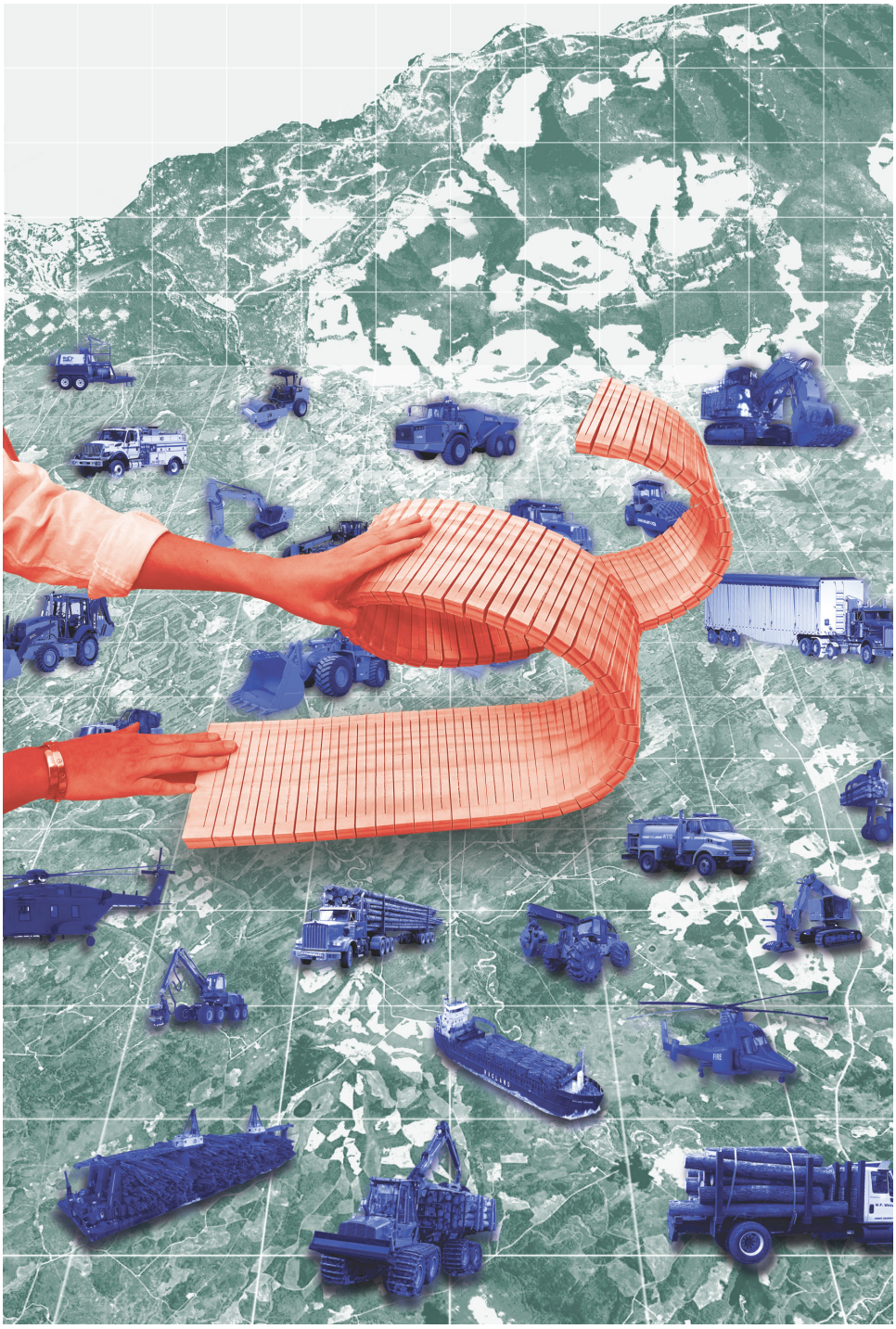
SYRACUSE UNIVERSITY
SCHOOL OF ARCHITECTURE

BENT_MATTER



TOTA K. HUNTER

FALL 2020

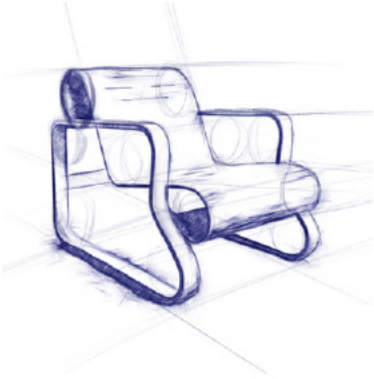
B. ARCH THESIS PREP

THESIS

Within this thesis, the notions of curvature and flexibility are explored in a natural resource that fights to be rigid and inelastic. Through modern-day craftsmanship, this research aspires to deploy a method of wood bending that frees the craftsman of physical limitations. Looking at existing assemblies of bentwood forms, the method is meant to be implemented to seek the same formal freedoms allowed by other methods and materials.

Furniture then functions as a vehicle for the experimentation of bending wood methods and its pragmatic application. Looking back at existing forms methods of bending wood, the thesis proposes different means of future exploration that have a grounding in the findings.

Alvaro Aalto



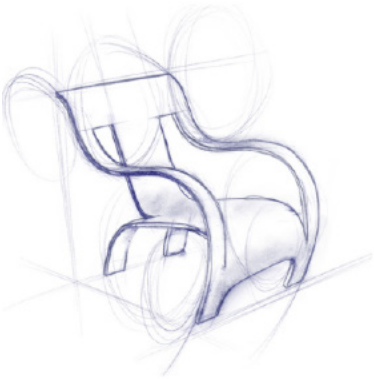
Paimio Chair

1932

Like many of Alvar Aalto's furniture designs, this chair was conceived of for the Paimio sanatorium (1927-32), an isolation hospital for tuberculosis patients. This model was for its lecture hall. Anxious to provide seating that was as welcoming and comfortable as possible, Aalto decided against tubular-steel designs and opted for an all-wood construction.

