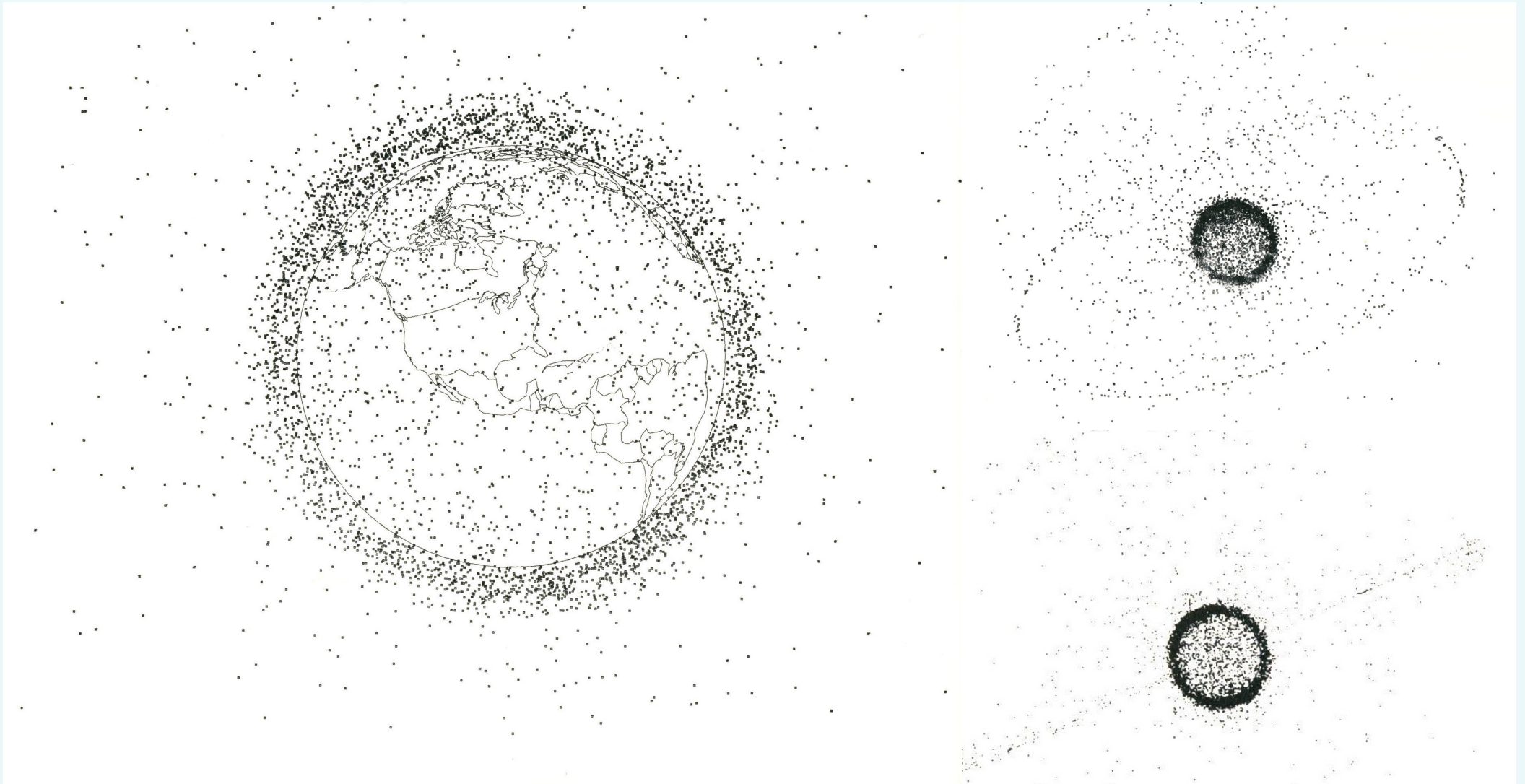
"The Manhattan map embraces such fine points as individual windows, subway stations, bus shelters, telephone booths, building canopies, trees and sidewalk planters."



The 1980 Population Census Result, Tokyo

Original Drawn: March 1985

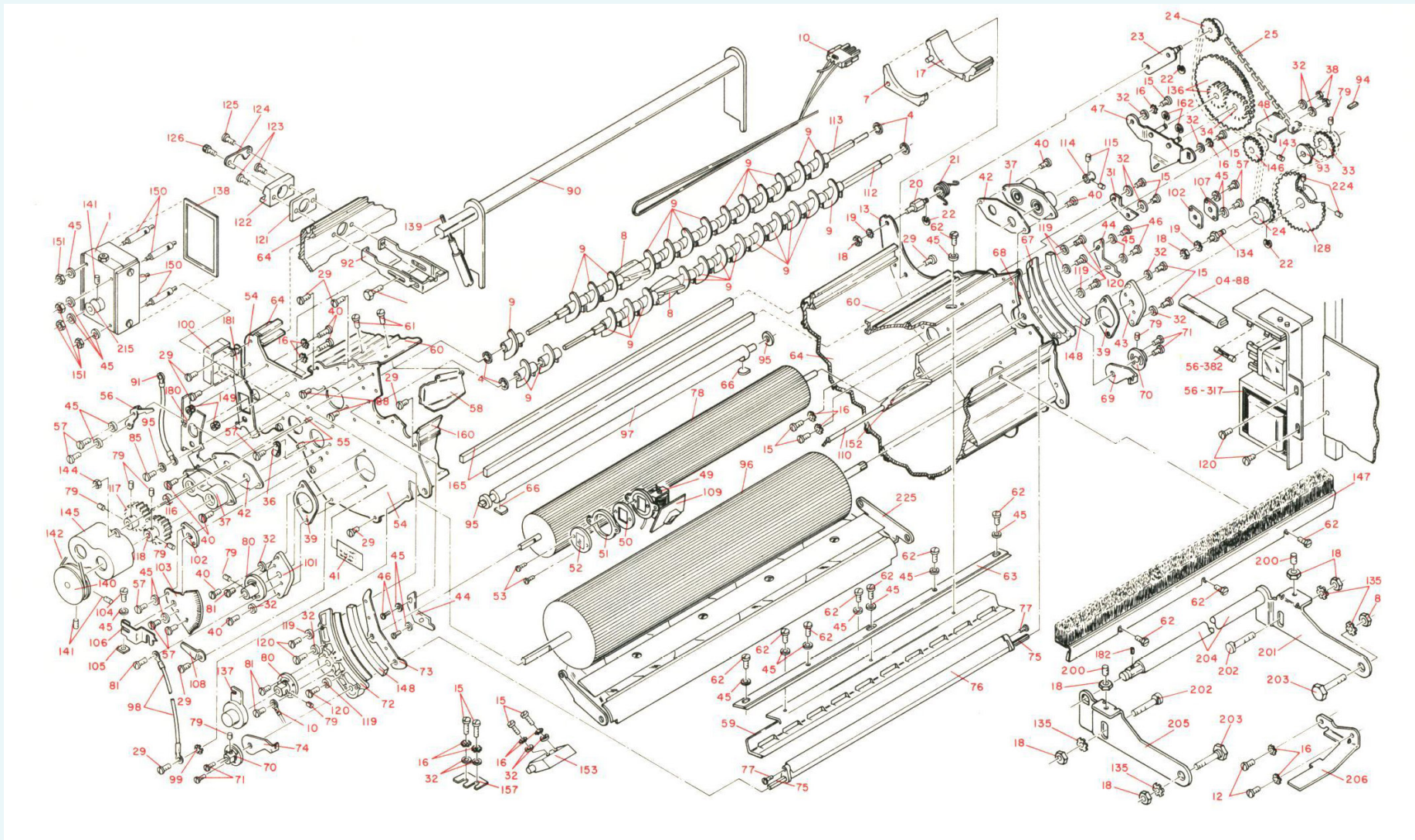
" The map of Tokya shows Population Density; note smaller concentrations dotting the tracks radiating from the city. The map at right records the proportion of children living at each location, with a systematic pattern of lower percentages in central Tokyo."



