# MOKUME-GANE　木目金

## History

Mokume-gane (mokume – wood eye or wood grain, gane – metal) is a traditional Japanese metalworking technique that was invented by Denbei Shoami (1651–1728). He initially dubbed it Guri Bori (guri – circle or arch, bori – carve or chisel) because of the product's resemblance to a lacquer work technique where patterns are carved into thick layers of different colored lacquer. Shoami was also influenced by the pattern-welded steel used in sword making. He adapted the principles of forge-welding to fuse alternating layers nonferrous metals into a billet, then carved into them to create ornamental tsuba sword fittings (handguards) and kozuka (the handle of a small knife stored in a groove of the sword sheath). He later began forging the laminate after carving to make a smooth surface with concentric bands of color that revealed the original depth and shape of the grooves, much like the elevation lines on a topographic map.

A number of factors led to the development of mokume-gane in Japan at this time: advances in sword-making techniques, the high level of skill among metalsmiths, extensive knowledge of metallurgy passed from master to apprentice for generations, and readily available materials and colored alloys.

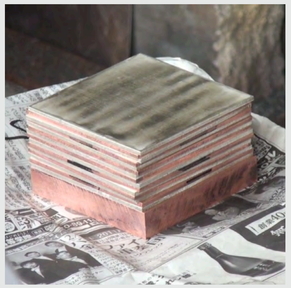
Mokume-gane was introduced to the West in the 19th century, when Japan exhibited the art form at the 1862 International Expo in London, England. Later in the same century, Edward Chandler Moore created many mokume-gane pieces as the design director for Tiffany & Co, New York. One design, a 32-inch vase, the largest known mokume object, was showcased at the Paris Exposition in 1889. Tiffany designs made exclusively of mokume-gane during Moore's tenure were rare; his work more often consisted of silver pieces which featured a mokume detail in the design, such as a frog, a spider, or a leaf.

Western development of the technique accelerated in the 1970s and 1980s. Hiroko Sato-Pijianowski researched mokume-gane techniques, studying with Norio Tamagawa at Tsubame City in Japan, in the 1970s. Hiroko Sato-Pijianowski and Gene Pijanowski introduced the technique to the United States, launching the development of a modern metal art movement by way of lectures, workshops, and University teaching positions.

Much trial and error is required to master the mokume-gane method, as well as patience, dedication, and motivation. Patience, in particular, is essential. Two mind-sets are needed—first, in the production of the billet and second, in the creative use of the billet. Recent advances in technology such as digitally controlled kilns have opened up new possibilities for mokume-gane. It is truly awe-inspiring to watch the ongoing evolution of mokume from 17th century Japan to the 21st century world.

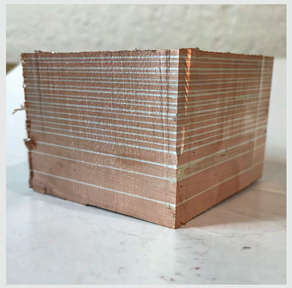
## Process

1 Each sheet of metal must be the same size, flat, clean, and dry. Gaps and contamination can cause billet failure.



2 Once the pieces are clean and dry, they are stacked in order and then pressed together between plates.

3 It is heated until you can see the metal "sweating" or the "flash" between layers as a liquid alloy forms, fusing them together.



4 The billet is "set" with a blow to the center of the plate. Once cool, the edges are trimmed and inspected for any signs of incomplete bonding.

5 The billet is heated again, not as much as when bonding but enough to make forging it easier.

6 While hammering, the metal gets harder from being compressed. It needs to be annealed (heated and slowly cooled) or cracks form.

7 This process is repeated until the billet is about a quarter inch thick. Then it is ready for patterning.

8 A pattern is cut into the billet with a router, drill, or chisel.

9 The pattern has been carved into this billet and it is ready to be roled or hammered flat.

10 Once flat, it can be formed into its final shape or, if it is thick enough, another round of patterning can be done.