

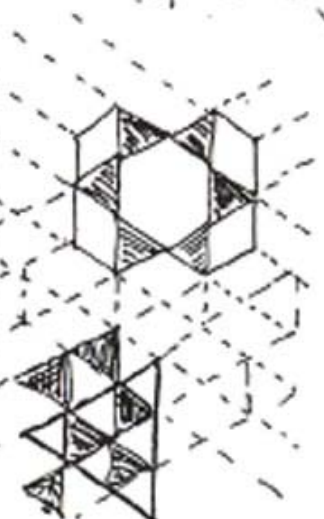
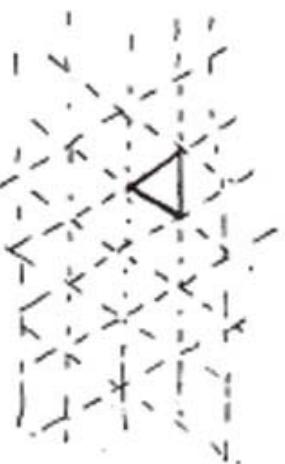
Mosaics or Tessellation.

Fitting patterns without gaps by reflecting, rotating, translating and overlapping in tessellation.

Regular pattern is the beehive.



This is based on triangulation.



Various patterns are possible - based on subdivision of triangles and hexagons.

Irregular forms are more interesting.

Instead of the basic unit being regular, the basic unit can be made irregular.



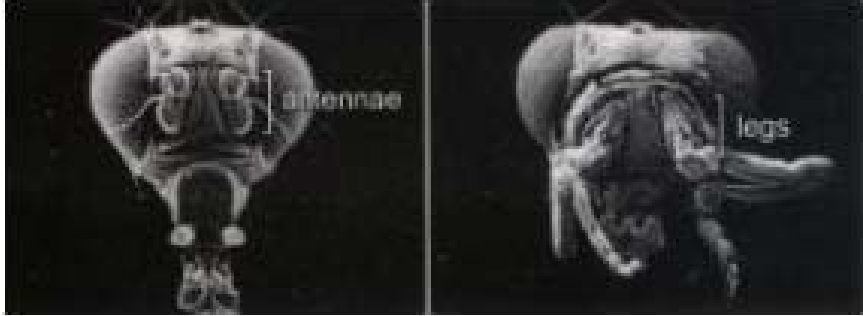
This shape is a quadrilateral. By flipping it over it can fit this pattern.



