







# Ronchamp

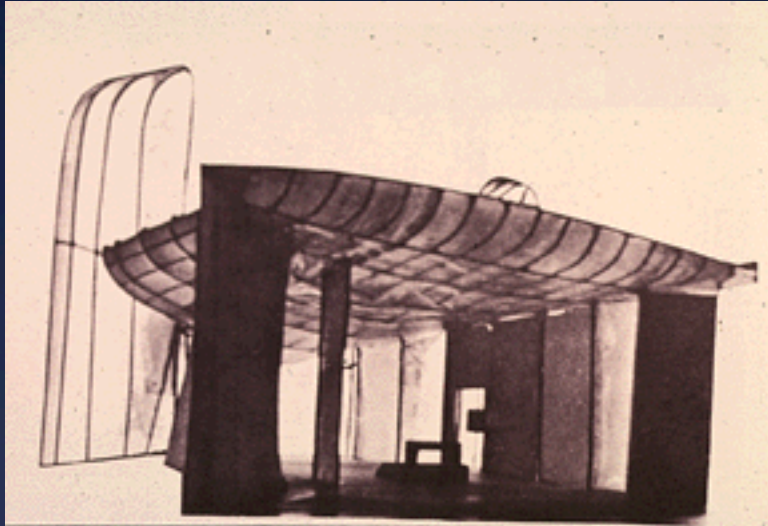
Concrete is a material, that as a heavy fluid, offers an architect an endless variety of forms and surface quality opportunities.

At an early point in the design process the architect and engineer must have an idea of how the concrete will be used as a structure.

The chapel Notre' Dame du hut at Ronchamp by Le Corbusier has a number of innovative ideas for concrete structure



# Ronchamp

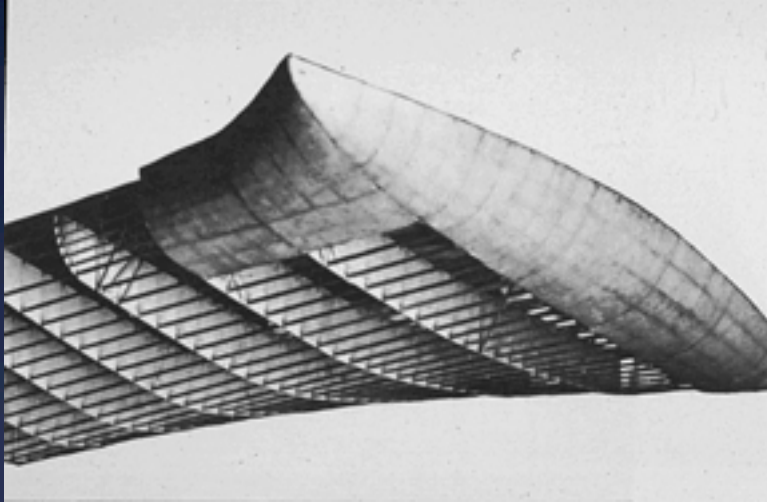


Despondent about the loss (*or theft...if you ask Corbu*) of the United Nations competition, Corbu was walking barefoot on a beach on Long Island when he stepped on a crab shell.

He was impressed that something so light had not crushed under his weight. Upon dissection of the shell, he found it's cellular structure allowed the shell to be both strong, and very lightweight.  
From "Corbusier at work"

# Ronchamp

Corbu had long ago advocated thinking of buildings as designers though of boats and airplanes.



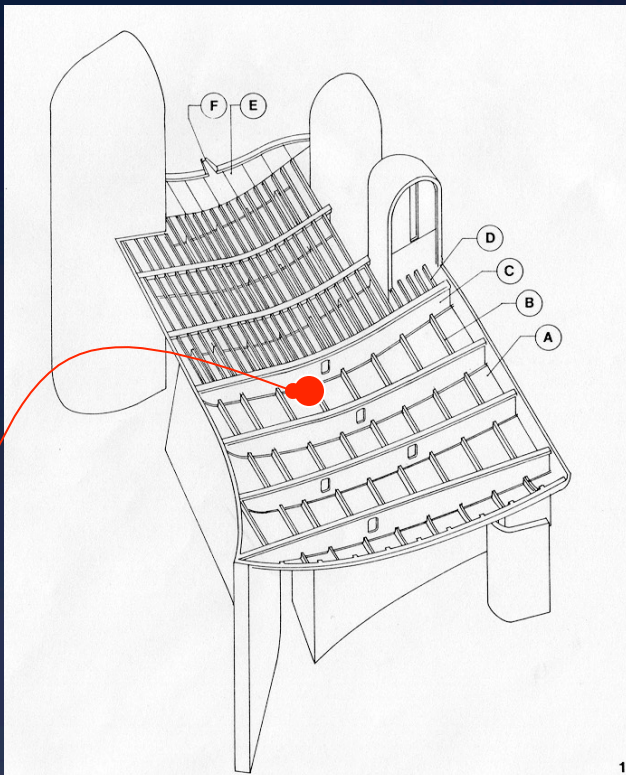
In the chapel, Corbu develop what appears to be massively thick concrete elements for roof and wall.

