

# Harvard Pioneers in Geographical Computation

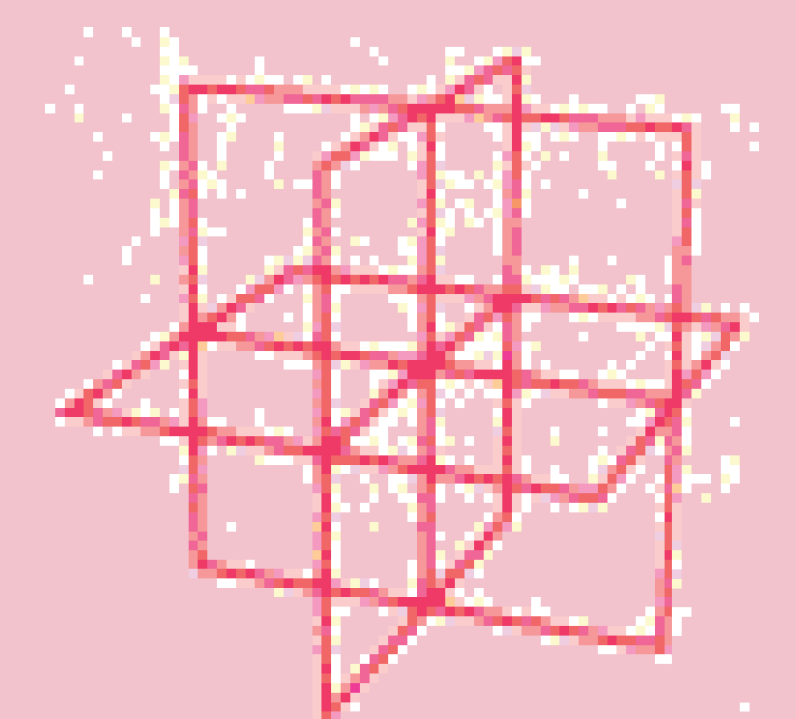
The Harvard Lab for Computer Graphics and Spatial Analysis

## Founded by Howard Fisher, 1965

The Lab, Based at the GSD was initially funded by a grant from the Ford Foundation. The original charge was to develop techniques for making computer generated maps presenting physical economic and social data.