Cross-Catalytic Architectures







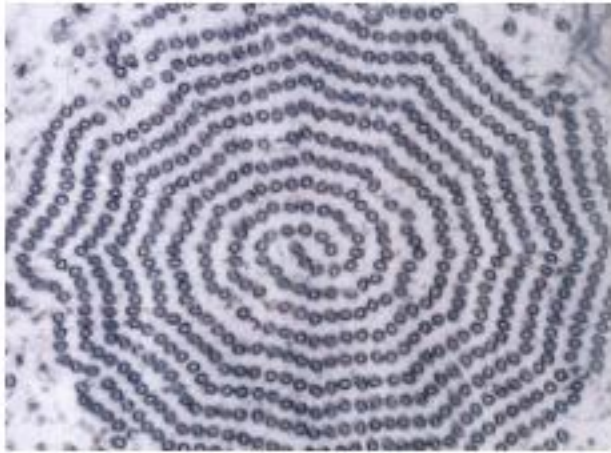


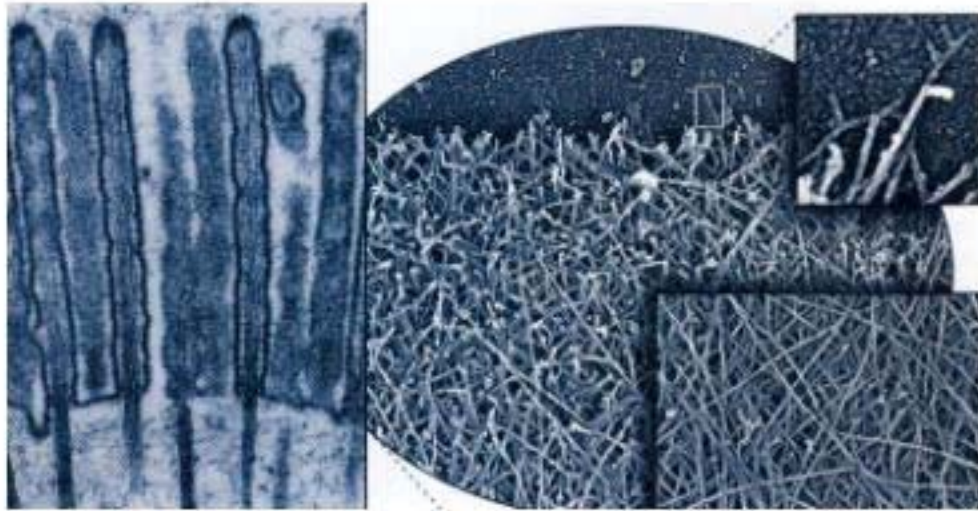


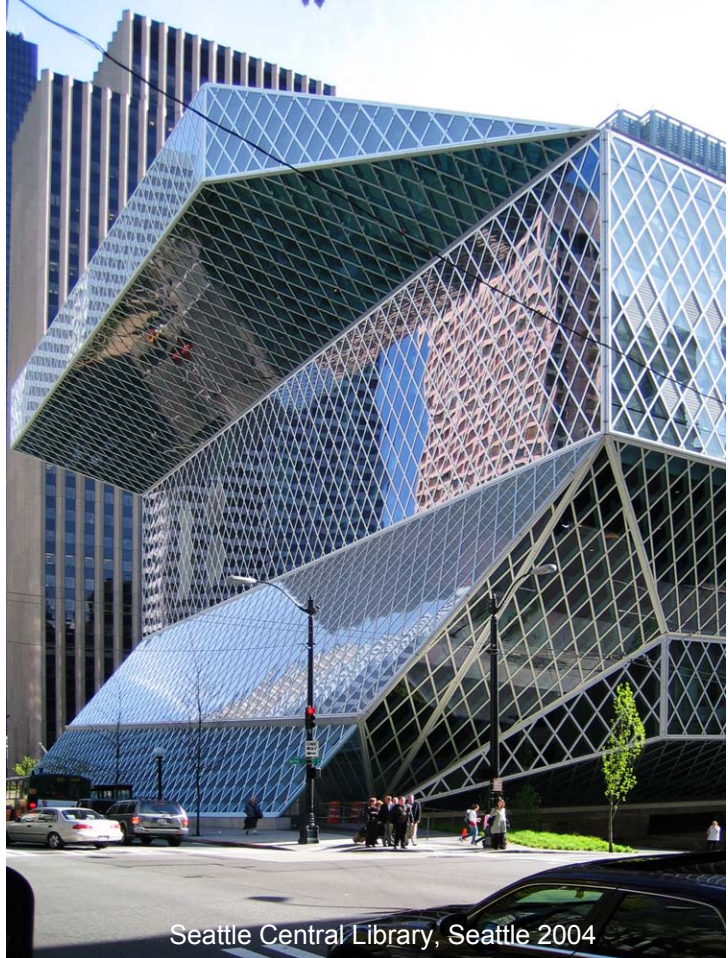




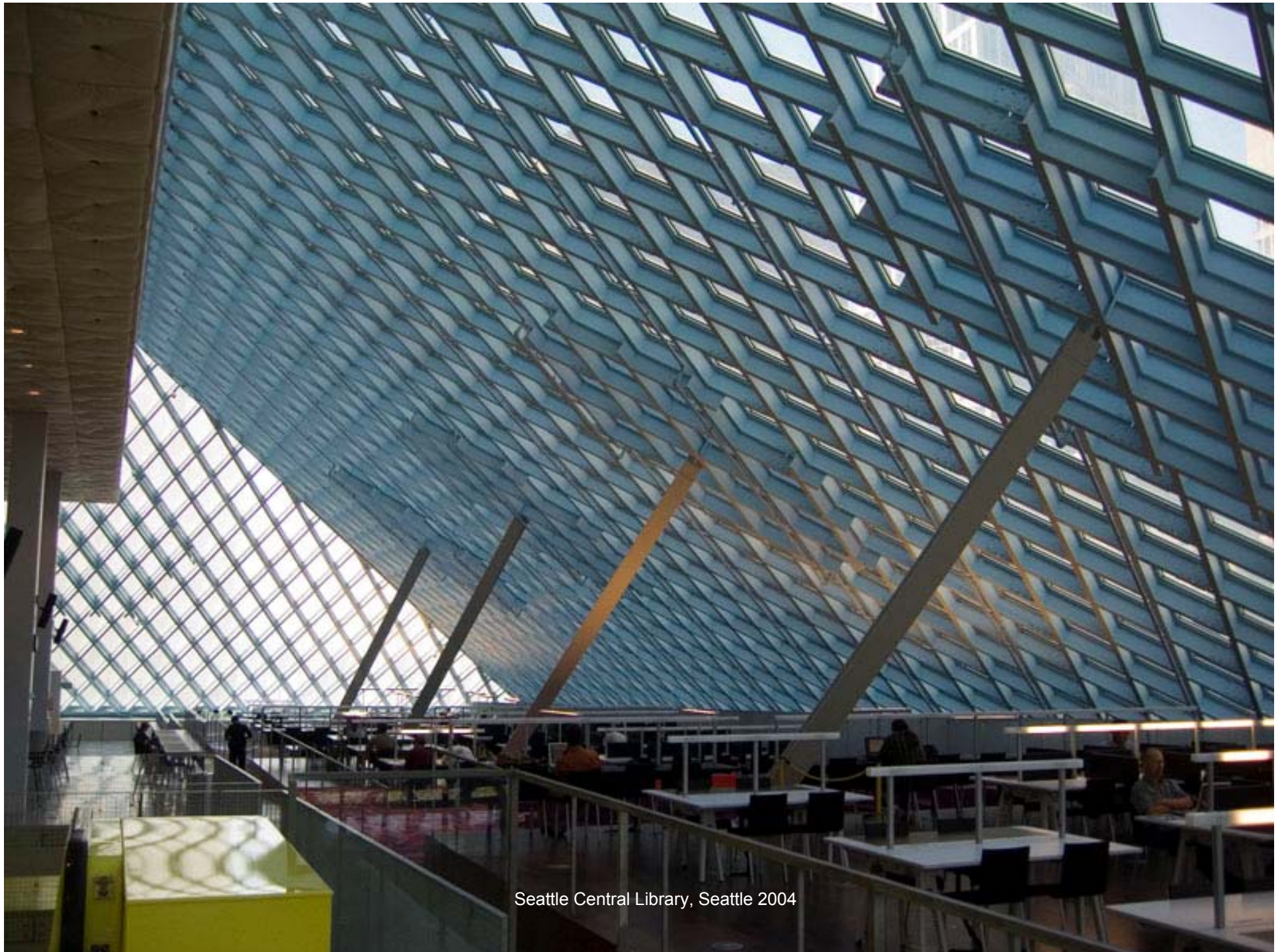




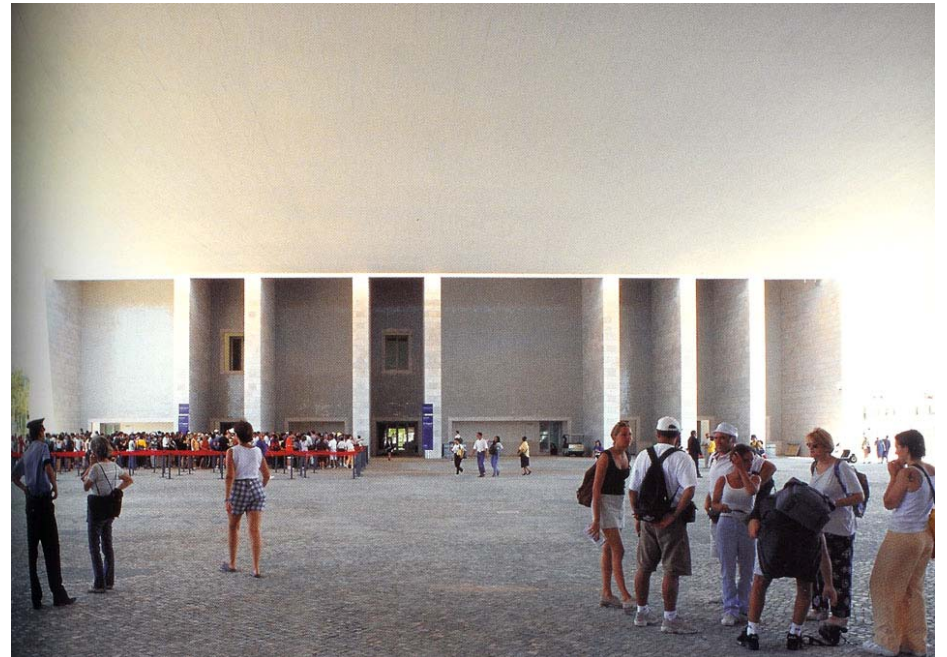
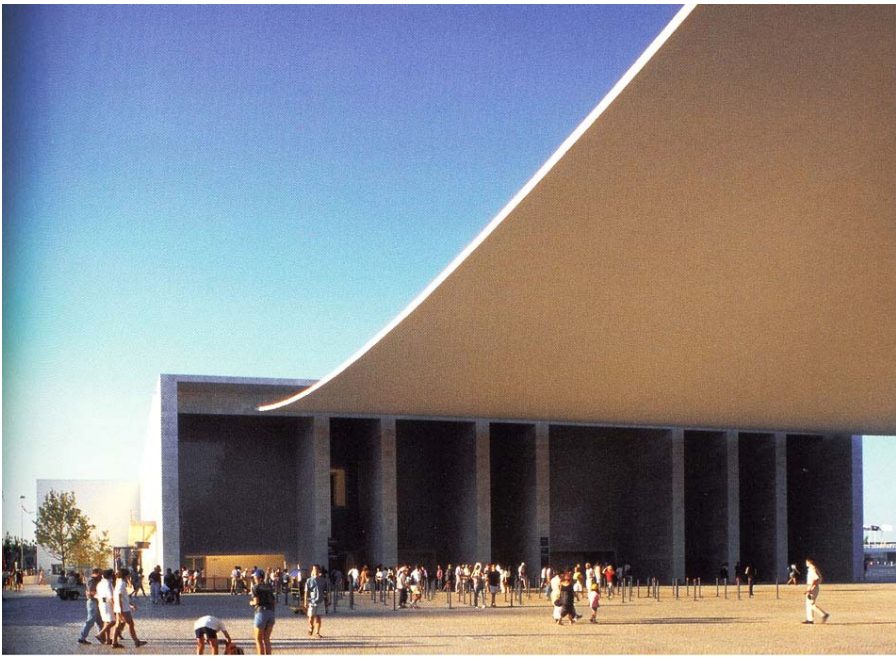