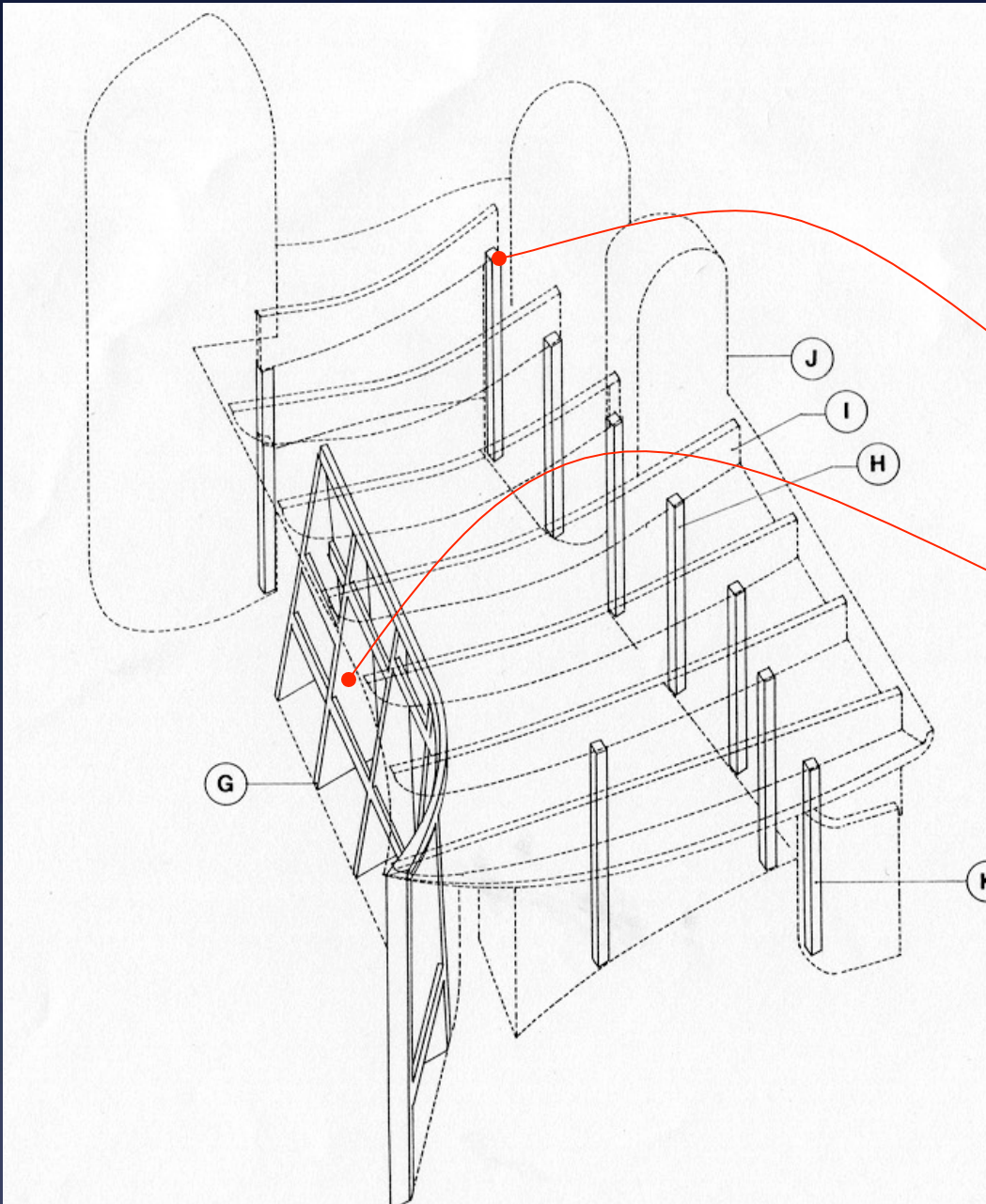
In reality, the roof is a series of parallel concrete beams, cast in concrete, having their bottom chord as part of the ceiling shell slab, and the top chord part of the roof shell slab

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The roof beams are formed and cast after the bottom of the shell was poured, there are small passages to allow movement through the beams and across the attic

Here we see inside of the roof element. The scale of the beam depth is apparent with the man easily sitting between the beams in the roof shell.