These armchairs, manufactured for sale by Otto Korhonen's firm and from 1935 by Artek, became among the most successful of Aalto's productions in the 1930s. The structural rationalism of separating ***support and supported*** was a fundamental principle of Modernist design. The delightful juxtaposition of coloured ***plywood*** seat and back and ***light birch*** frame has an organic quality to it, which invites one to sit down in the chair. By this time Aalto had mastered the possibilities of forming plywood in ***hot metal presses***.

Gerland Summers



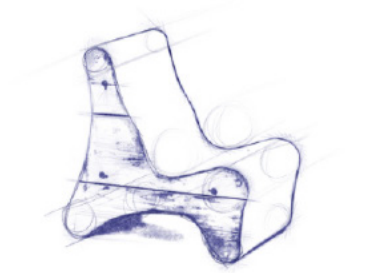
Armchair

1934

This chair's very clever, simple design allows it to be made from a single sheet of plywood. Designed in 1934 by Gerald Summers and manufactured by his London company, The Makers of Simple Furniture, the chair is made from a ***plywood sheet consisting of 13 layers of cross-grained veneer***. The sheet was first cut with four straight lines, which outlined the position and width of the arms and back legs. While the ***glue*** between the plys was still wet, the sheet was then pressed in a ***wooden mould*** for eight hours. The mould articulated the curve of the chair's legs and arms, leaving only the front ***legs to be cut out*** after the moulding process was finished.

The construction of the chair from a ***single piece of moulded board*** gives it a highly distinctive visual and structural clarity. Summers was one of a group of European designers working in the early 1930s to push the formal and structural limits of new furniture materials such as plywood.