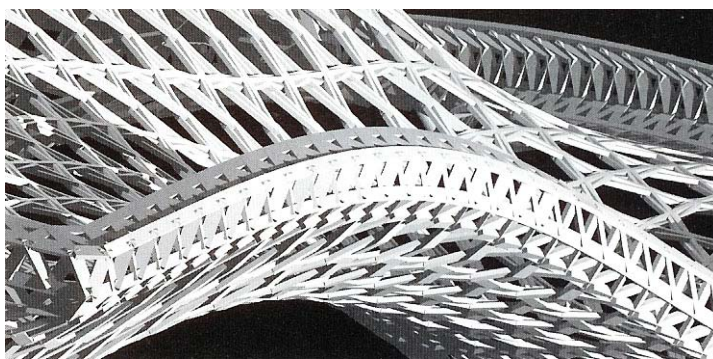
Seattle Central Library, Seattle 2004

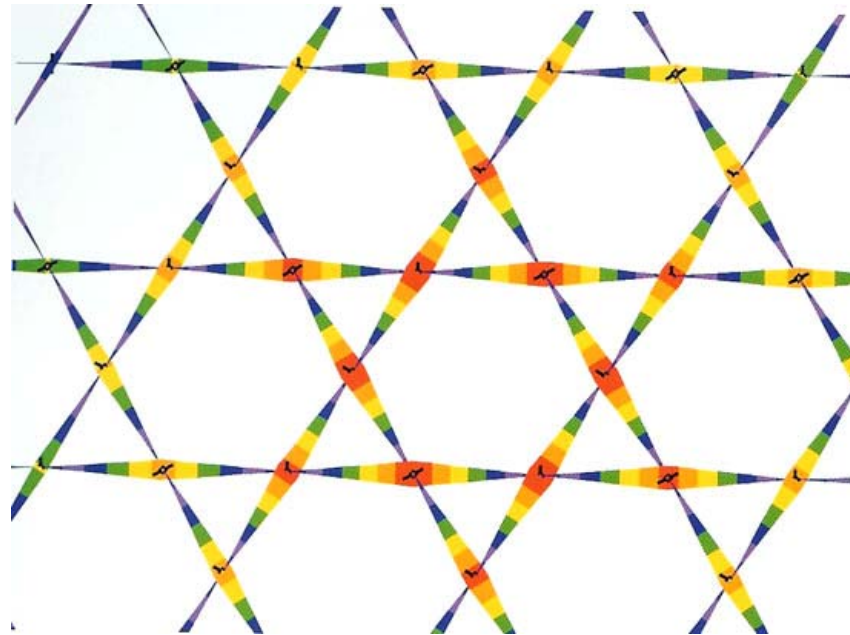


Seattle Central Library, Seattle 2004

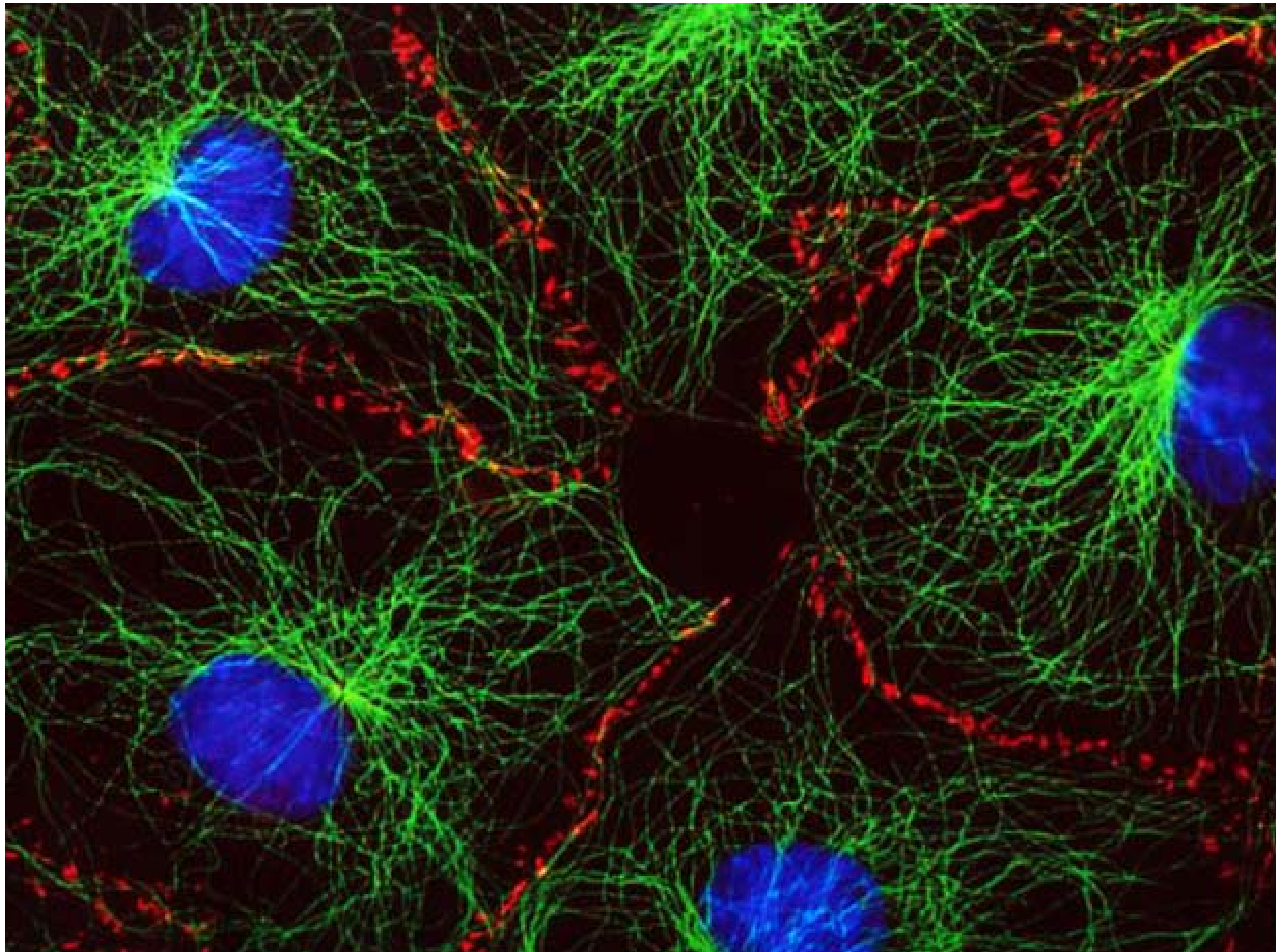


Portuguese National Pavilion Expo 1998

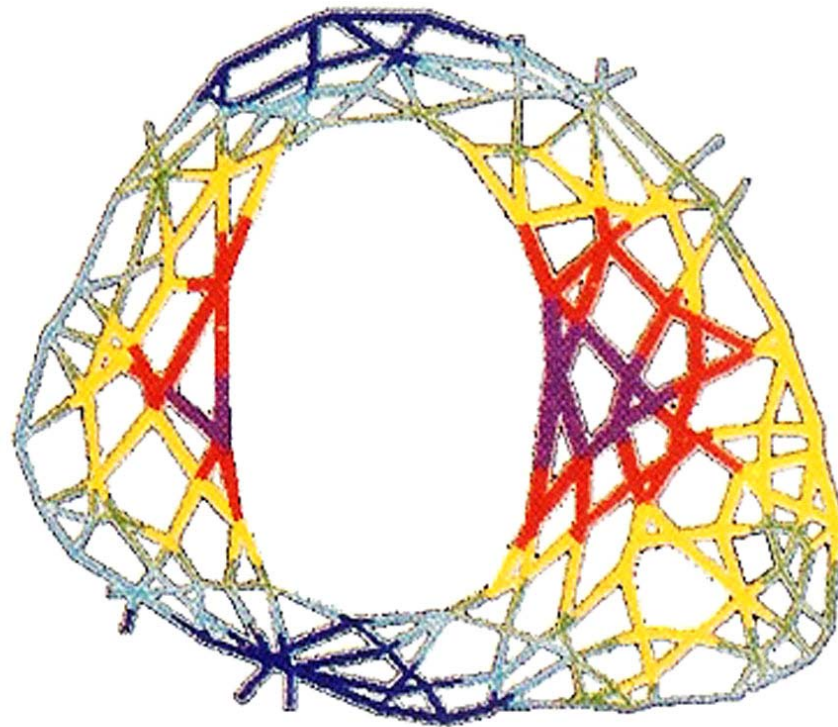