Collision Frequency of Artificial Sattelites: A Creation of Debris Belt.

Drawn: November 1989

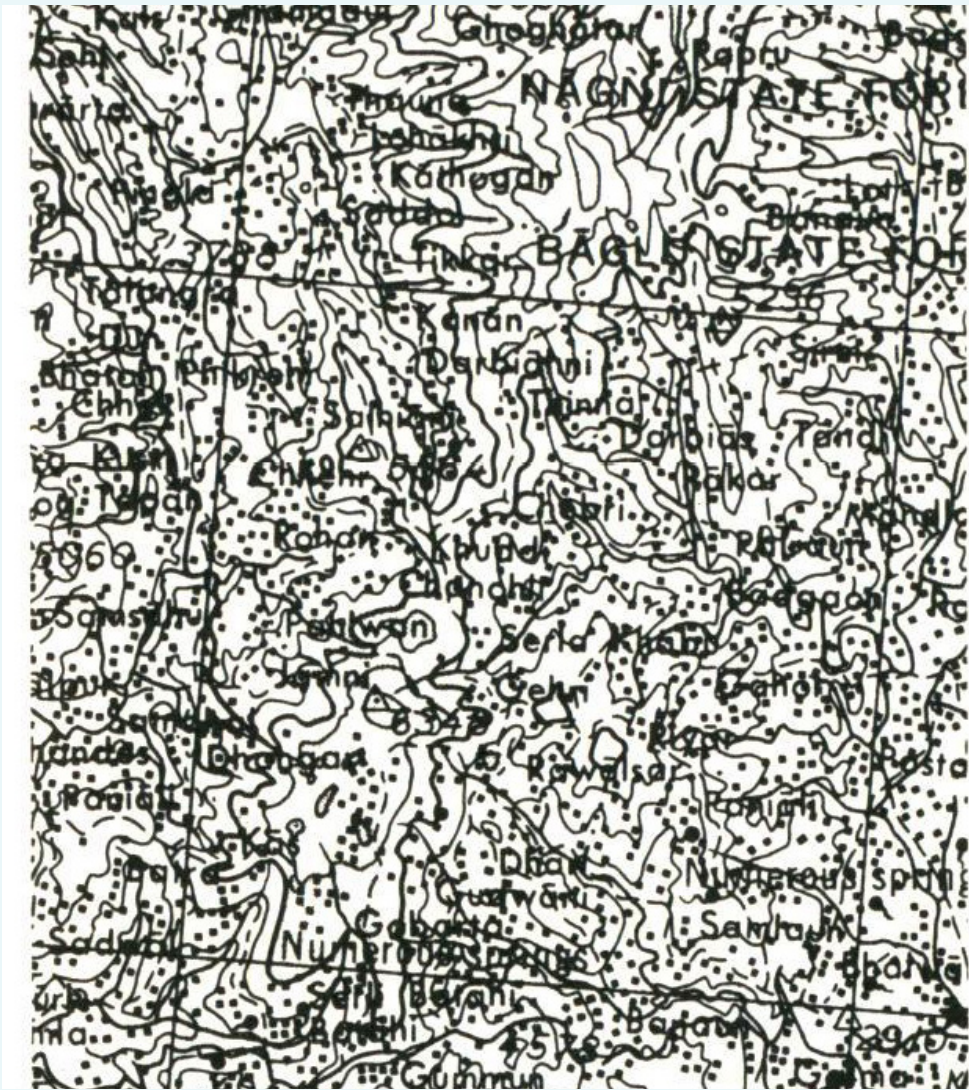
"Some 7000 pieces of space debris-operating and dead satellites, explosion fragments from rocket engines, garbage bags, and frozen sewage dumped by astronauts, shrapnel from anti-satellite weapons tests, 34 nuclear reactor, and their fuel cores, an escaped wrench and a toothbrush now orbit our world."