Frederick Kiesler



Multi-use Chair

1942

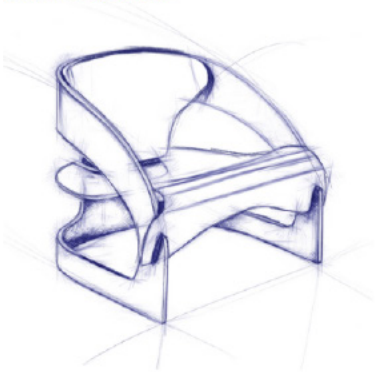
"The seats were a kind of wave which curved down, surged up, and fell once more, thus forming an object without beginning or end," said Kiesler of his Multi-use Chairs, "and in its convex curves the body could take ease." Kiesler designed these chairs—constructed for seven dollars each in the Bronx—to fill the unconventional spaces he created for Peggy Guggenheim's The Art of this Century Gallery on 57th Street. The Surrealist-inspired "rest-forms" were meant to be versatile; Kiesler ***delineated eighteen uses*** for them, including seating and stands for the display of objects. Their organic shape demonstrates Kiesler's experimentation with "continuous tension."

Charles+Ray Eames

LCW Chair
1945

The design of this chair arose from experiments with ***moulding plywood*** conducted by Charles and Ray Eames during the Second World War while they researched the manufacture of leg splints for the US Navy. They succeeded in forming plywood in three planes to create softly curving, organic shapes. The LCW chair (standing for Lounge Chair Wood) was one of several variant designs from the years immediately after the War that all featured separate seats and backs. The first Eames plywood chairs were made in Los Angeles by Evans Products, but from 1946 the bigger Herman Miller Furniture Company in Zeeland, Michigan, marketed the furniture, and from 1949 Herman Miller took over production too. The furniture was aimed at middle-class American families that wanted an up-to-date image. This example was part of the furnishings of the Tarter House in Los Angeles, designed by the architect Gregory Ain.

Joe Colombo

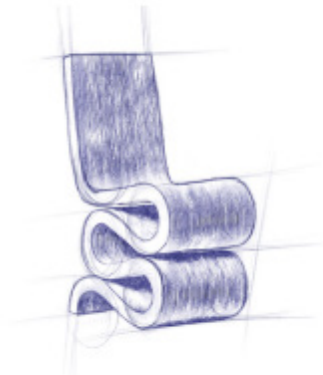


Model 4801 Chair
1963

At first glance the glossy surface and bright colour might make you think this chair is made of ***plastic***, especially since both the designer and the manufacturer are well-known for their 1960s plastic furniture. In fact, the chair is made of just ***three bent and pressed plywood elements*** simply ***slotted*** together. Any sense of the material as wood is obliterated by the coat of polyester varnish, making it appear entirely synthetic.

Kartell was founded by Giulio Castelli, a chemical engineer, in 1949 and was at the forefront of plastics technology. In 1964 Kartell first produced this chair and the first all-plastic chair, also designed by Colombo. This chair, therefore, sits at the cusp of the shift away from plywood (the material-of-choice for advanced designers since the 1930s) towards the new plastics. In this chair, the ***old technology is masquerading as the new technique.***

Frank Gehry



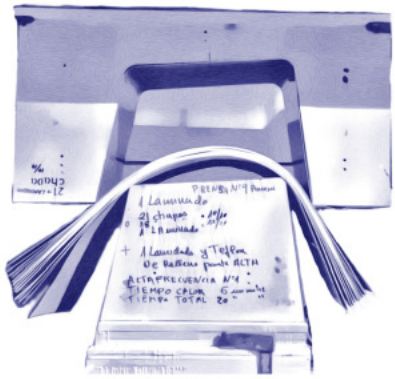
Wiggle Chair
1972

When a group of artists and scientists from NASA called a meeting at artist Robert Irwin's studio in 1969, they asked architect Frank Gehry to give the place a quick makeover. Given the ***shoestring*** budget, Gehry came up with something simple yet subtly futuristic: seating made from stacks of cardboard, a humble material he kept around for making models.