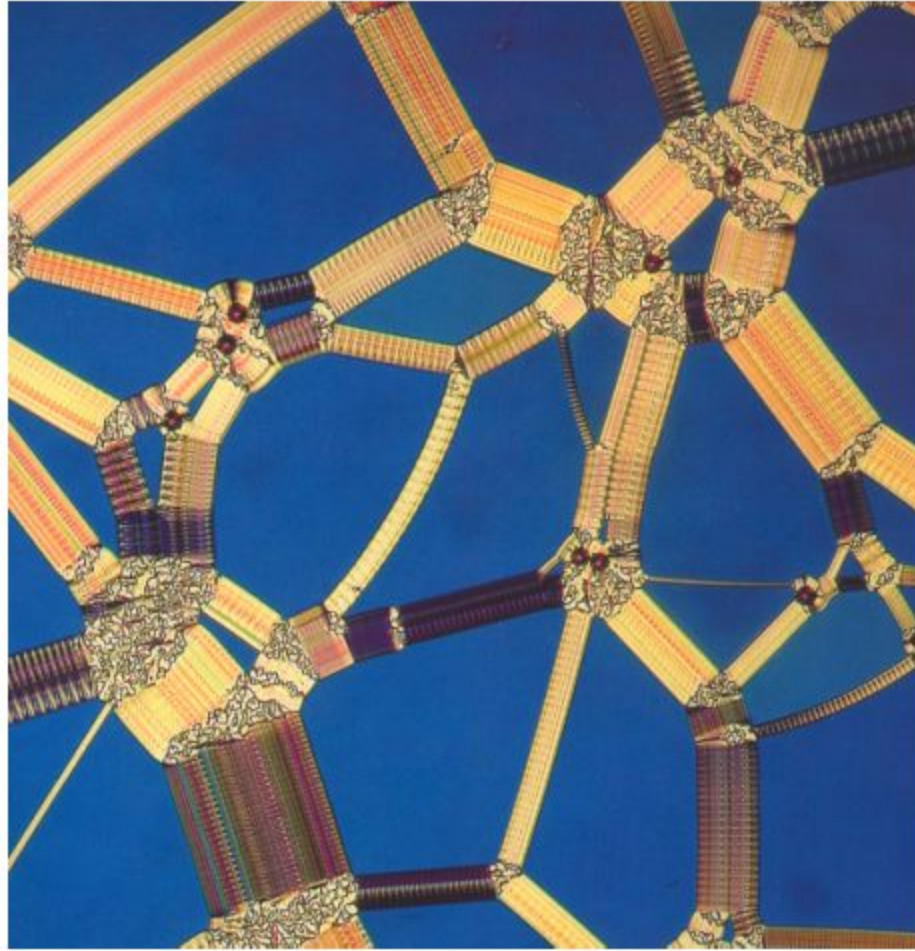


Centre Pompidou, studies for grillage, Metz France 2004-2009

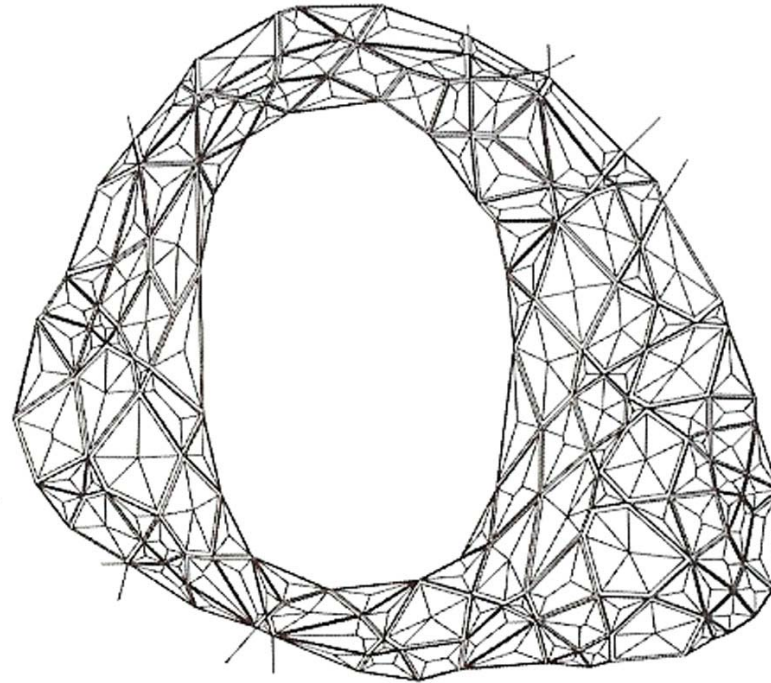


Chemnitz Stadium, Chemnitz Germany 1995

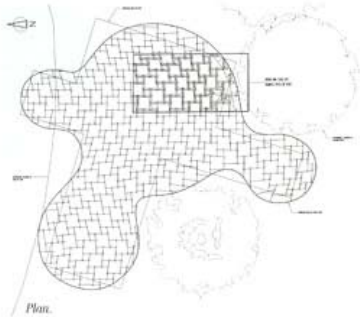




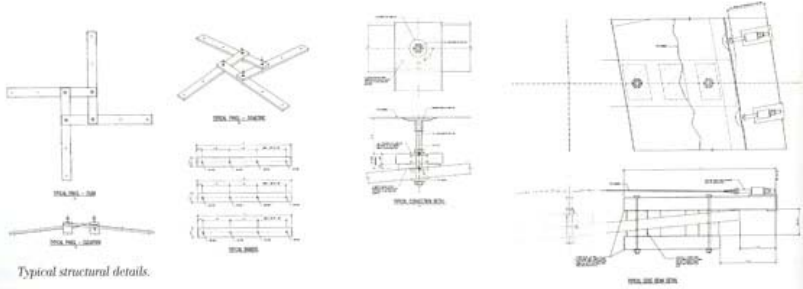
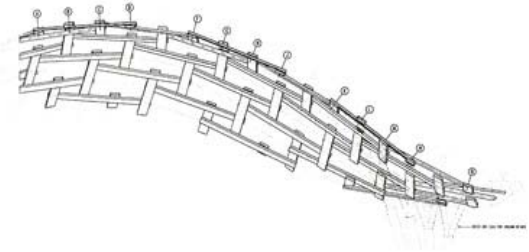
