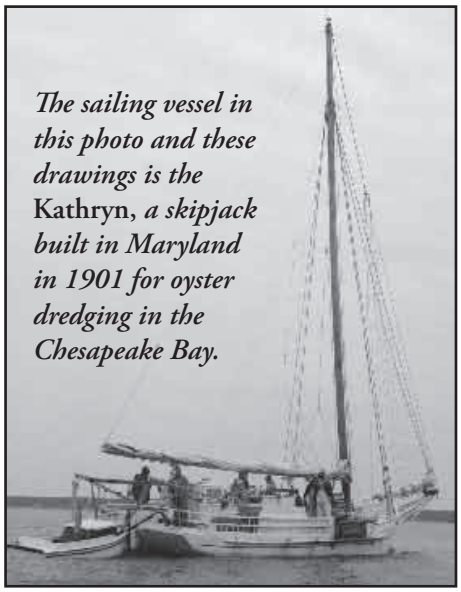
How Ships are Designed

Matthew Baker's 16th-century warship

Architects who design buildings make technical drawings, called blueprints; naval architects who design ships create **ships' plans**. Drawing ships is a lot of fun, and there are a lot of ways to draw them. While ships' plans can be beautiful to look at, there's a whole lot more you can do with them—you could build a ship from them. People who design ships are called **naval architects**, and they use a lot of mathematics and science to do their jobs. Hundreds of years ago, people who designed and built ships (usually the same person), usually didn't even know how to read. Apprentices learned from master shipbuilders, and valuable experience was gained from a lot of trial and error. Because ships traveled around, (that was the whole point of building a ship in the first place!), sailors got to see how people designed ships in other parts of the world. This sharing of information led to a gradual improvement in the way ships were designed. For example, before the time of Columbus, sailors from Western Europe sailed east on square-rigged ships through the Mediterranean Sea and saw Arab sailors in their boats, called **dhows**, with fore-and-aft, or **lateen**, sails doing a much better job of sailing into the wind than they were. Square sails were great for going off the wind, but the fore-and-aft lateen sails were much better for tacking upwind. In time, ships in Western Europe were putting these lateen sails on their ships too. When Columbus sailed in 1492, his three ships were rigged with both square and lateen sails.

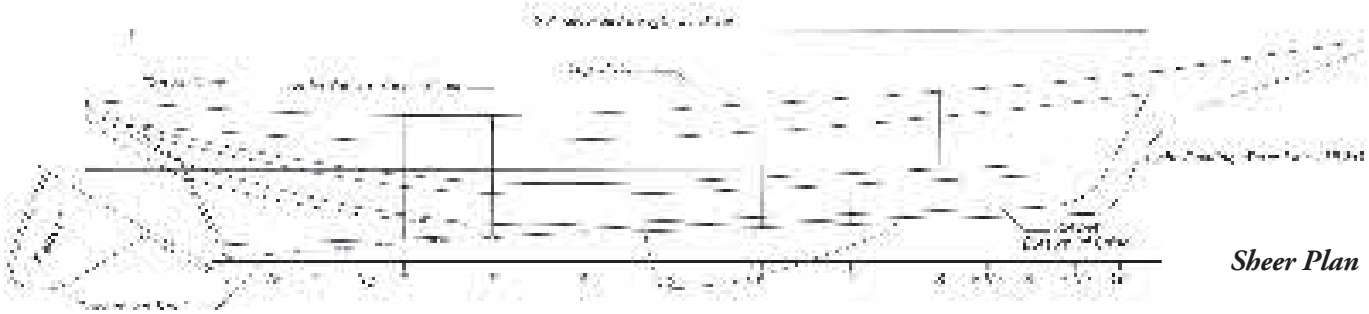


The sailing vessel in this photo and these drawings is the **Kathryn,** *a skipjack built in Maryland in 1901 for oyster dredging in the Chesapeake Bay.*

Over the years, as people learned more about how and why ships float, move through the water, and how sails work with the wind, they began to use a lot more science in designing watercraft. The earliest naval architect historians know about was named **Matthew Baker**. He designed an English warship's hull in the 16th century based on the streamlined shape of a fish. By the late 1800s, engineers were taking over the job of designing ships, leaving the master shipbuilder to do just that—build ships, not design them.

Because ships are three-dimensional, plans are made with three types of views—the **sheer plan**, **half-breadth plan**, and **body plan**. Basically, imagine slicing a ship in three ways and then pulling out the slices to trace and measure them. If you make lengthwise slices from the top going straight down, you'll get the lines for the sheer plan; cutting cross-sections from the top going straight down yields the body plan; and coming in from the side, making slices straight across will give you the curves for the half-breadth plan. (For the half-breadth plan, you can assume that the ship is symmetrical, so you don't have to draw the other side.)

Naval architects need to be good at drafting as well. The plans they produce are loaded with scientific information, but they also have to be easy for the shipbuilder to read. Sailing ships also have **sail plans**. These are usually simpler to look at because, most of the time, they are simply drawn with the perimeter dimensions to the proper scale, but the science going into their design is just as complicated—it is up to the sailmaker to construct the sails with the proper curves and materials so that they work efficiently. Naval architects work closely with shipbuilders and sailmakers to deliver the best ships they can.



Sheer Plan