IDM Series III Copier, Duplicator Adjustment Parts Manual, Boulder, Colorado

Original Drawn: March 1976

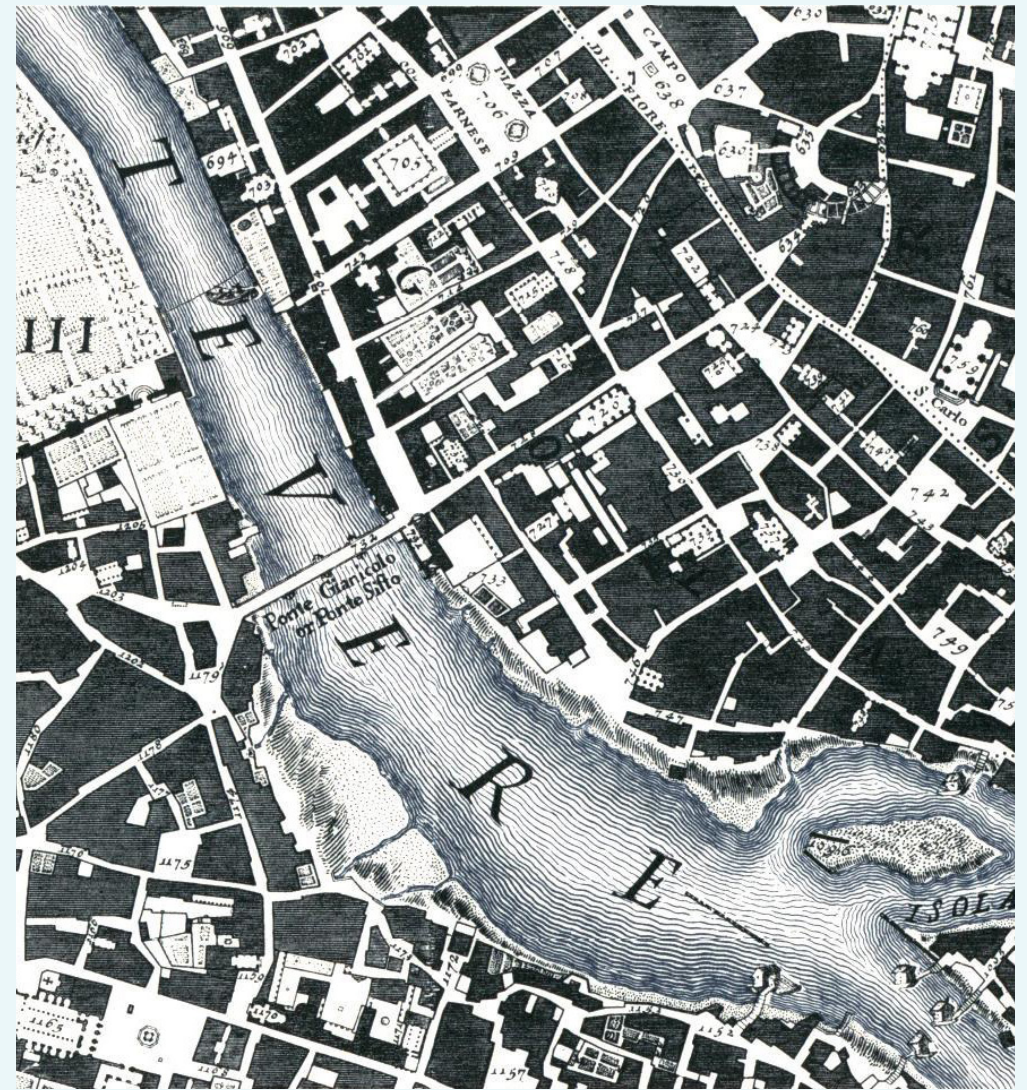
“ What matters inevitably, unrelentingly, is proper relationship among information layers.”



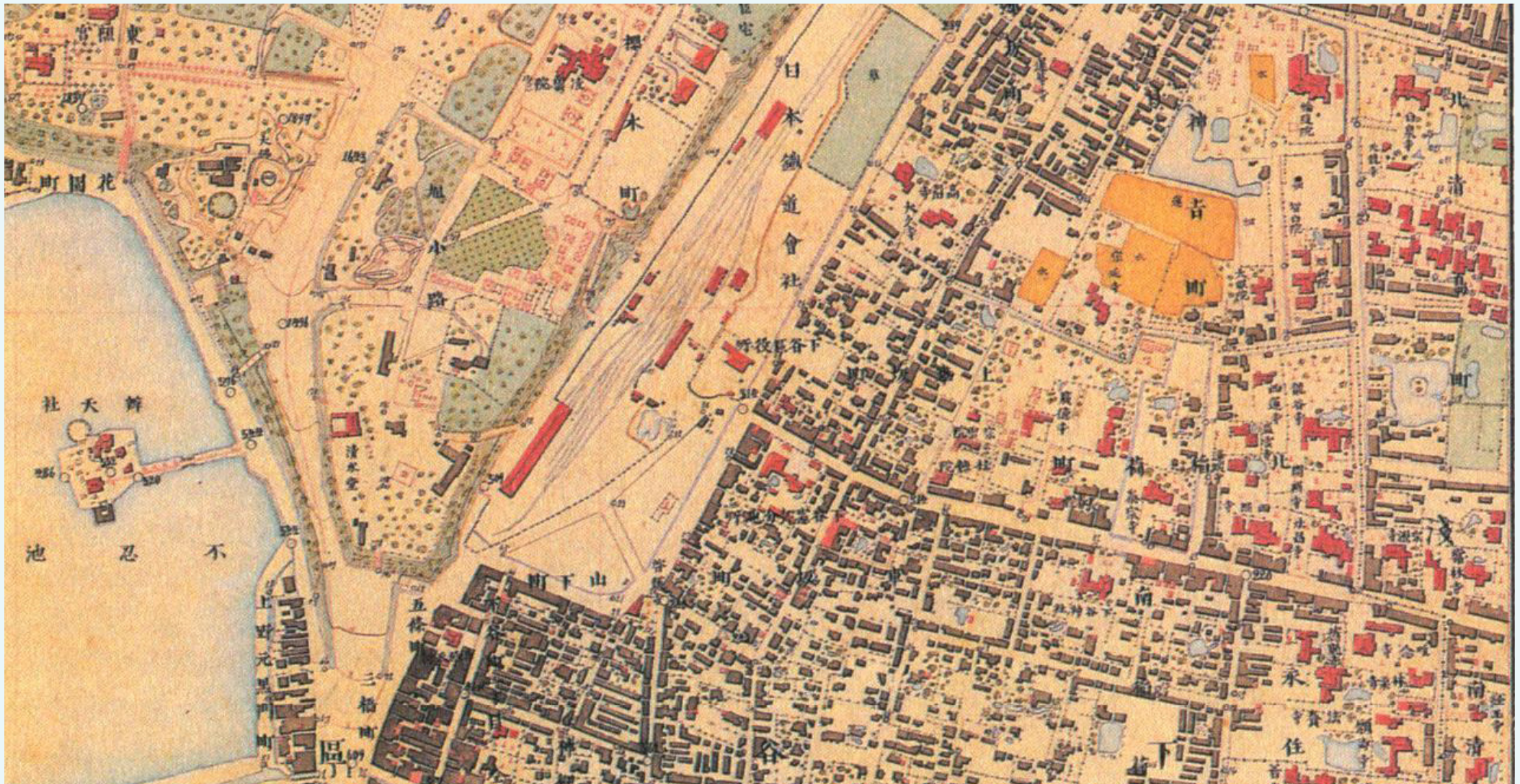
Simla, India, Survey of India

Drawn: 1954, 1748

"Layering of data, often achieved by felicitous subtraction of weight, enhances representation of both data dimensionality and density on flatland. Usually involves creating a hierarchy of visual effects, possibly matching an ordering of information content"