"I discovered that by alternating the direction of layers of corrugations, the finished board had enough strength to support a small car, and a uniform, velvety texture on all four sides," he told The Christian Science Monitor in 1972. "I found I could cut these edgeboard sections into geometrical forms, or bend them into sculptural, ribbon-candy folds."

While the press and public went wildfor what The New York Times Magazine deemed "***paper furniture for penny pinchers***," Gehry worried its popularity would eclipse his architecture, so he stopped production of Easy Edges in 1973 and quit cardboard furniture altogether by 1982, eventually ceding rights to Vitra, where the Wiggle (from ***$1,175***) is made today.

*01*_Lamination

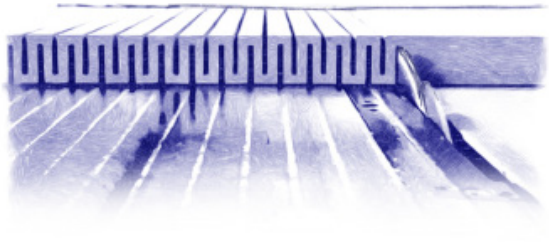


Lamination in a Press is first and foremost, one of the absolute easiest ways to curve a piece of wood. It includes the process of laminating together several thin sheets a wood in a press. This involves no heat, steam, or any process that you're not already familiar with. But in circumstances of mass manufacturing does require heavy duty presses.