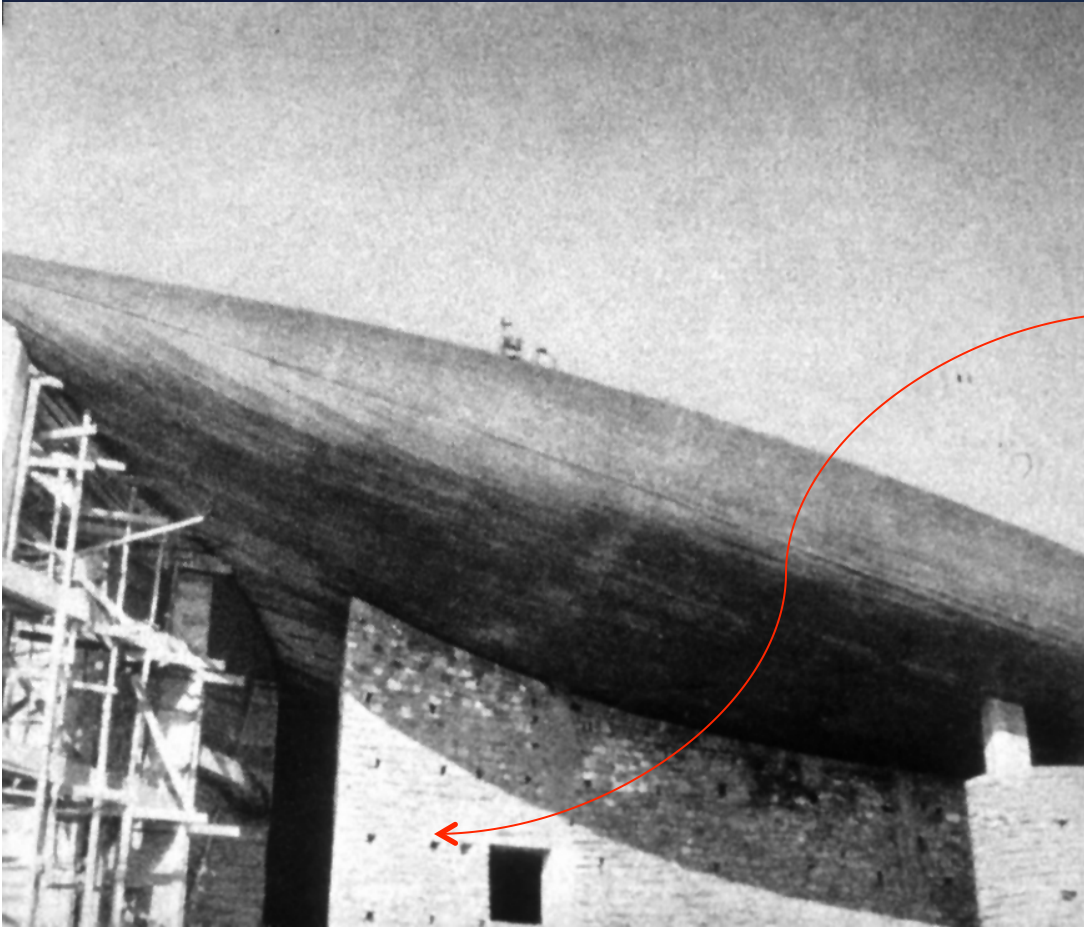
The walls contain two kinds of columns.

The simple extruded square concrete columns in the thin walls

and triangular columns in the thick wall that form the “spars” defining the changing shape of the wall at each gridline

