Charlotte Bigg:
“Designing Better Trees”

in: Eric Hounshell, Ruth Amstutz (eds.):

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SHADOW OF THE TREE

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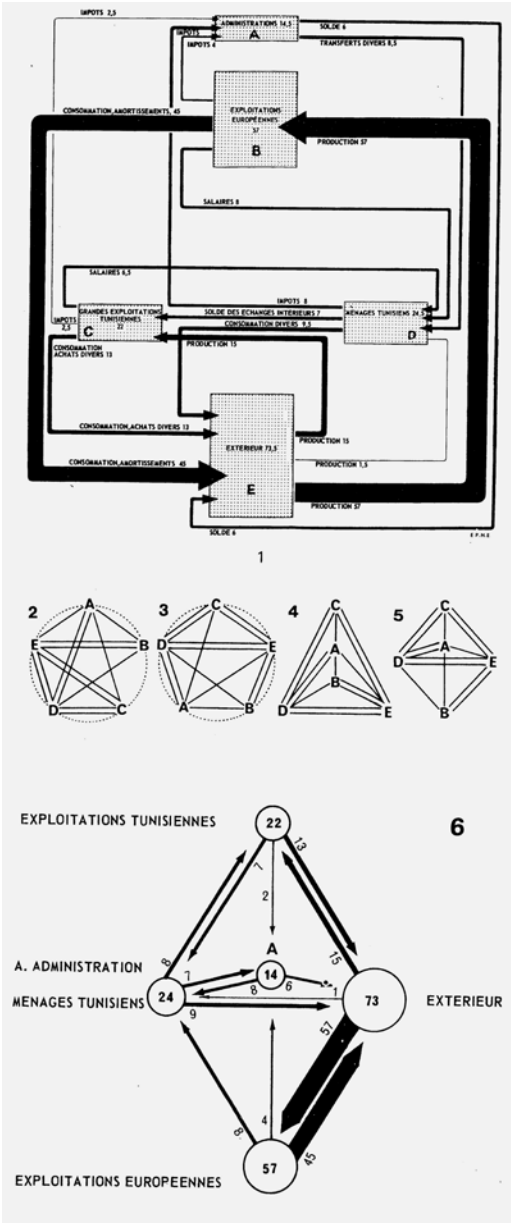
Charlotte Bigg

DESIGNING BETTER TREES Bertin's Genealogical Networks

What connects Isidore of Seville (ca. 560–630), Lambert of Saint-Omer (ca. 1061–ca. 1125), Joachim of Fiore (ca. 1135–1202), Ramon Llull (1232–1315), Hartmann Schedel (1440–1514) and Athanasius Kircher (1602–1680)?[1] According to Manuel Lima, author of *The Book of Trees: Visualizing Branches of Knowledge,* they are all "visualizations pioneers."[2] As the fields of data visualization and information design have developed over the past few years, powered by computer technologies and the desire to process increasingly large datasets, experts such as Lima have cast trees as forms of data visualization. In so doing they provide a pedigree to their field by linking the genealogical trees figuring on medieval illuminated manuscripts with their own practices.[3] They also shine light on the often forgotten illustrators of historical books, underscoring their agency in creating visual forms. It should come as no surprise, then, that genealogical trees were some of the first objects systematically reflected and improved upon in the emerging field of "graphic information processing," as it was initially called in the mid-twentieth century. One of the self-proclaimed pioneers of the field, French cartographer Jacques Bertin, worked on and discussed trees from the 1950s in working out his "Semiology of Graphics."[4] Bertin claimed that any homogenous series of observations can be subjected to three major kinds of "graphical transcriptions": networks, diagrams, and maps. Alongside computer programs and road networks, genealogical trees were named as typical examples of networks.

"A family tree is the set of links (correspondences) that unite the members of a family, that is to say the elements A,B,C... of a single group of individuals. [...]. These elements belong to the same component. When these elements are transcribed on the plane, a network is constructed. A network can be constructed in various ways because the elements A,B,C... of the component can be transcribed by points and their links by lines, or the reverse, or both by lines, or by zones. Moreover, the arrangement of the elements can be rectilinear, or circular, or form a pattern. The choice depends both on the information itself and on the simplifying function of the graphic transcription. Graphic treatment [...] consists in discovering the simplest arrangement of elements and correspondences, that is, in reducing to a minimum the number of non-significant crossings. [...] It is then possible to deduce the image whose reading will be the most efficient according to the very nature of the concepts proposed by the information."