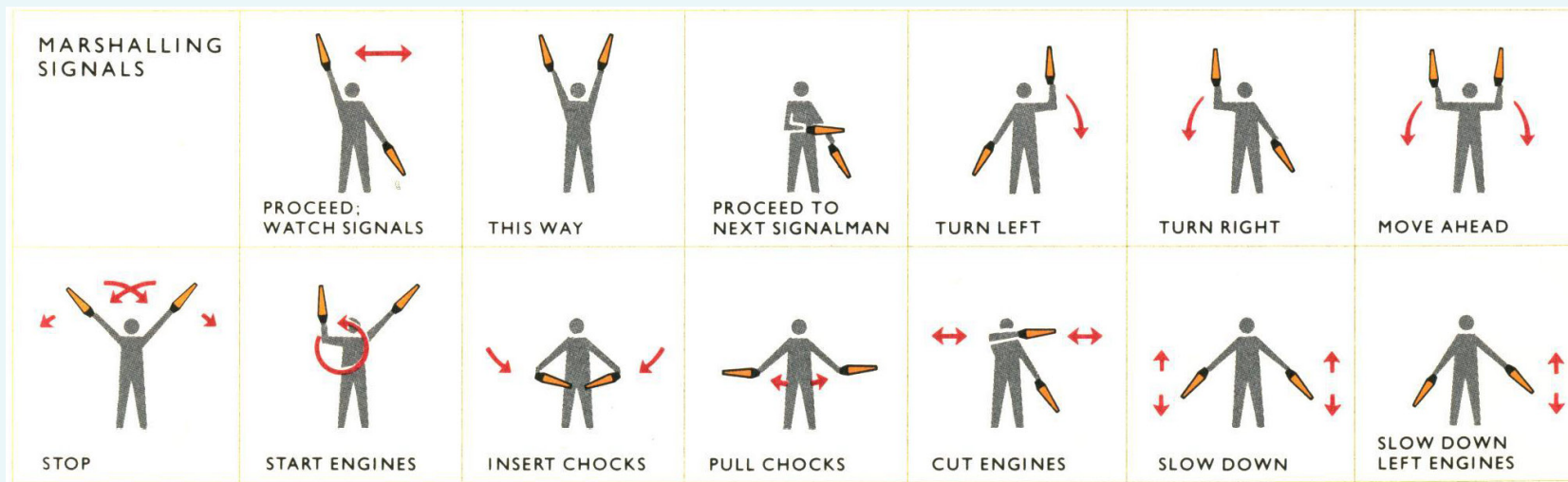
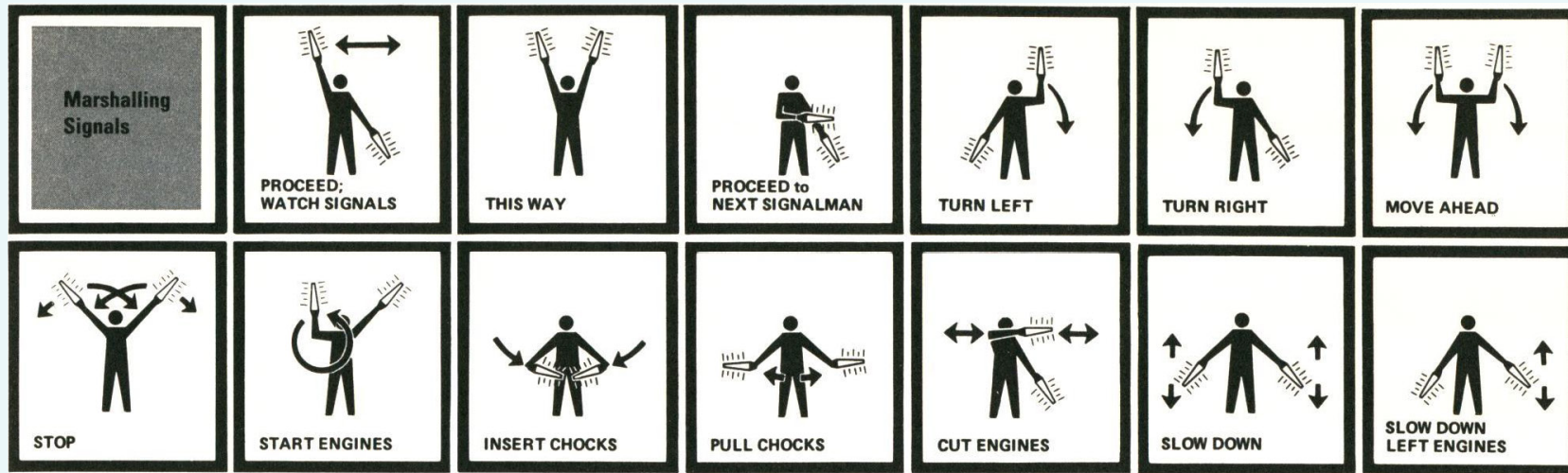
Giambattista Nolli, Pianta Grande di Roma