Each column receives a beam

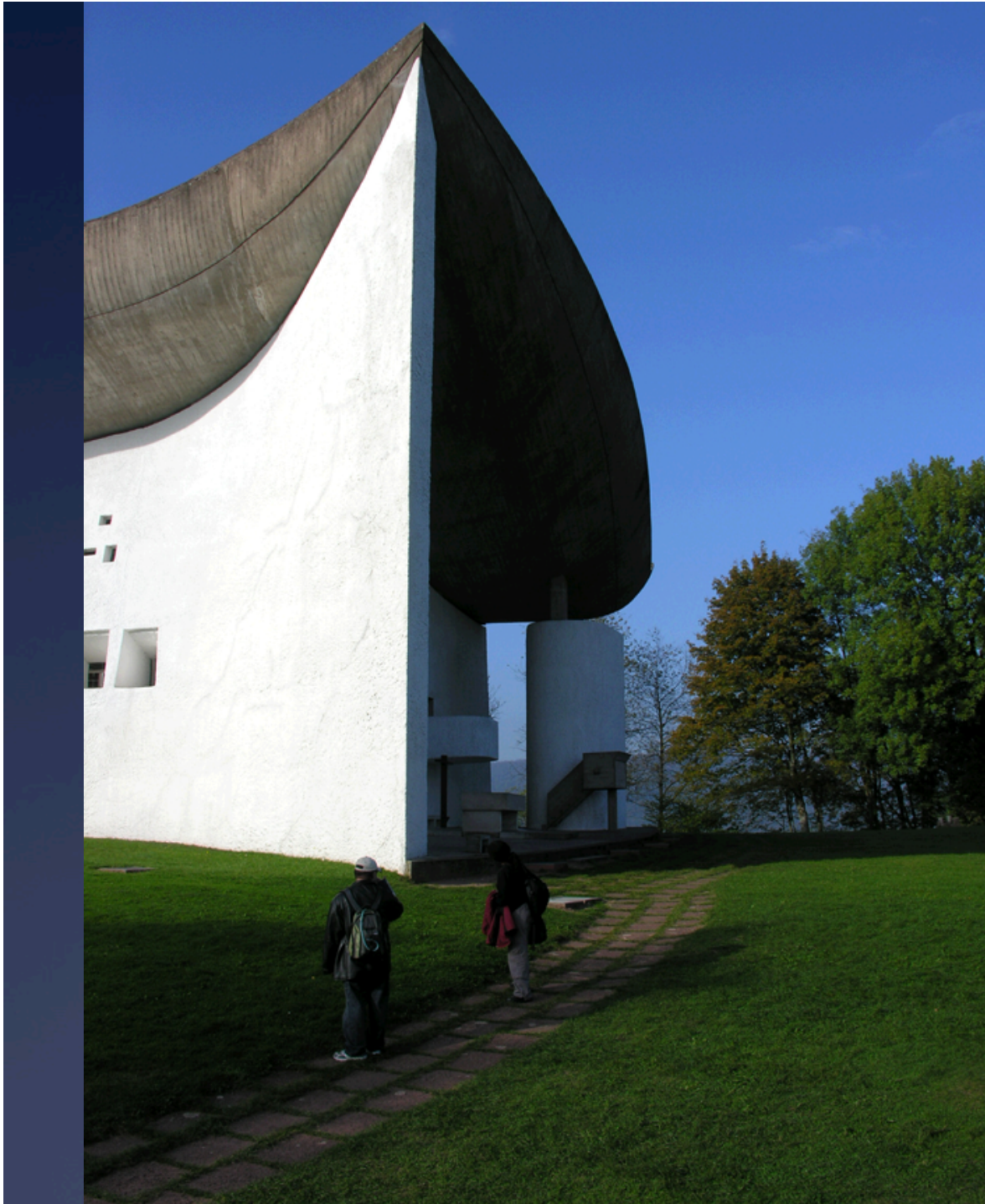