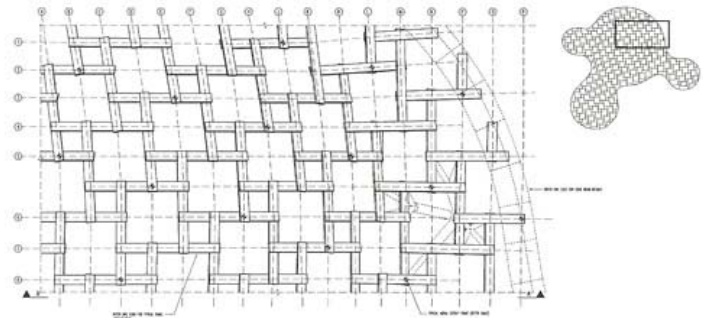
Chemnitz Stadium, Chemnitz Germany 1995



Forest Park Pavilion, St Louis, Missouri, 2004-2007

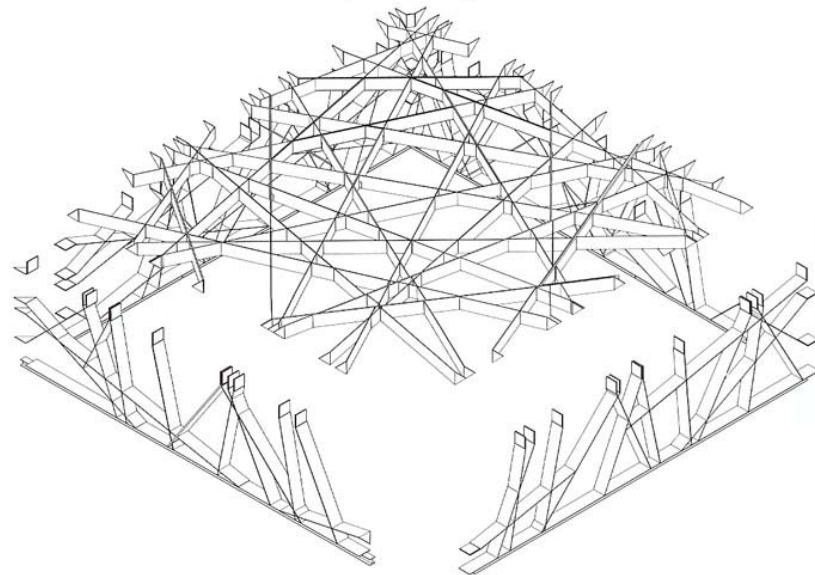
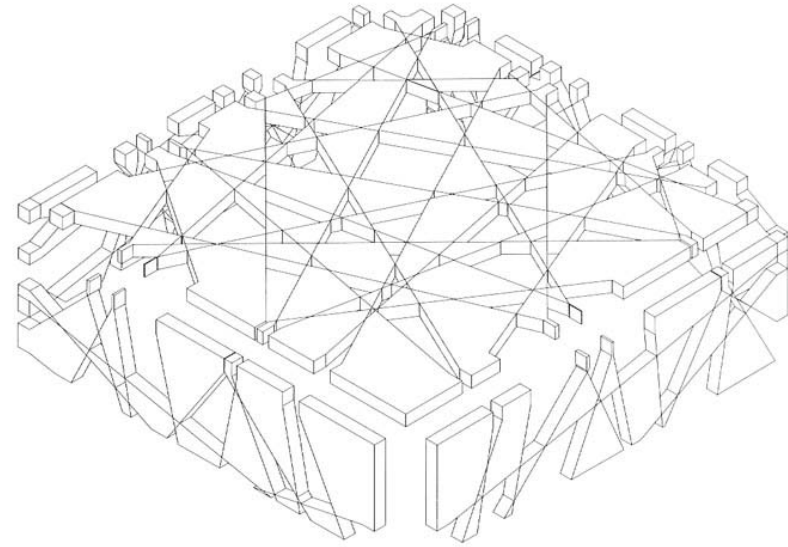


Plan.



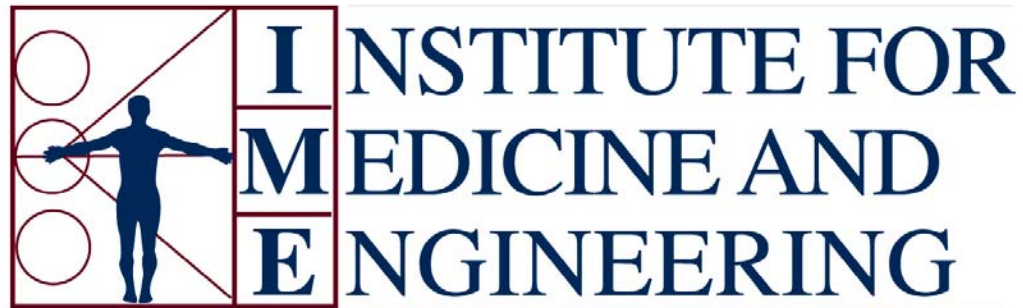
Typical structural details.