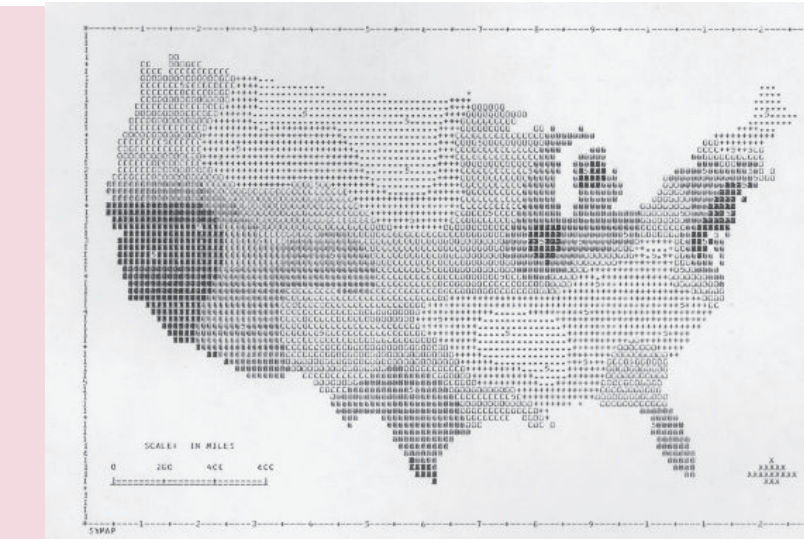
Howard Fisher



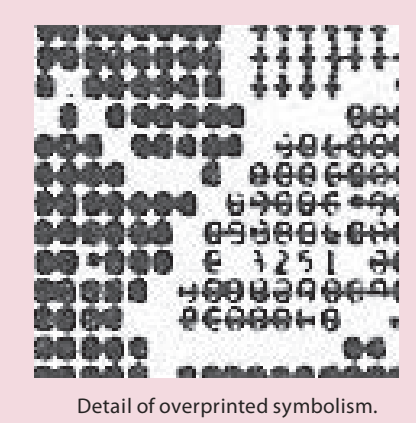
The LCGSA Logo

## Digital Cartography and Visualization

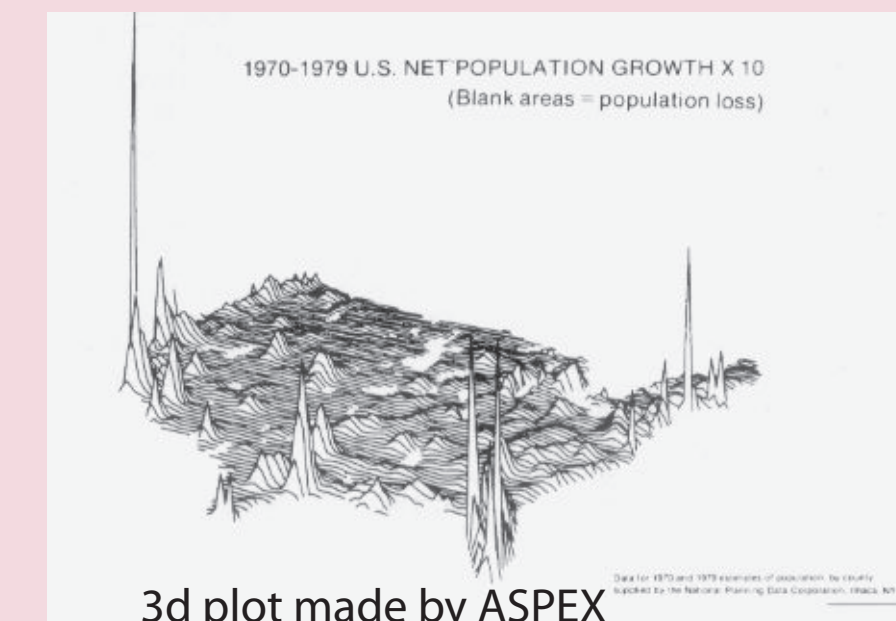
At a time when computers were thought of as producing only numbers and text, the Lab first pushed the limits of text printers to reveal spatial patterns in data with its original software (SYMAP). When digital plotters were first developed to produce 2d graphics, Lab researchers used them to create some of early computer-generated 3d visualizations. In addition to cartography, the Lab also developed tools for 3D Computer Aided Design.



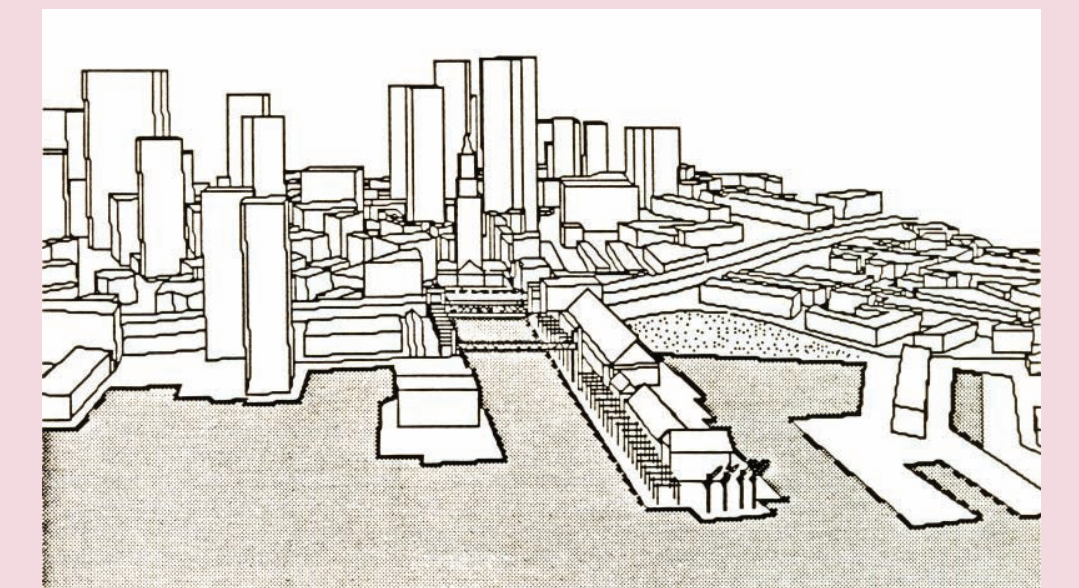
A map produced by SYMAP



Detail of overprinted symbolism.



3d plot made by ASPEX



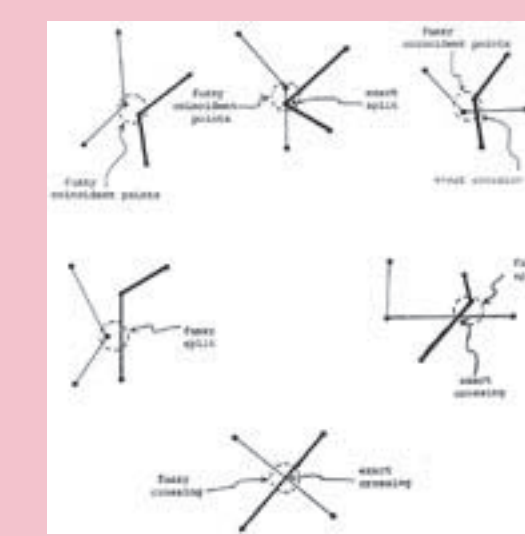
View of 3d Model made with SCHEMA

## The primary incubator for GIS invention

Software and data developed at the Lab was distributed to scholars and researchers worldwide. Regular symposia held at the GSD provided a place for innovators to gather, to pose and solve problems. Eventually, data models were developed to solve much more complex problems of data management and analysis beyond mapping. ODYSSEY, incorporated the topological data structures that eventually became the core of ARC/INFO (the fore-runner of ArcGIS). The principles of Map Algebra were formally developed for a program called GRID, which later became the basis for Raster GIS.



