Heezen's highlands

People who chart the ocean floor draw up landscapes no one has seen, using machines that send out sound waves and invisible rays. Turning sound into shape, their achievement is a map we can see and understand.

Martin Kemp

Systematic mapping of the ocean floor has progressed, in its relatively short existence, through stages that mirror in important respects the history of terrestrial maps from the time of the Renaissance. Yet the prime early means for representing undersea topographies involved emissions not discernible by our eyes.

The technical development of echo-sounding was driven by submarine warfare. Using this sonar technique, pioneering oceanographers, including Maurice Ewing, Bruce Heezen and Marie Tharp, turned their attention to the remarkable highlands and lowlands that were being progressively disclosed in the depths of the oceans.

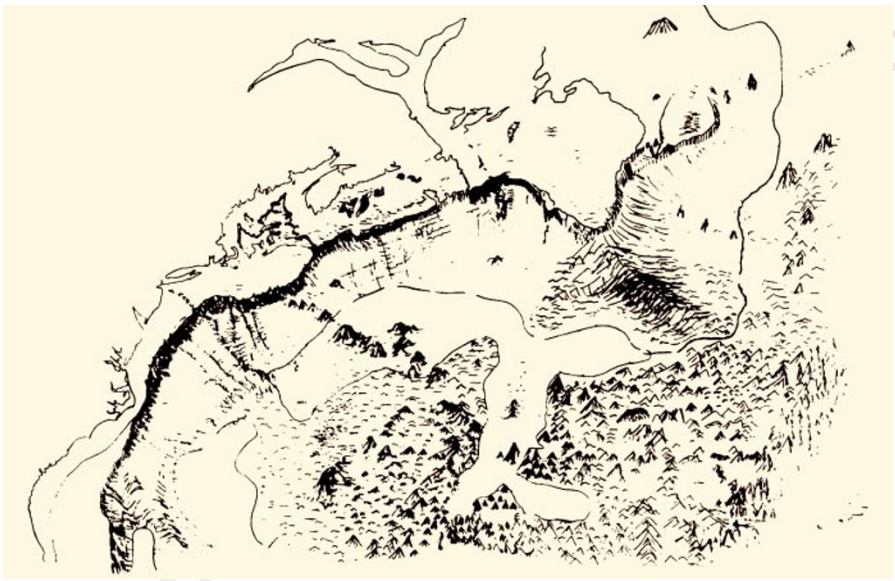
The earliest charts or 'physiographic diagrams', made possible by the increasingly high resolution of echo-sounders in the 1950s, synthesized exactly the same components of observed measurement, logical extrapolation, approximation, theory and imaginative guesswork that had characterized the mapping of *terra incognita* in the wake of Renaissance voyages of discovery.

The basic data consisted of the linear tracks of the surveying lines, often quite widely spaced, and the sonar measurements of the profiles of the ocean floor along these lines.

Tharp has described how she and Heezen conceived the first coherent relief map of the Atlantic in 1952, and how Heezen dashed off his first inspirational sketch: "he seized a piece of paper and within an hour or so drew in the topography". On the basis that "the proper way is to present it as it would be seen if all the water were drained away", they came to operate with three principles.

First, "hypotheses of ocean floor structure must be used to supplement the often meagre data, and only the use of correct hypotheses will result in maps closely approximating nature". Second, "what data exist in several disciplines must be put at one scale". Third, "sketching proceeds from the shoreline seawards and then from the mid-ocean crest landwards, as the policy was to go from the known to the unknown".

The resulting maps were greatly refined in data and technique over the subsequent years — involving, among others, Heinrich Berann, the Austrian painter of Alpine panoramas. They notably resemble historic maps in fictive relief, as exemplified by the sixteenth-century painted topographies designed by Ignatio Danti (Palazzo Vecchio, Florence, and the Vatican) and Paul and Thomas Sandby's eighteenth-century surveys of the unruly Highlands of Scotland.



Heezen drew in the topography within an hour or so for the first physiographic sketch of the western North Atlantic; from *The Ocean Floor*, ed. R. Scrutton and M. Talwani (Wiley, 1982).

Heezen and Tharp's results, published in the form of both technical diagrams and popular panoramas, satisfy ancient and modern pictorial impulses in equal measure. Reflected sound at the frequency of birdsong is translated into pictorial images in a way that has become characteristic of recent scanning devices that use such non-visible emissions as X-rays and positrons. It seems that our pictorial proclivities refuse to go away, however non-sensory the techniques of machine perception become. □

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From sketch to detail: profiles help in the building of the physiographic panorama of the Atlantic; from *The Face of the Deep*, by Bruce C. Heezen and Charles D. Hollister (Oxford University Press, 1971).