Serpentine Gallery Pavilion 2002

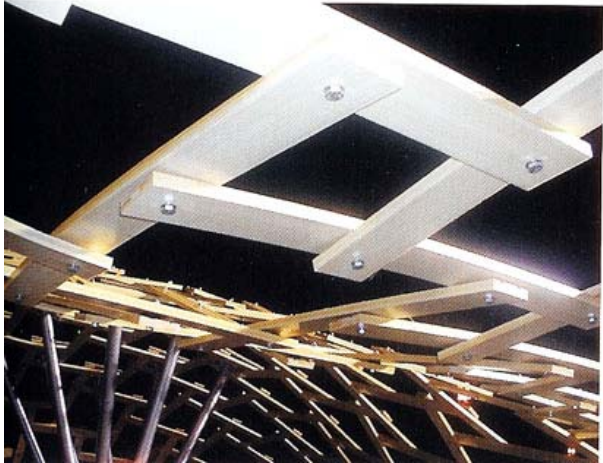
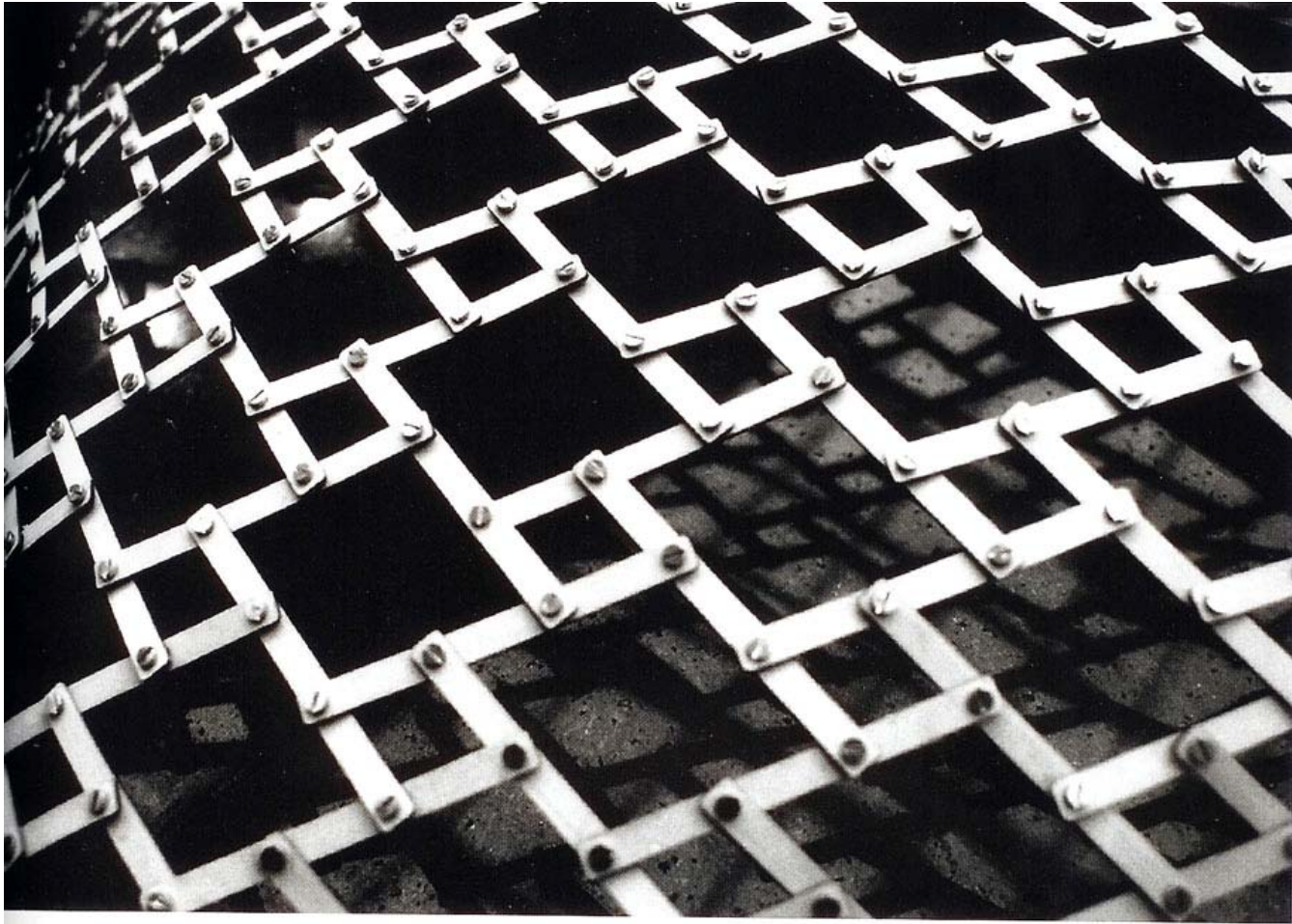


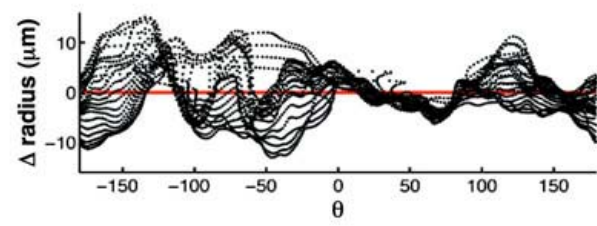
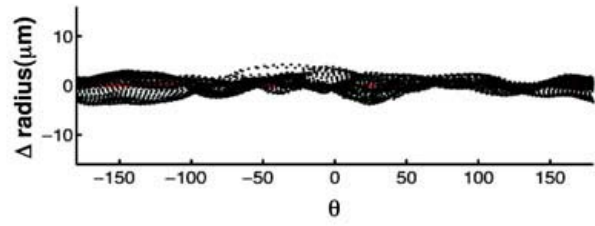
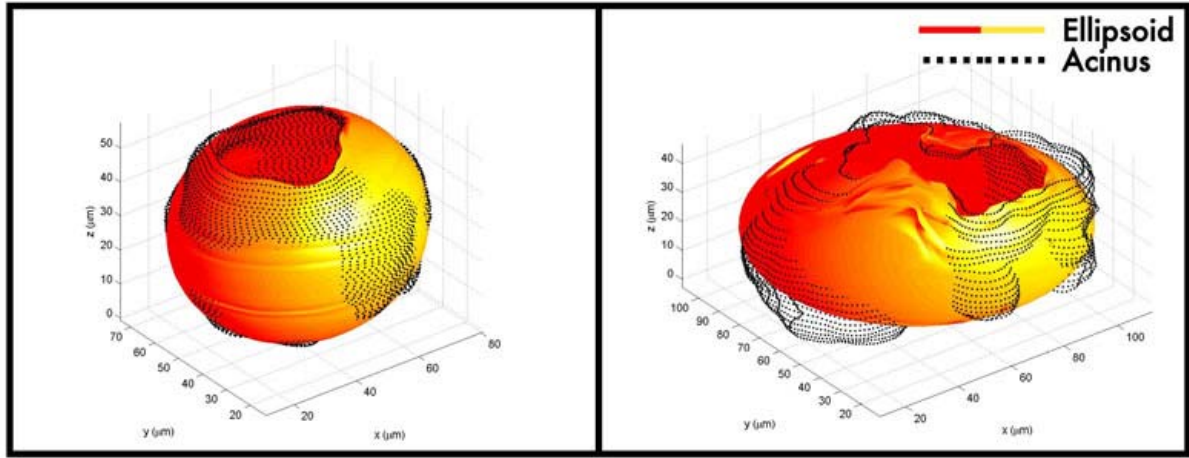