Jacques Bertin: "La graphique", in: *Communications* 15 (1970), pp. 169–185, p. 181.

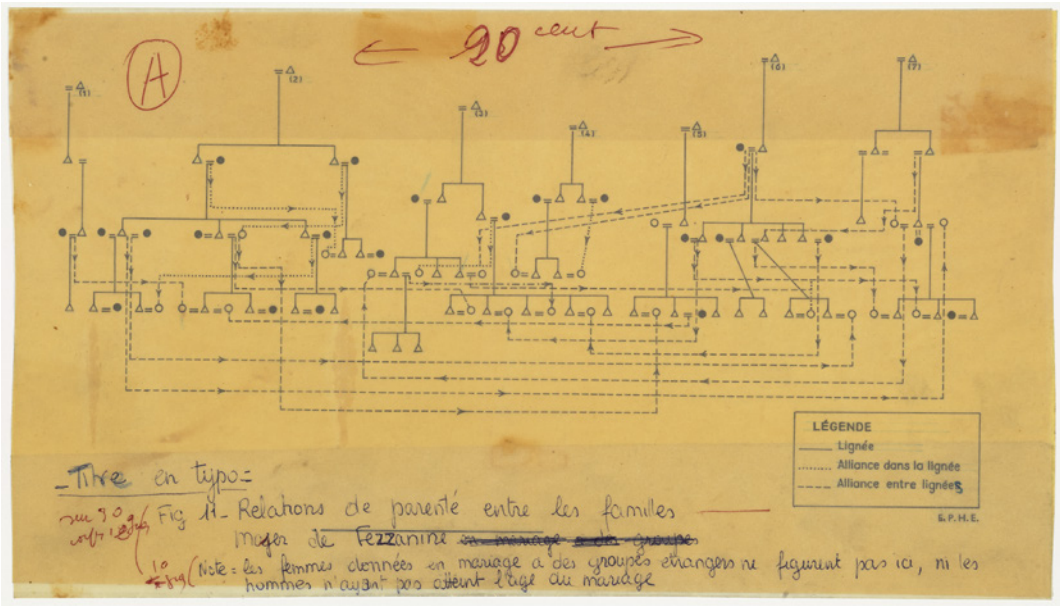


"Example of a transformation: Value of exchanges, between five large groups of economic agents in a market economy. After J. Cuisenier", in: Jacques Bertin: *Sémiologie graphique: Les diagrammes, les réseaux, les cartes,* Paris: Gauthiers-Villars (2005 [1967]), p. 274.

These diagrams depict economic flows in the year 1950 in Tunisia's Ansarin region. They provide a snapshot of the region's economic makeup by depicting flows between households, the administration, European exploitations, Tunisian exploitations, and the outside world. The thickness of the arrows is proportional to the strength of the flow, indicated in millions of Francs. The bottom figure (6) contains the same information as the figure above (1), the series in the middle (2–5) showing the different possibilities of spatially arranging five points and their connections. Through this series Bertin showed how his method could make diagrams more efficient, the information to be shown more readily graspable. The transformation aimed in particular at avoiding intersecting lines, achieved here by building a three-dimensional diagram (option 5). Bertin used as a starting point (1) a diagram his laboratory had prepared for the published version of Jean Cuisenier's PhD thesis, *L'Ansarine: Contribution à la sociologie du développement,* Paris: Presses universitaires de France (1962). This example shows that Bertin developed his method over time based on collaborations with and commissions from social and human scientists.