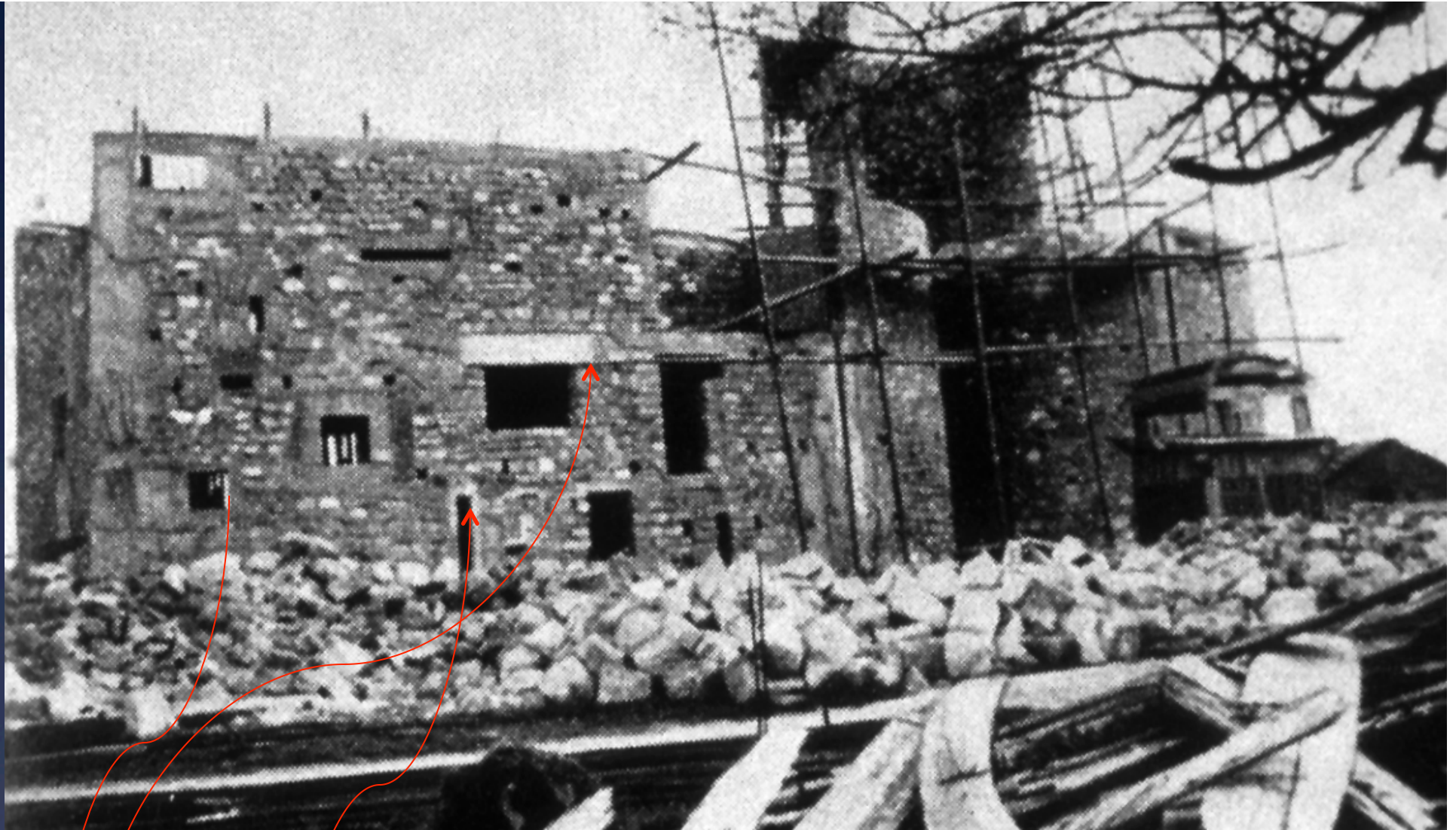
For stained glass? Or putlogs?