Tokyo Prefecture. Musashino, Uneo Park, Kurumazaka Area

Original Drawn: 1884

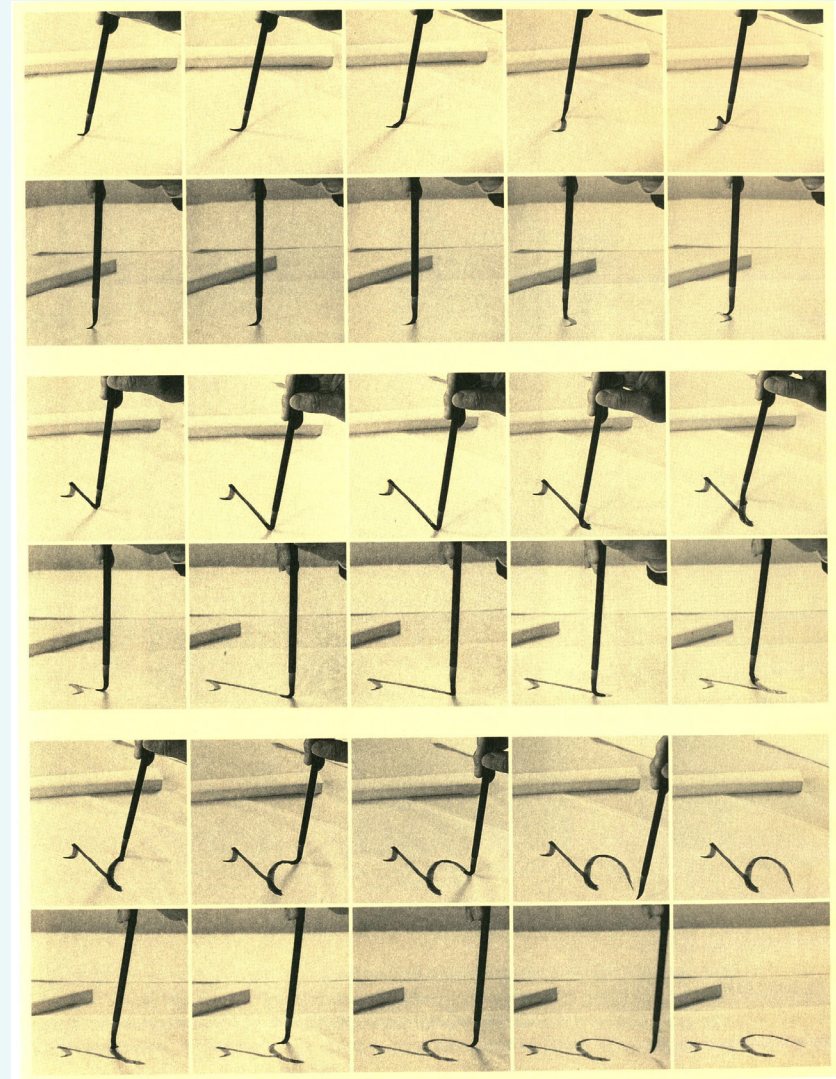
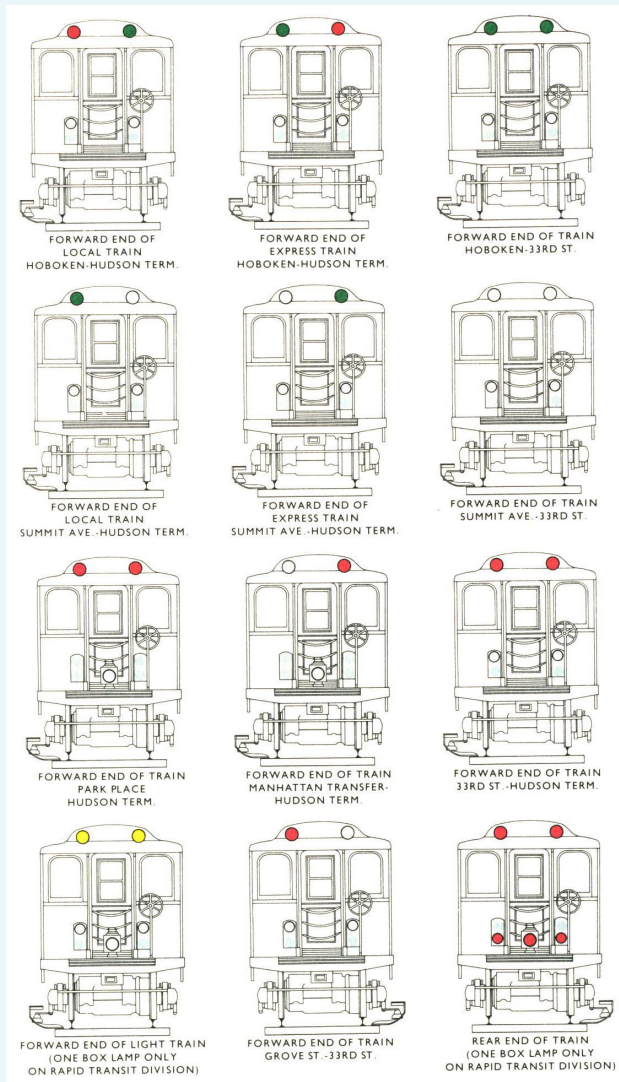
“ Pure bright or very strong colours have loud, unbearable effects when they stand unrelieved over large areas adjacent to each other, but extraordinary effects can be achieved when they are used sparingly on or between dull backgrounds tones.”



Henry Dreyfuss, Symbol Sourcebook, New York

Drawn: 1972

"If one limits strong, heavy, rich and solid colours to small area pattern occur.... Large area background or base-colours do their work quietly, allowing the smaller, bright areas to stand out most vividly, if the former are muted, grayish or neutral "



Hudson and Manhattan Railroad Company

Kayu Hirata, Tsugi Shiki Shi

Original Drawn: 1884

“ Small multiples reveal all at once, a scope of alternatives, a range of options.”

MURAL WITH BLUE BRUSHSTROKE

To make *Mural with Blue Brushstroke*, Lichtenstein drew on sources ranging from the most exalted to the most banal. Classical architecture (2, 14) provided inspiration, as did the site itself (8, where painted windows align with real ones). Homages to twentieth-century masters abound: Léger's people (1), Kelly's color fields (6), Matisse's split philodendron form (9), Arp's silhouettes (10, echoed in a piece of Swiss cheese), De Kooning's brushstrokes (12), Stella's triangles and French curves (15), Johns's flagstones (16), and Braque's balusters (20). Art styles—like Abstract Expressionism (11, 12, and 13, the latter with its "perfect painting"), Cubism (20), and Art Deco (21)—and artist's tools (4, 5, and 15) appear. And bustling around amid all this high culture are images of everyday modern life, those perennial sources of fascination to Lichtenstein: sunbursts (3), copy books (17), advertisements (7), food and drink (10, 18), and, of course, comic strips (19).



1. Detail of *The Dance* by Fernand Léger



2. Facade, Library of Celsus, Ephesus



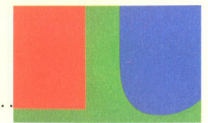
3. Roy Lichtenstein, *Placid Sea*, 1964



4. A gilded picture frame



5. The back of a painting, showing canvas, stretcher, and wedges



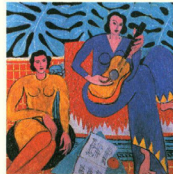
6. Ellsworth Kelly, *Red Blue Green*, 1963



7. Ad for Elgin watches, 1950s



8. Detail of the mural in place at Equitable



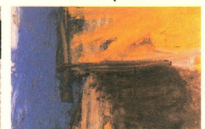
9. Henri Matisse, *Music*, 1939



10. Jean Arp, *Six White Forms and One Gray Form Make a Constellation on a Blue Ground*, 1953



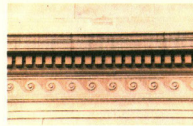
11. Roy Lichtenstein, *Big Painting*, 1965