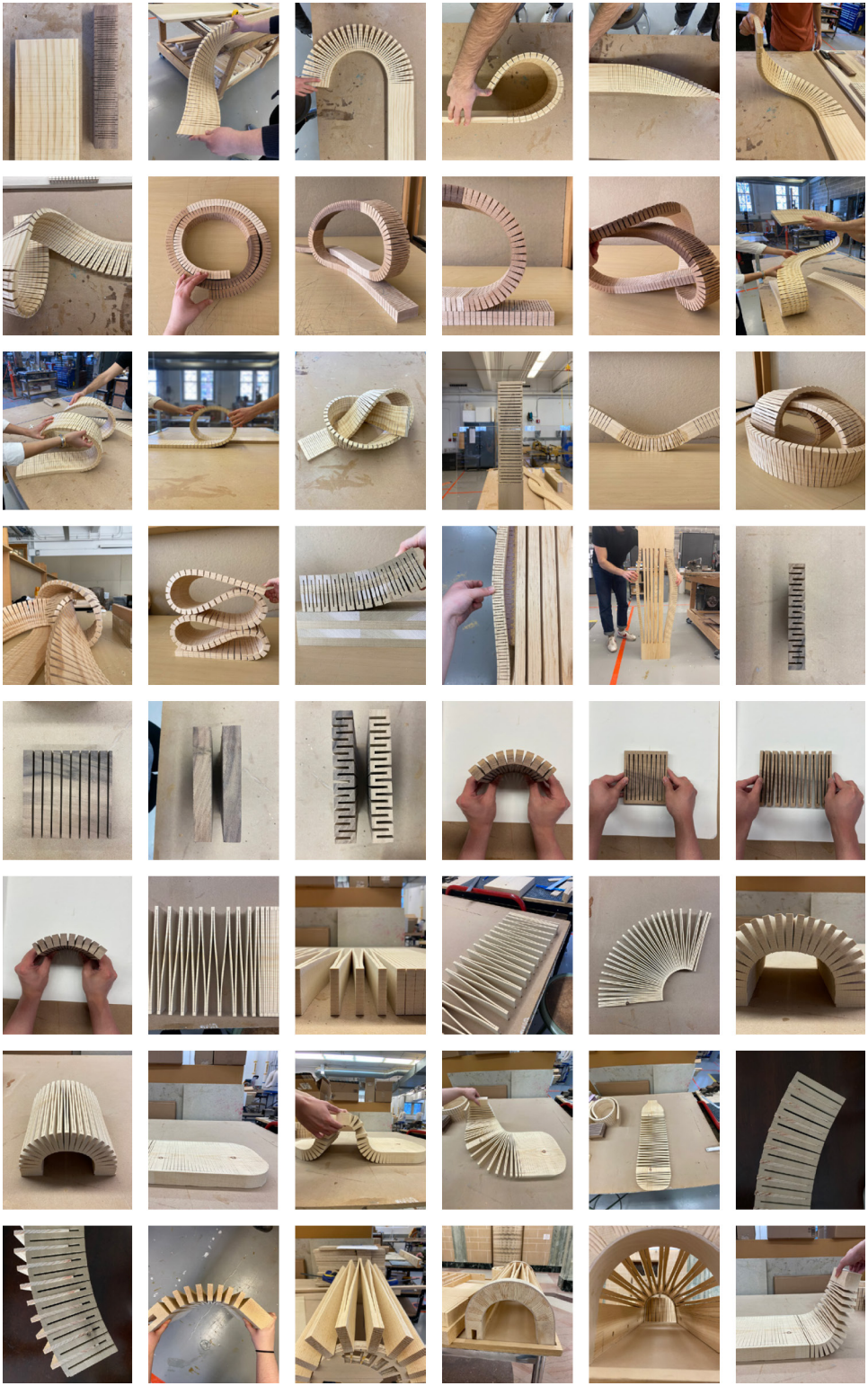
*02*_Steam / Heat

This is where you take a piece of wood and put it in an environment of high temperature and steam and moisture, which permeates the wood and makes it flexible. It's a process that does require a little bit of learning and risk of injuries. Also depending on the wood and its thickness, wood products need to be put in the bent form as soon as taken out of steam or heat box to set. However it has to been done slow enough as to not snap.

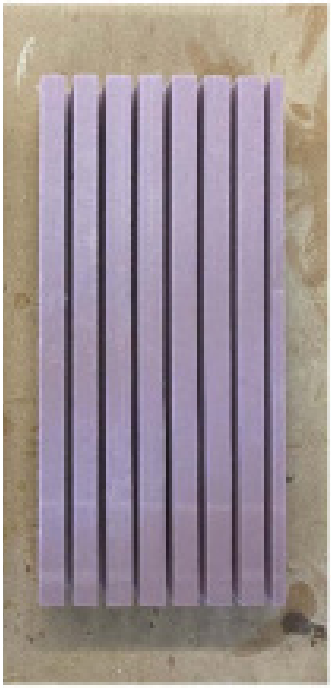
03_Kerf Cutting

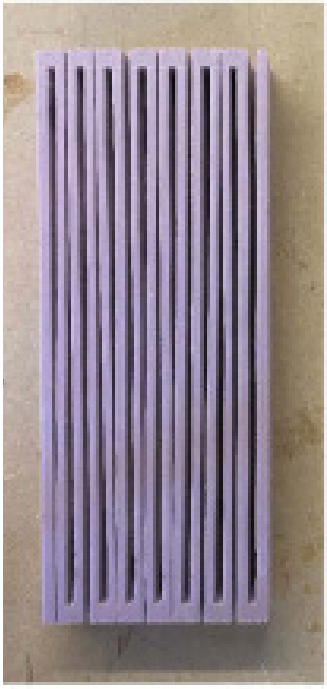


When you take a strip of wood and you cut several slots in it that go nearly all the way through but not quite, it creates a board that is flexible. You can then curve the board into many different shapes, and it doesn't require heat or glue



Physical Prototypes of Bending Experimentation



a.

e.

i.

b.

f.

j.

c.

g.

k.

d.

h.

l.