DESIGNING BETTER TREES The Structuralist Tree

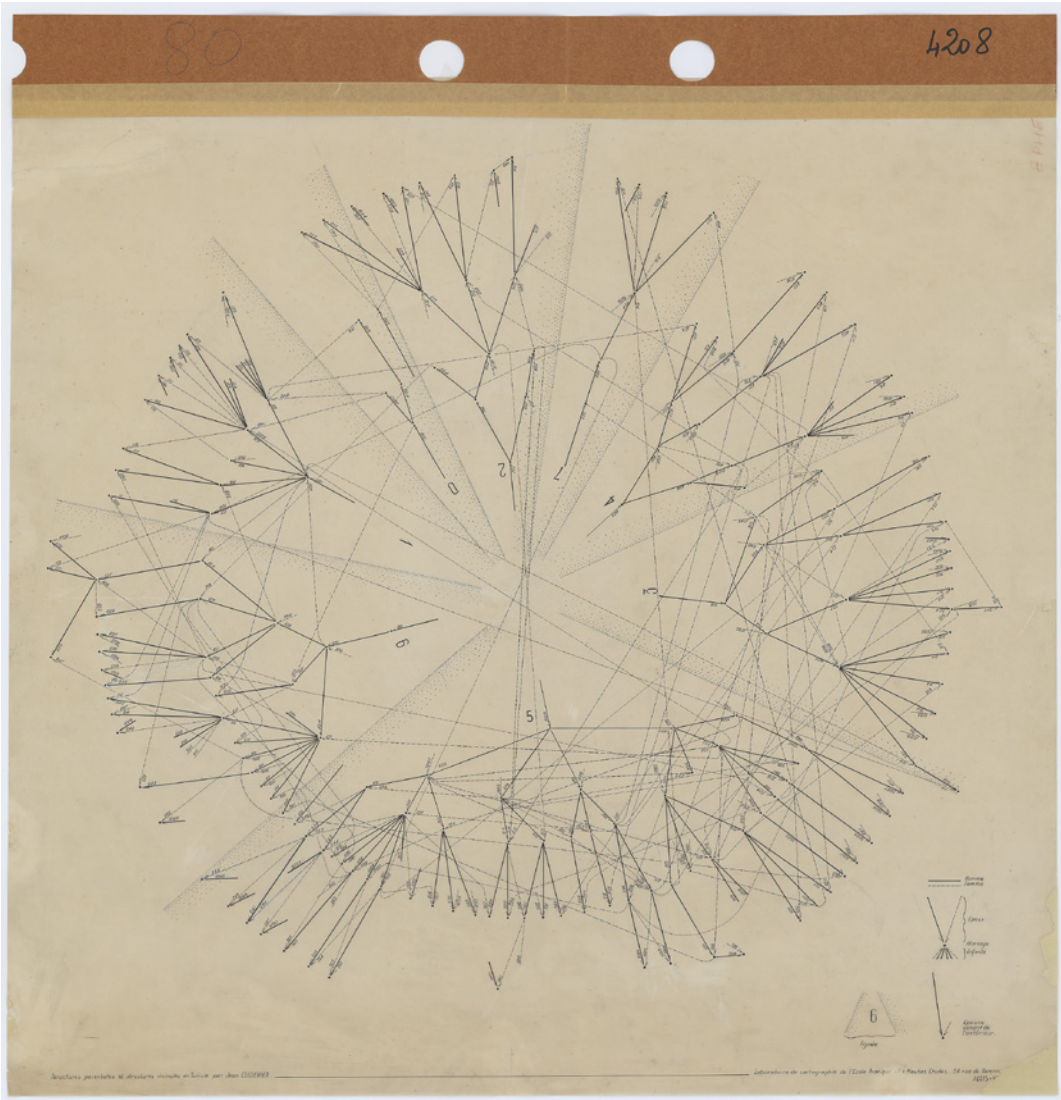
Bertin was based at the Laboratoire de cartographie he had founded in 1954 within the Ecole Pratique des Hautes Etudes in Paris (renamed Laboratoire de graphique in 1975 when it joined the Ecole des Hautes Etudes en Sciences Sociales). There he worked closely with geographers, historians, and anthropologists on the production of maps and graphs for their scientific publications. Bertin worked in the context of an exciting, experimental transformation of the social and human sciences at the time, marked in particular by the structuralist movement whose "visual identity" he helped create. He illustrated anthropologist Claude Lévi-Strauss's books and contributed to shape the structuralism-inspired Annales school of historians, especially through his intense collaboration with Fernand Braudel, and his work was admired by Roland Barthes.



"Kinship relations between the majer families of Fezzanine." Advanced version of the diagram prepared by the Laboratory of cartography for publication in Jean Cuisenier's book, *L'Ansarine: Contribution à la sociologie du développement,* Paris: Presses Universitaires de France (1962). Archives Nationales (France), file 20010291/70.

This is a classic genealogical tree, with individuals (represented as triangles and circles) embodying the units and their kinship (represented as lines) embodying relations between the units. This kind of representation works for small data sets such as one or a few families, albeit at the price of leaving out some information and of featuring many intersections, which Bertin thought hampered understanding and should be avoided.