12. Willem de Kooning, *Greece on 8th Avenue*, 1958



13. Roy Lichtenstein, *Artist's Studio - Foot Medication*, 1974



14. Entablature on downtown New York building



15. Frank Stella, *Dove of Turin*, 1977



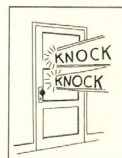
16. Jasper Johns, *End Paper*, 1976



17. Classic black-and-white composition book



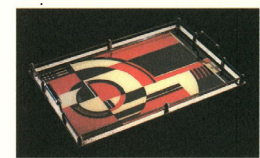
18. Roy Lichtenstein, *Still Life with Red Wine*, 1972



19. Roy Lichtenstein, *Knock Knock*, 1961



20. Georges Braque, *The Baluster*, 1938

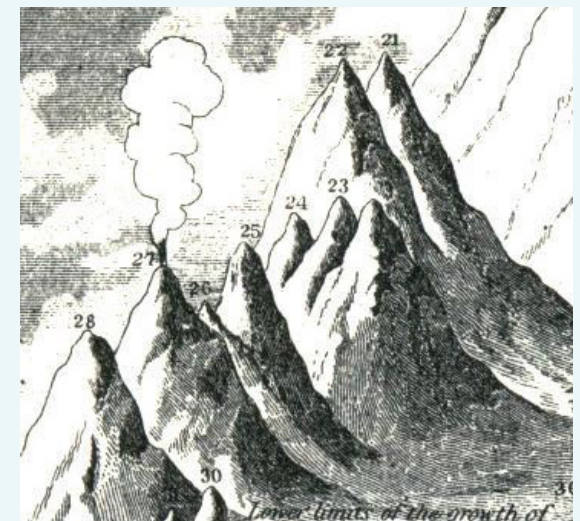
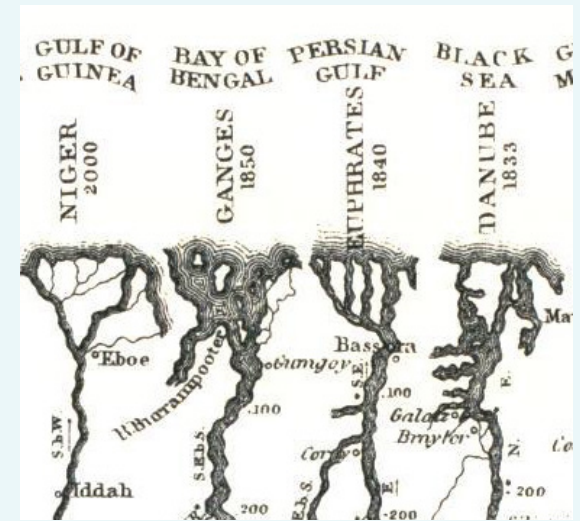
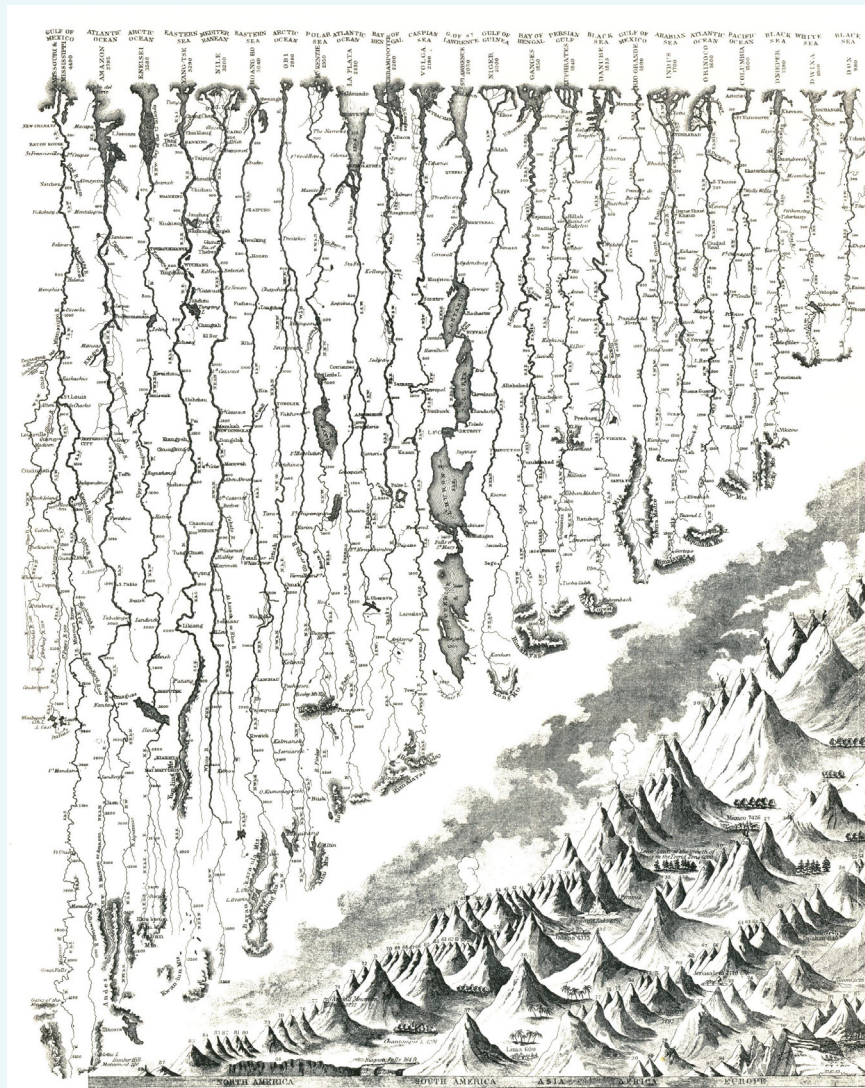