a. balsam fir

b. white pine

c. hemlock

d. red spruce

e. quaking aspen

f. black cherry

g. yellow birch

h. sugar maple

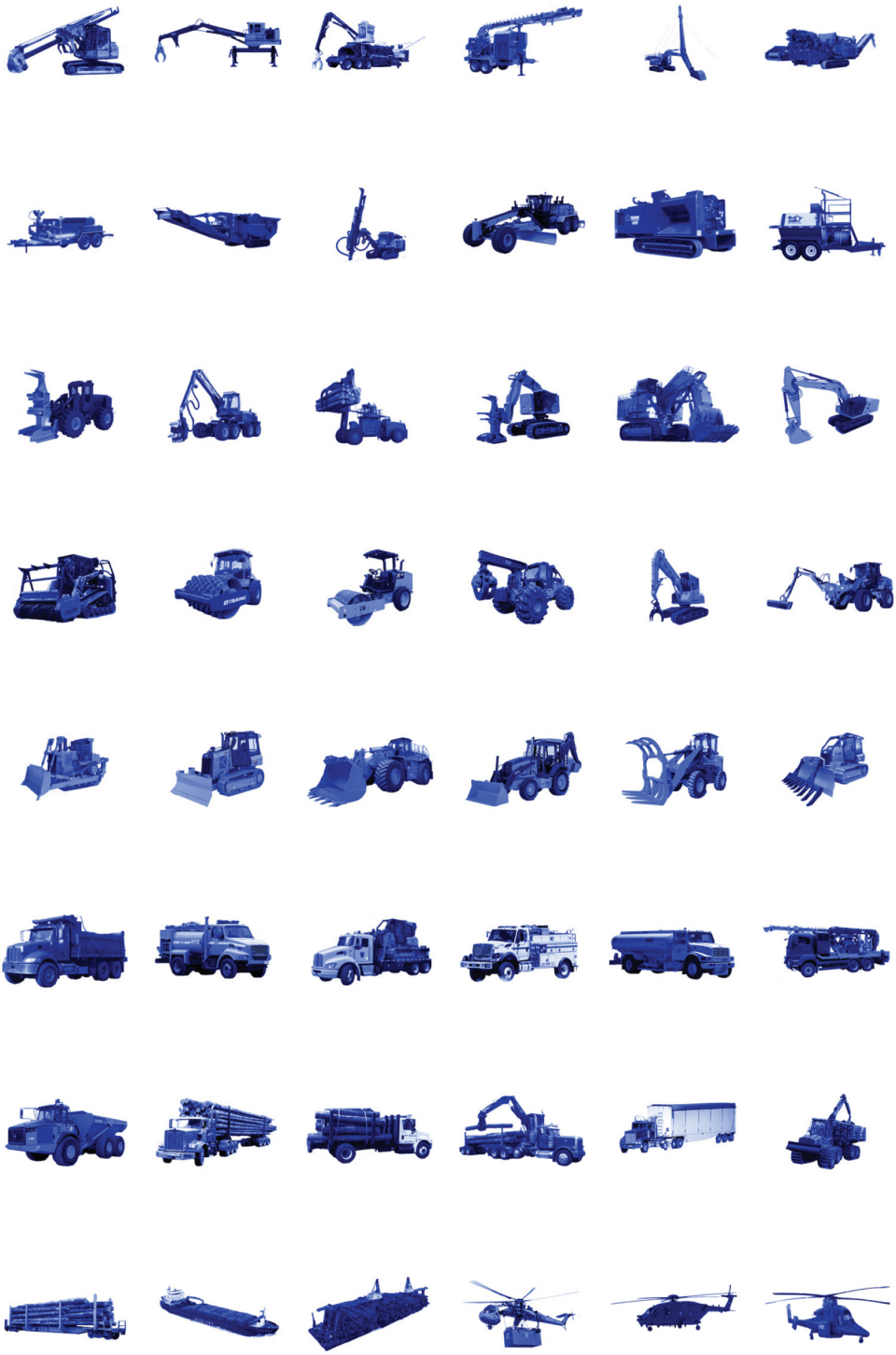
i. white maple

j. white ash

k. northern ed oak

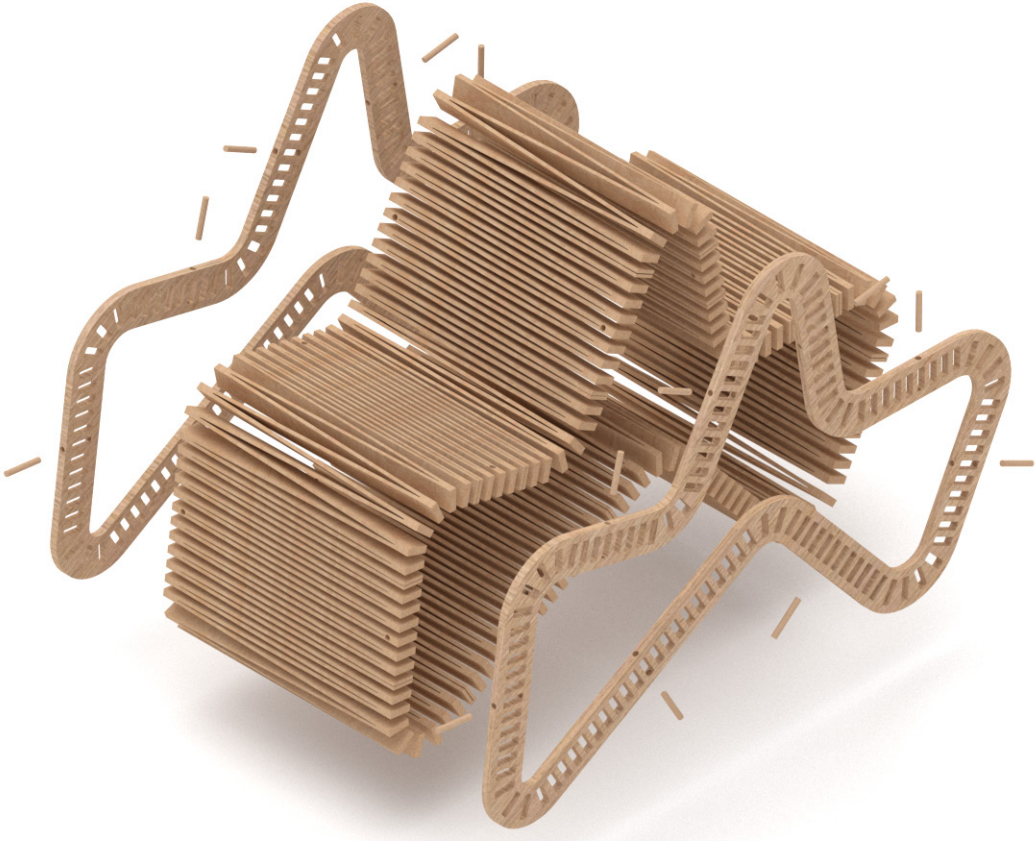
l. american beech

antique vehicle parts
barrels
baseball bats
boats
bowling pins
boxes
cabin logs
cabinets
canoe paddles
caskets
charcoal
christmas tree
distillation
doors
flooring
fluke board
furniture