Column in the shadow gap





Slicing dark and light

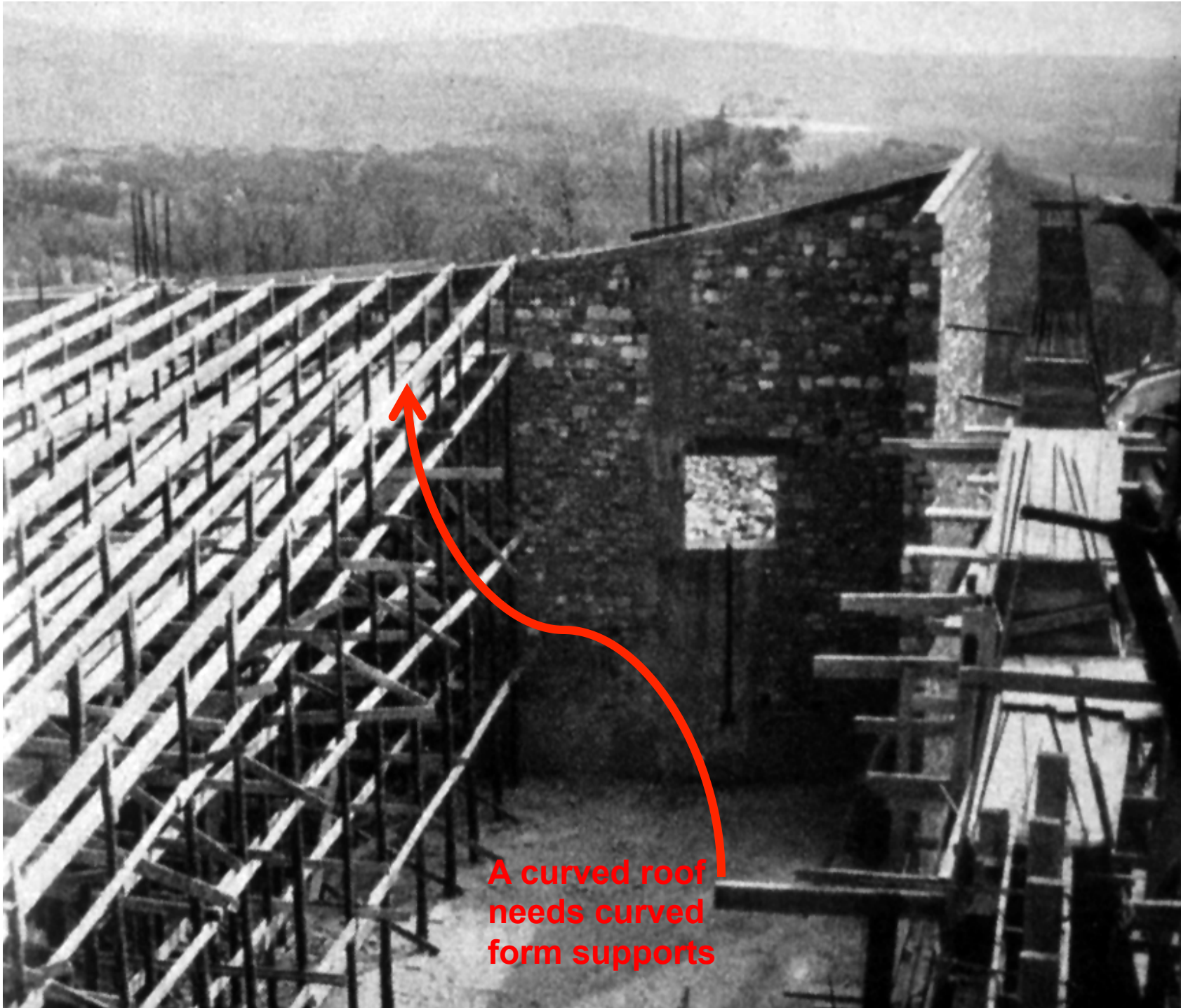


It just looks like a monolithic wall...actually has lots of parts

Lintels

Jambs

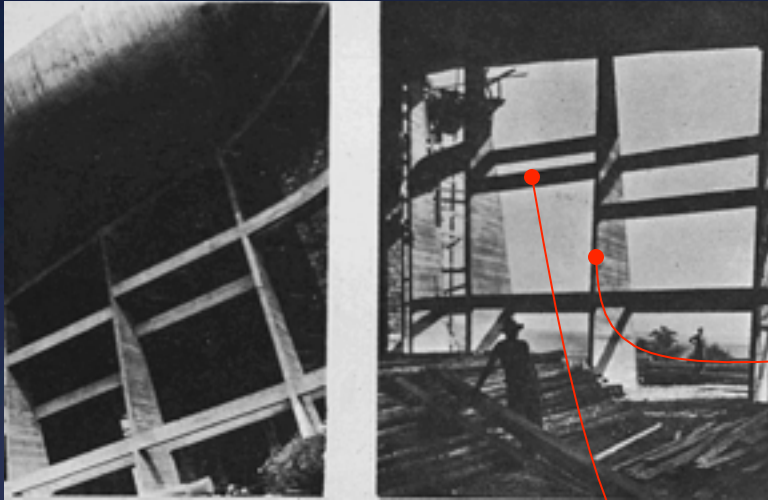
Frames



**A curved roof  
needs curved  
form supports**

# Ronchamp

Corbu thought of the wall as he did the crabshell...and the roof.



The wall employs fin-like columns under each roof truss.



To prevent buckling of the very thin columns, small beams are poured between each to stiffen the column.



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Each fin-column is wrapped with metal lath (like chicken wire) and is sprayed with concrete to make the final heavily textured surface.

Today, gunite or shotcrete spray-applied concrete methods are used for erosion control, swimming pools.

The very dry mix is pumped under pressure to a spray head where compressed air is added to force the concrete through the nozzle onto the wall



The difference between shotcrete and gunite is where the water is added to the mix.

Shotcrete uses water added at the readymix plant for accurate wcr control.

Gunite adds water at jobsite, not wcr problem if installer doesn't add too much



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The great wall of the chapel has openings which clearly express a great thickness.