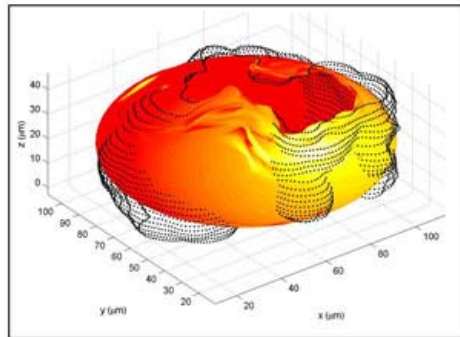
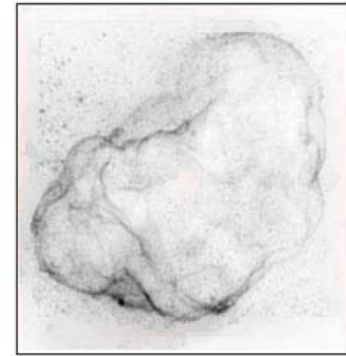
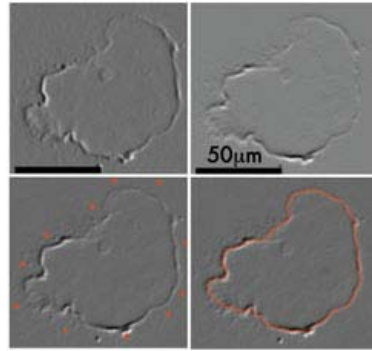
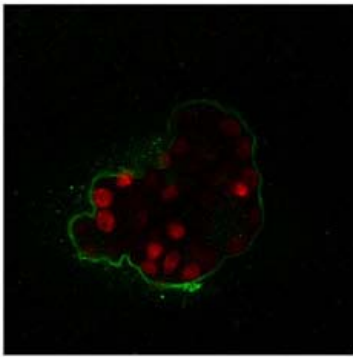
Centre Pompidou, Metz France 2004-2009