Diagram showing the topological data structure of a polygon.



Basic cases for fuzzy tolerance overlay from whirpool.



1980 LAND USE  
THE MONOCLONY REGION, NEW HAMPSHIRE



ALL LAND USES BELOW 100 FEET WITHIN THE FLOOD PLAIN  
ODYSSEY modeled complex spatial relationships

## Testbed for applications in spatial planning.

The Lab supported the academic mission of the Graduate School of Design - - home to Harvard's graduate programs in Architecture, Landscape Architecture and Urban Planning. Innovators in landscape planning methods Carl Steinitz, Ian McHarg and Peter Rodgers engaged the Lab and its researchers in applying spatial analysis techniques and a systems approach to the understanding and decision support in landscape planning. One student inspired by these early efforts was Jack Dangermond (MLA 1970) who went on to found Environmental Systems Research Institute. A great number of students passing through the GSD at this time went on to make large contributions to software development and applications.



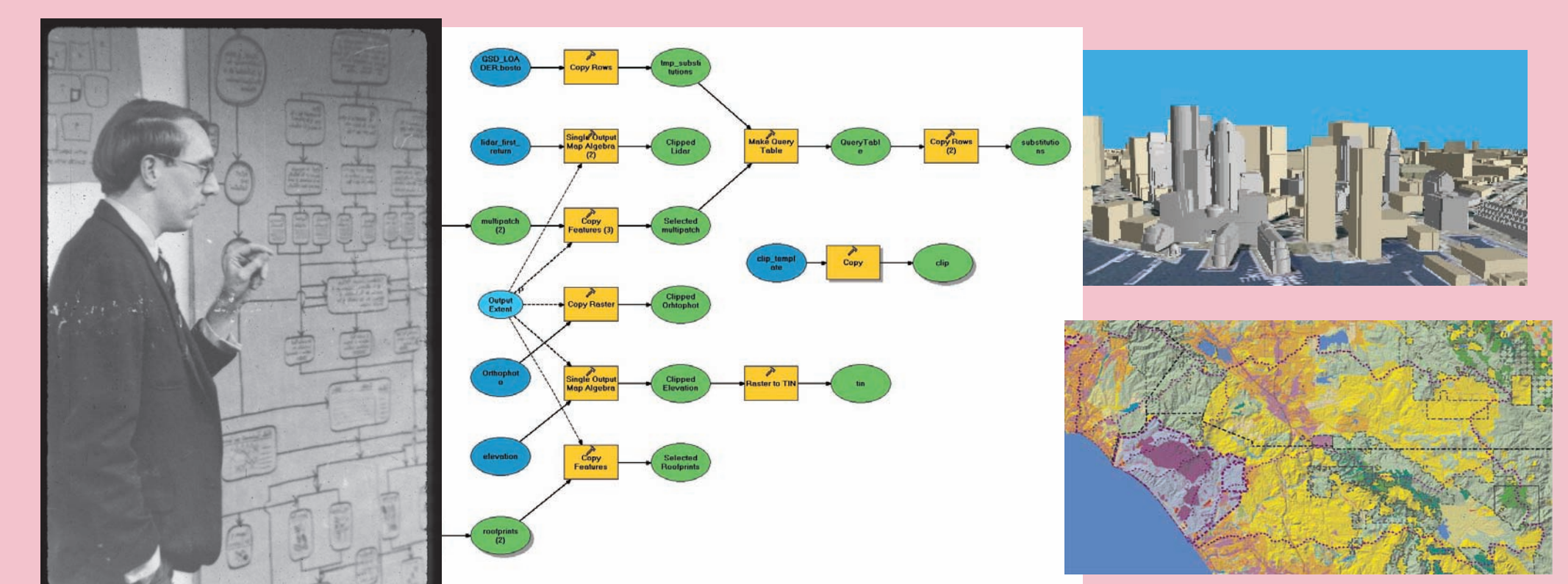
Carl Steinitz, Peter Rodgers,  
Jack Dangermond



Percent in agriculture. Soil potential for agriculture. Areas for conservation (based on criteria of conservationists).

## The Lab's Legacy

The Lab was officially dissolved in 1991. Over its 26 years of existence it produced many shelves of reports and millions of lines of computer code. The lasting legacy of the lab is in the many people who became inspired by the potential of geographical computation. Geographic analysis is still very much infused in the work of Professor Strinitz and almost every aspect of work at the Graduate School of Design. The impact of the Lab now extends into practically every organization that uses computers to manage and analyze spatial data.



# Harvard Graduate School of Design

reinvigorating geography