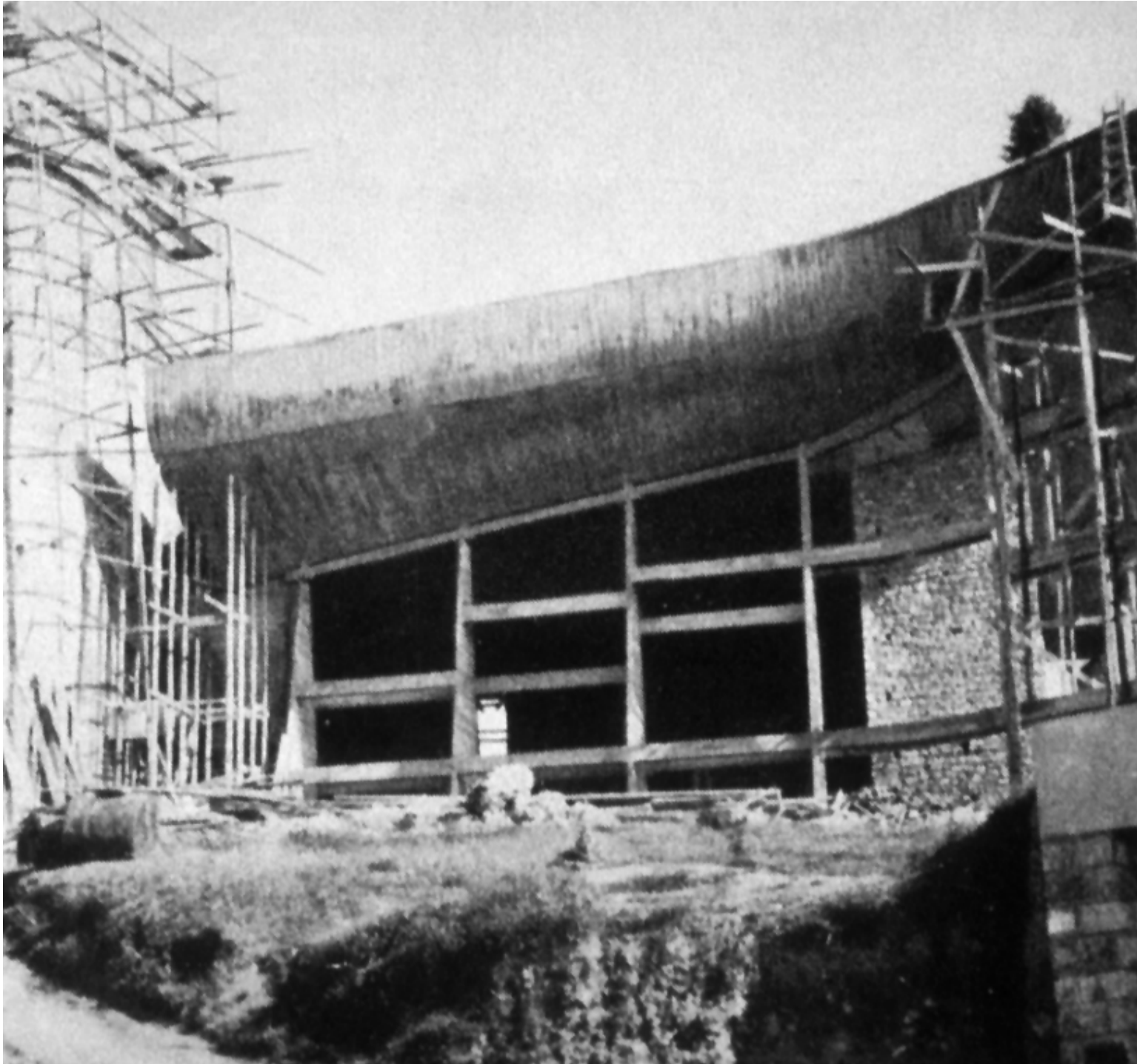
But this is a modern wall by a modern architect... *how could a modern advocate like Corbu advocate the use of medieval construction methods?*



Yet this wall has to carry each of the massive concrete roof trusses.



Art and Pragmatics...the drip



The greatest  
wall in  
architecture  
takes shape







Scooping light from the North, a more even light through the day



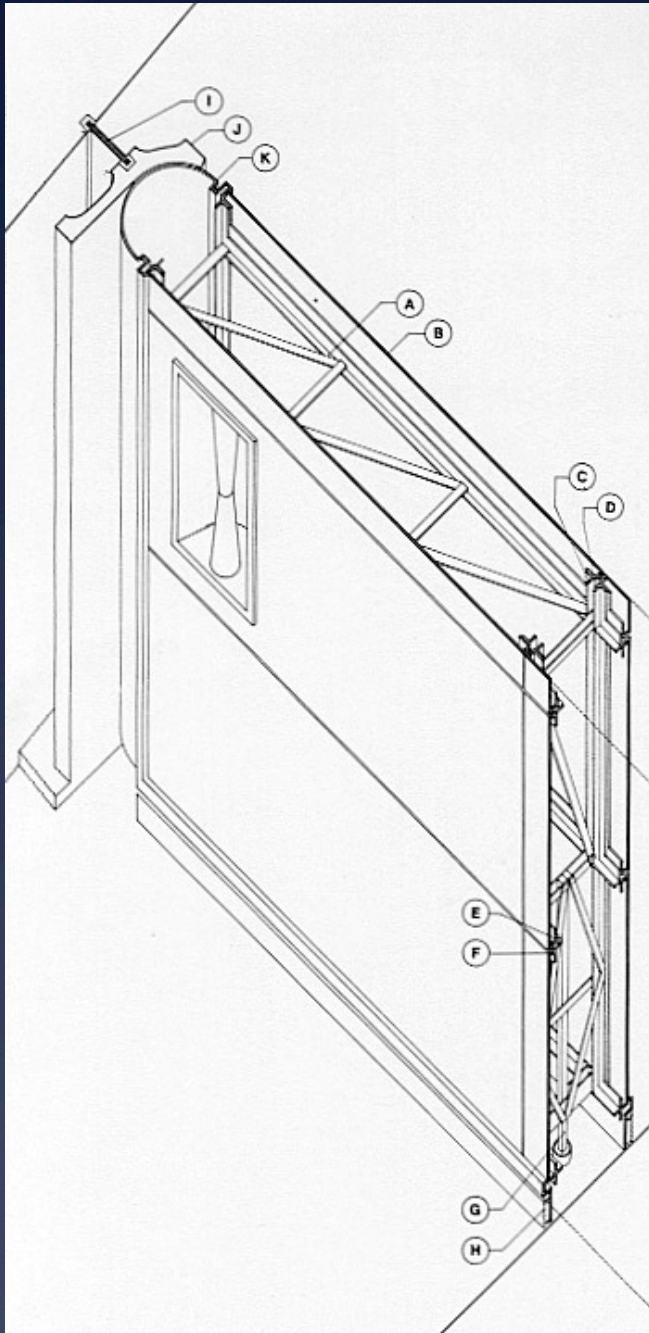


Light falling on a rough surface is graded by the surface so we can know the falloff





Scooping South light, reflecting red  
to last as long as possible



Even the pivoting doors at Ronchamp are built like an airplane.