furniture
guitar
gunstock
light framing
lumber
mandolins
matches
moldings
oars
organ
oriented strandboard
paneling
paneling crates
particleboard
pianos
pilling
playground structures
plywood
poles
pulpwood
railroads
roofing
sauna benches
sawtimber
sheathing
shingles
siding
snowshoes
steam bending
subflooring
tool handles
toys
trim
veneer
violins
woodenwares



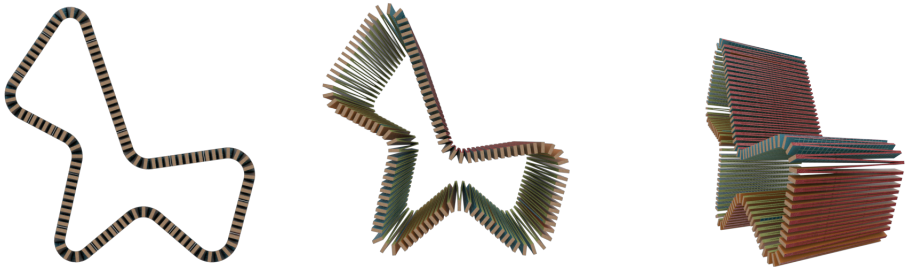
Machines Used in the Long Chain of Resource to Product