21. Art Deco tray, designer and manufacturer unknown

Mural with Blue Brushstroke, Roy Lichtenstein, New York

Drawn: November 1988

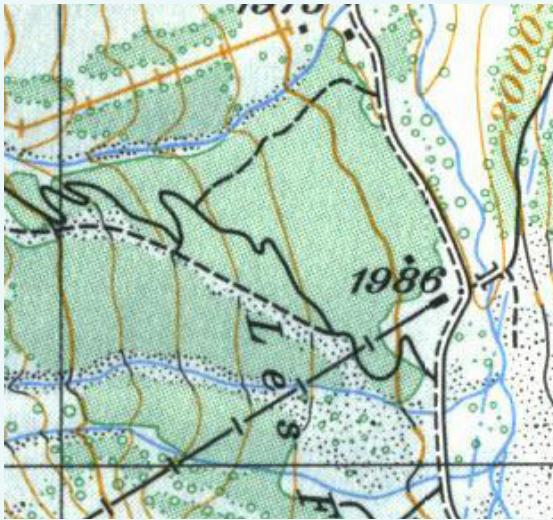
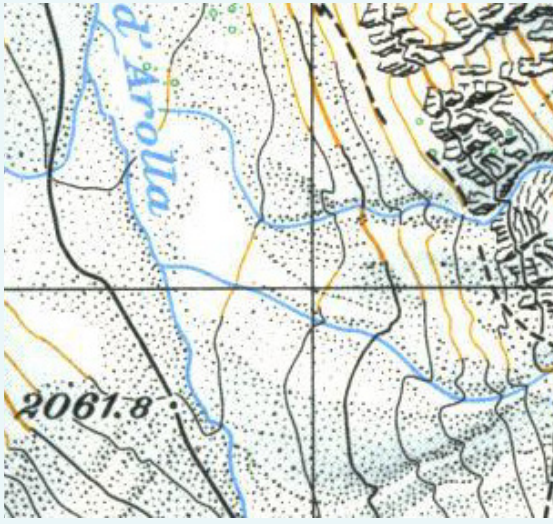
"For a book describing the mural, Samuel Antupit crafted this superb double page spread, linking 21 small images from various sources to the mural at center. The design both isolates details and places it in context."



Johnson's New Illustrated Family Atlas with Physical Geography, New York

Original Drawn: 1864

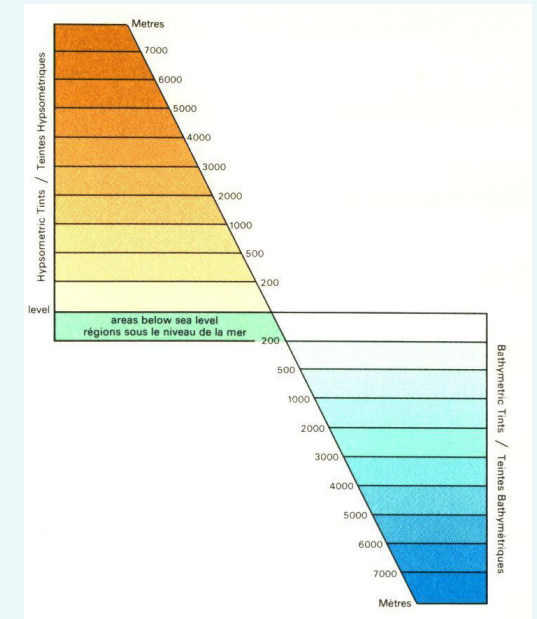
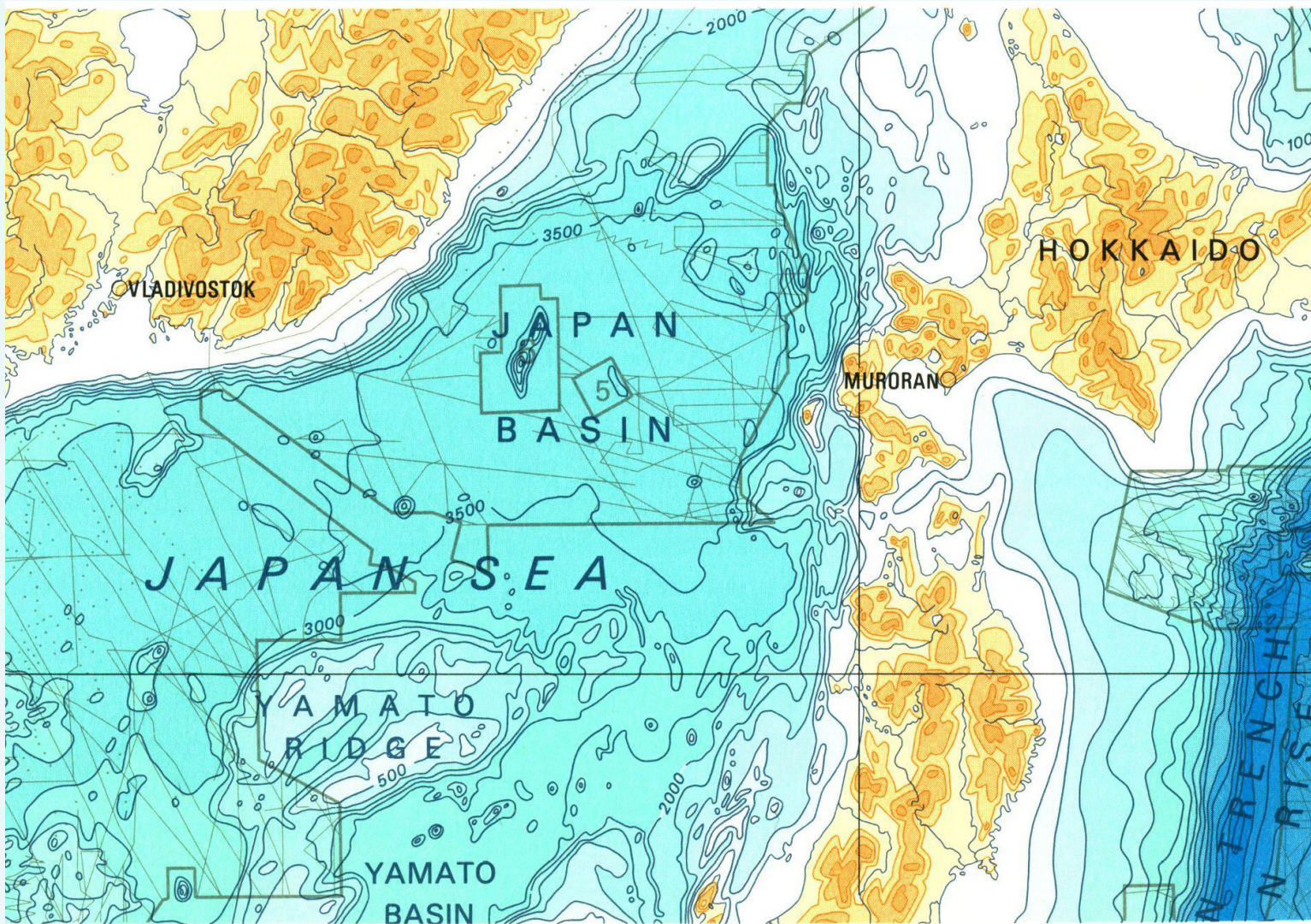
" Surveying length of world's rivers , the chart hangs them out, in parallel more or less, while still retaining specifics of place-names, lakes, and river branches. The juxtaposed mountains are less successful, too arbitrary in their relocation, and too stylized and lacking the nice locals particulars of the rivers ."