Two skins of porcelain enameled steel panels are fastened to a subframe of lightweight metal trusswork.

This allows the door to be both thick, massive in appearance and lightweight at the same time.

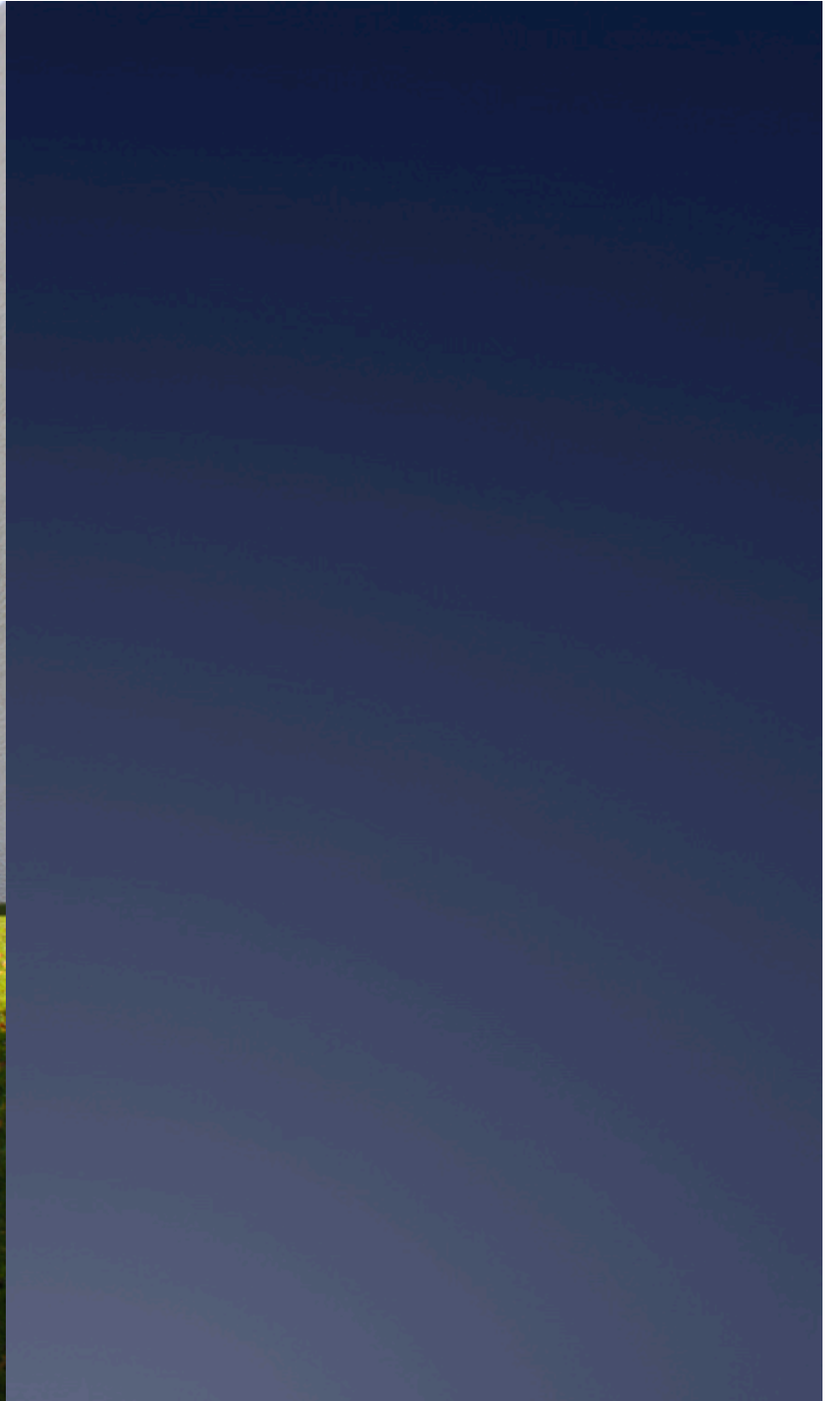




What place does art have with architecture?



A door and light to enter the upper pulpit





Architecture from pragmatics...sculpted scupper

To receive the water from the roof





When you go to Ronchamp

...slow down  
...first draw it  
...then photograph it

...take photographs, avoid  
“snap” shots by knowing the  
building through drawing

Alex and Christina