Several of these scholars worked on kinship, commissioning Bertin to produce genealogical trees. This fed his research into more efficient, systematic ways of visualizing information. Bertin developed new ways of visualizing genealogical trees, notably in the course of his yearlong collaboration with Jean Cuisenier, in connection with the latter's research into endogamy and exogamy in Arab marriage practices.



Representation of the entirety of kinship relations among the Ouled Arfa people from the Ansarin region in Tunisia, prepared by the Laboratory of cartography for publication in Jean Cuisenier: "Endogamie et exogamie dans le mariage arabe", in: *L'homme* 2/2 (1962), pp. 80–105. Archives nationales (France), file 20150572/1/1.

This diagram follows Bertin's structuralism-inspired precept in that it showcases relations rather than units/individuals, compared to the classic trees, and thereby helps make visible otherwise invisible structures. Women are represented as dotted lines, men as lines, shading as the boundaries of lineage. A line and a dotted line converge into a dot (marriage), from which lines emerge (children). Short dotted lines denote female spouses originating outside the community.

"[T]his network of alliances and filiation between agnates brings to light, in two different ways, the architectonic role played by marriage with the daughter of the paternal uncle in the Arab kinship system. The path will thereby be laid for a sketch of a very simple model aimed at explaining the frequency of endogamy at the different levels of the parent group."

"Marriage, figured as points, constitute the units, while individuals (a man or a woman) figured as lines, constitute the relations. The entirety of kinship relations can be transcribed as a network or rather more exactly as a tree, whose marriages are knots."

Jean Cuisenier: "Endogamie et exogamie dans le mariage arabe", in: *L'homme* 2/2 (1962), pp. 80–105, p. 82, p. 95.

In the wake of Lévi-Strauss's search for underlying structures in kinship systems, Cuisenier sought to show that the typical Arabic practice of marriage between parallel cousins was independent of external determinants. He considered that

"in order to understand this structure, the complete system of alliances must be reconstituted over several generations. However, as soon as the group reaches a given size, and the investigation goes back several generations, it becomes practically impossible to capture the play of alliances between agnates using Morgan's diagrams: the lines crisscross each other in an inextricable tangle."

Jean Cuisenier: "Endogamie et exogamie dans le mariage arabe", in: *L'homme* 2/2 (1962), pp. 80–105, p. 82.

Cuisenier claimed that good accountancy and Bertin's graphic method yielded a solution to the challenge of extracting a recognizable structure from such a large data set. Bertin provided suitably structuralism-inspired graphics for the structuralist overhaul of anthropology of the time. He both extended and transformed the history of genealogical tree production, with a lasting impact in French history and anthropology, while putting trees at the heart of the new era of data visualization and information design.[5]

Notes

1 This contribution is based on research carried out within the collective project DESIGNSHS https://laboratoire-graphique.fr/ funded by Agence Nationale pour la Rercherche, ANR-20-CE27-0023. Special thanks to the French national archives for their kind supply of the digital versions of images from the Laboratoire de graphique held in their custody and to Anne-Lyse Renon for her suggestions and comments.
2 Manuel Lima: *The Book of Trees: Visualizing Branches of Knowledge,* Princeton: Princeton Architectural Press (2014), pp. 9–10.
3 Michael Friendly: "A Brief History of Data Visualization", in: Chun-Houh Chen, Wolfgang Härdle, Antony Unwin (eds.): *Handbook of Data Visualization*, Berlin/Heidelberg: Springer (2008), pp. 15–56.
4 Jacques Bertin: *Sémiologie graphique: Les diagrammes, les réseaux, les cartes,* Paris: Gauthiers-Villars (1967).
5 See, e.g. Héran (further readings) or Elie Haddad: "Deux modèles récents de la parenté à l'épreuve de la noblesse française d'Ancien Régime", in: *L'Atelier du Centre de recherches historiques* 9 (2012).

Further Readings

Jacques Bertin: *Graphics and Graphic Information Processing*, trans. by William J. Berg, Paul Scott, Berlin: De Gruyter (1981).

Alexander Campolo: "Sights and Sight: Jacques Bertin and the Visual Language of Structuralism", in: *Grey Room* 78 (2020), pp. 34–65.

François Héran: *Figures de la parenté: Une histoire critique de la raison structurale*, Paris: Presses universitaires de France (2009).

Manuel Lima: *The Book of Trees: Visualizing Branches of Knowledge,* Princeton: Princeton Architectural Press (2014).