Matterhorn, Landeskarte der Schweiz, Wabern

Drawn: 1983

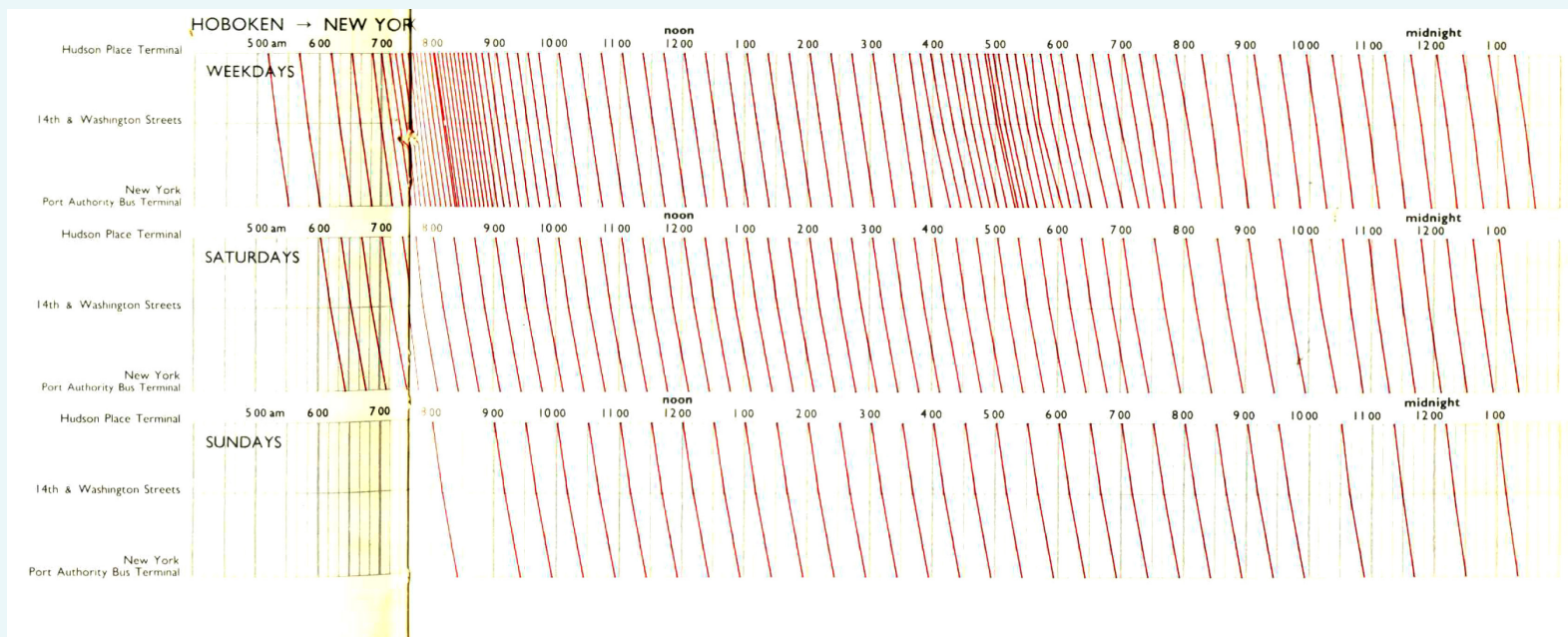
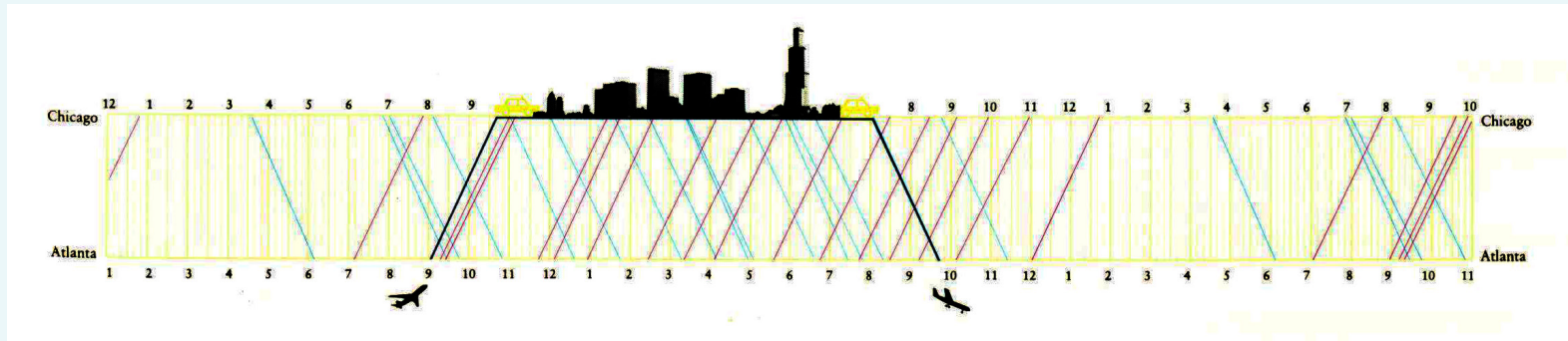
" Here colour labels by distinguishing water from stone and glacier from field, measures by indicating altitude with contour and rate of change by darkening, imitates reality with river blues and shadow hachures, and visually enlivens the topography quite beyond what could be done in black and white alone."



General Bathymetric Chart of the Oceans, International Hydrographic Organization

Drawn: 1964

"The deeper the darker, is serving as a visual metaphor for colouring. Numbered coloured outline colour fields providing accuracy in reading. Every colour mark on this map signals four variables: latitude, longitude, sea or land, and depth or altitude measured in meters. "



Airplane Schedule, Ascertaining and Regulating the Time and Speed of Railway Trains

Drawn: 1984, 1857

“ Railways soon came to use graphical method for planning schedules, especially in negotiating sequences of several trains running on the same line. Today systems of immense complexity are governed by graphical timetable portraying thousands of station stops. ”

- Introduce multiple dimensions on a two-dimension surface.
- The priority of the visualisation is accurate information. The presentation should be a later addition.
- Analyse the information accurately and attempt to discover patterns.
- Symbols make the visualisation universal as words might make it more local to a specific audience.
- Higher data density (amount of information per unit area) in a specific visualisation can be perceived with better understanding.

Learnings