Works at landing with loader boom to remove limbs and cut tree into “bucks.”	Machine swings in a full-circle to move, sort, pile, and put logs on log trucks.	Chipping machines produces low-bark-content chips for wood pulp mills.	Logs or small trees are lifted and carried on slopes from the stump to landing.	Cable is rigged from high tower to harvest area to lift and carry logs to landing.	Machine grinds waste wood into usable wood biomass, then moved by coveyer.
Used for extinguish fires near forest operations, and burning of forest fuels.	Rock crushing machine produces gravel and construction aggregate.	Tracked machine used to drill holes into rock, preparing for rock blasting.	Machine smoothes and shapes forest road surfaces; primarily for maintenance.	Machines removes the bark and limbs from logs for later use as wood biomass.	Used to spray grass with mixture to re-vegetat forest roadsides for erosion control.
Fells trees on wheels in controlled direction and places onto pile “bunches.”	Delimbs and cuts tree into logs of same size, using an automated cutting head.	Log un-loader at timber mill, can remove entire truck-load with single grab.	Fells trees on tracks in controlled direction and places onto pile “bunches.”	Digs-lifts-loads dirt and rock with boom and heavy digging bucket to build forest roads.	Digs-lifts-loads dirt and rock to build forest roads in smaller construction areas.
Grinds thick forest under story bush, limbs, and tree tops into mulch.	Steel blade used for heavy-duty forest road compaction and dozing operations.	Heavy roller used for compaction of forest sub grade and rock surfacing.	Purpose-built machine grabs logs, ans pulls logs to the roadside landing.	Tracked boom logger “swings” felled and cut down logs to the roadside landing areas.	Mobile machine that clears roadsides of unwanted brush overgrowth.
Builds and smooths landings, improves road drainage, and moves debris.	Forest road builder that is used for its blade that pushes dirt and level ground.	Used to move or load soil, rock, sand, debris, into or onto another machine.	Uses bucket scoops, digs and loads, small jobs, repairs forest roads and road drainage	Log mover at helicopter log drop or at the timber mill, used to move logs.	The dozer pushes, moves, and places excess logging debris into compact piles.
Hauls first, rock, and wood debris and trailers - to build and repair forest roads.	Pumps and hauls over 2,000 gallons of water to spray forest roads to control dust.	Dozer prepares to dig firelines and fight uncontrolled forest fires near operations.	Used to extinguish unwanted fires near operations, and controlled burns.	Hauls aviation fuel to refuel helicopter at the field service location near the project.	Cable is rigged from short tower to harvest area to lift and carry logs to landing.
Very large construction hauler with a rear dumping box for dirt and wood debris.	Semi-truck and long-log trailer hauls 40’-long logs from forest operations to mills.	Pulls a “hay rack” short-log trailer that hauls 30’-short logs from forest to mill.	Truck driver operates loader heel-boom grapple to load logs onto trailer.	Truck pulls a 40’ long open-top trailer that hauls wood chips from the forest to mills.	Carries small logs from the stump to the roadside landing operation.
Cargo rail cars purpose-built for transporting logs on train carts long distances.	Cargo ship transports logs and wood chips from local to international markets.	Cargo barges purpose-built for transporting logs long distances over bodies of water.	Cargos of logs, trees, water bucket, or heavy forest construction materials.	Lifts and transports a variety of forestry cargos: work crews, sprays or logs.	Aircraft flies logs or whole trees, while suspended from a longline cable.



Exploded Axon

Exploration of Colors



Exploration of Varied Perimeter

Explorations of Methods of Fastening










Physical Chair Variations

Thesis Document

Spring 2021

Syracuse University

School Of Architecture

Advisors:

Jean-Francois Bedard
Britt Eversole
Roger Hubeli
Julie Larsen