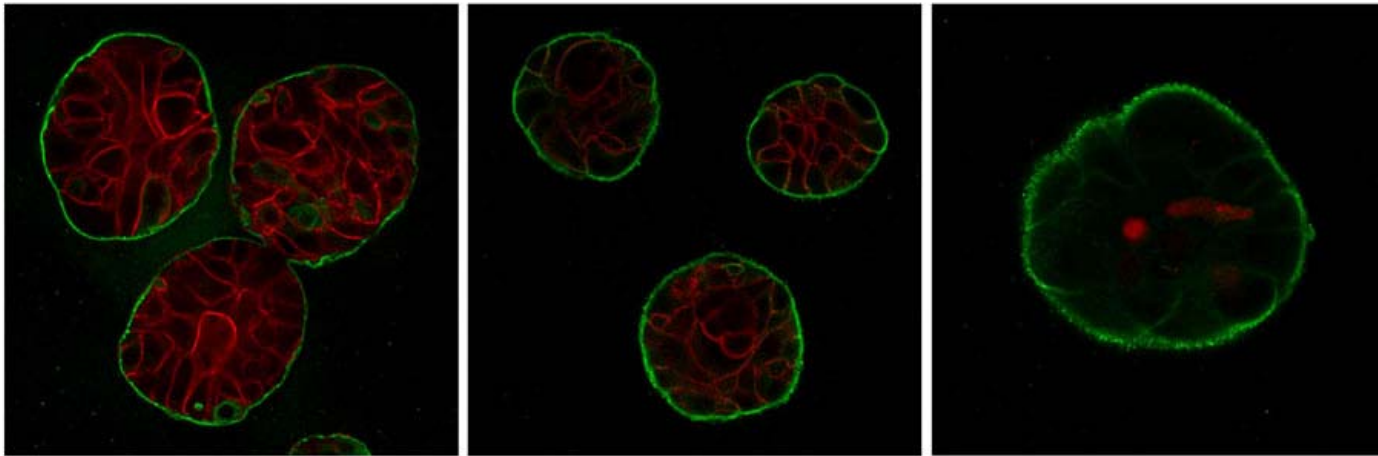


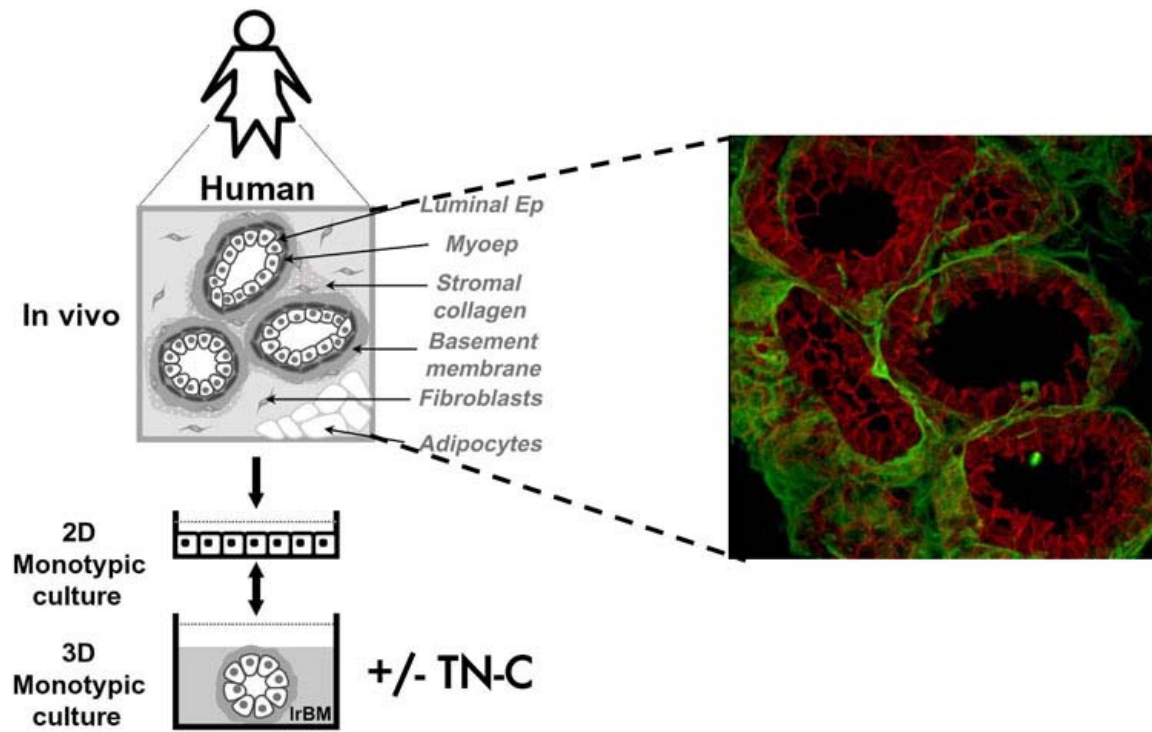
UNIVERSITY OF PENNSYLVANIA

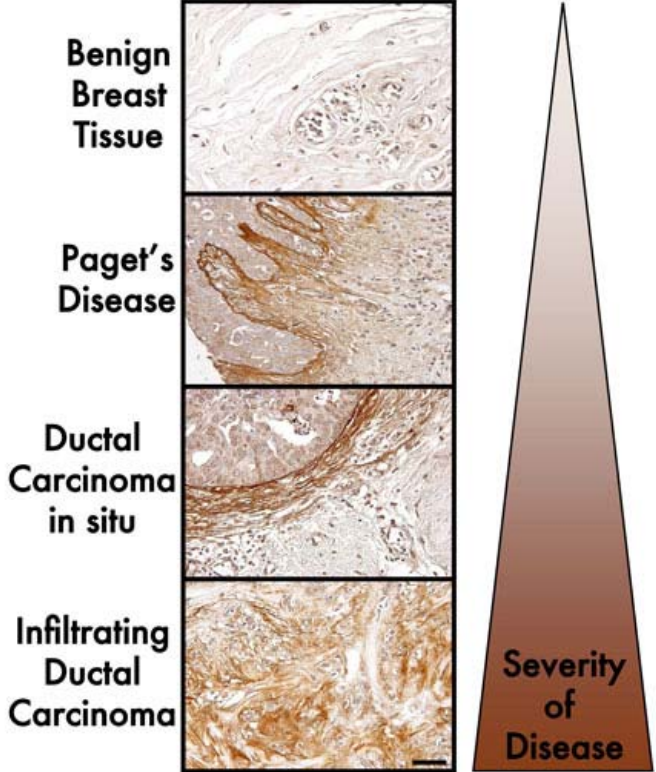
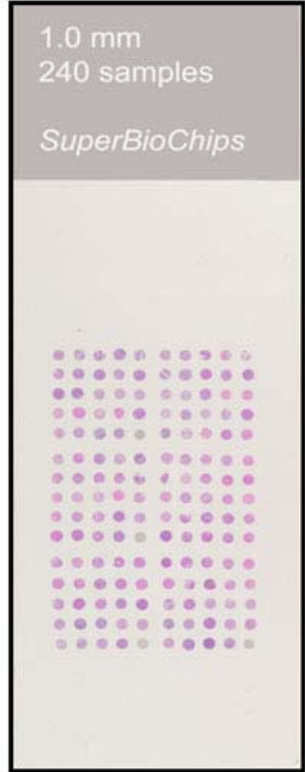












breast cancer

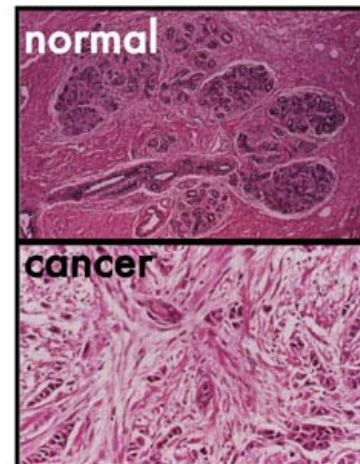
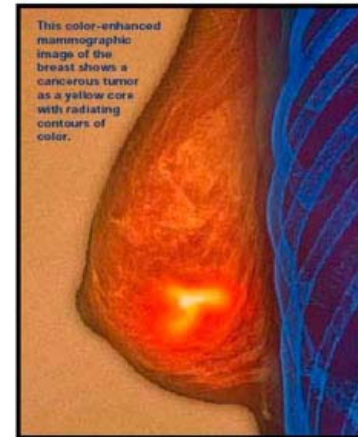
leading cause of cancer deaths in women

1/6 women in U.S. will develop breast cancer

212,920 women will be found to have invasive breast cancer in 2006

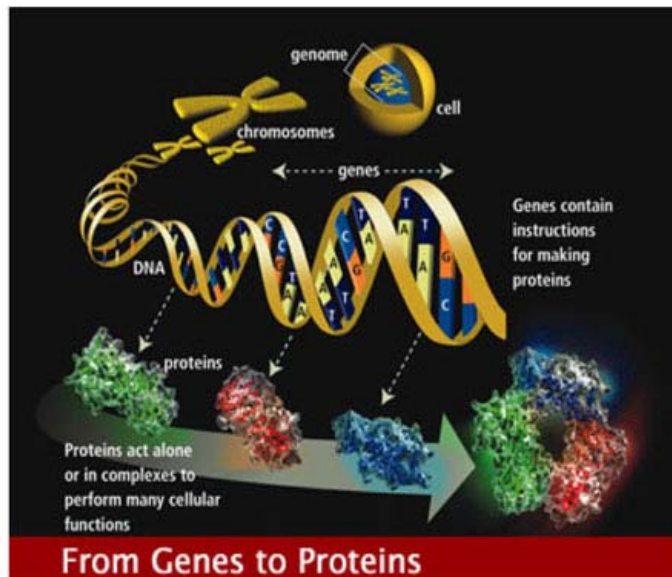
20% of women who develop breast cancer, die of disease

Architecture of ducts & surrounding elements radically altered





“central dogma”



DNA → RNA → Protein → Form & Function

Gene is a short stretch of **DNA** & each encodes a different protein

DNA is chemical language that stores genetic information

Genome refers to the total genetic material

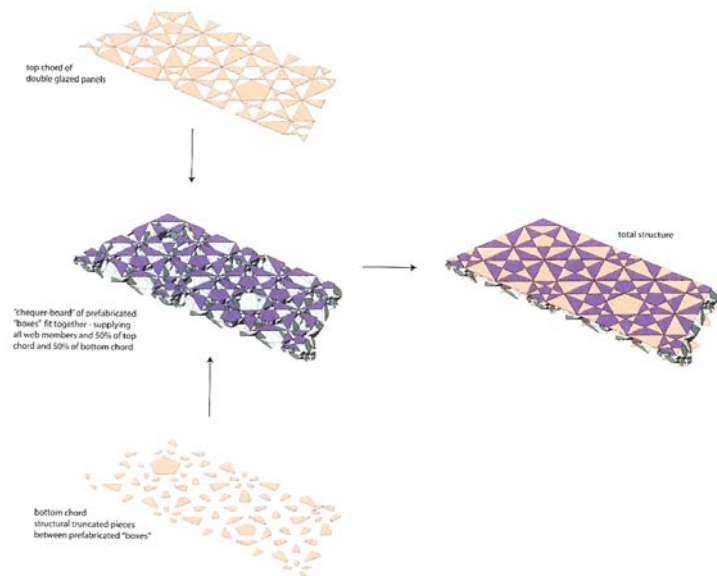
RNA is transcribed from DNA

Proteins are translated from RNA

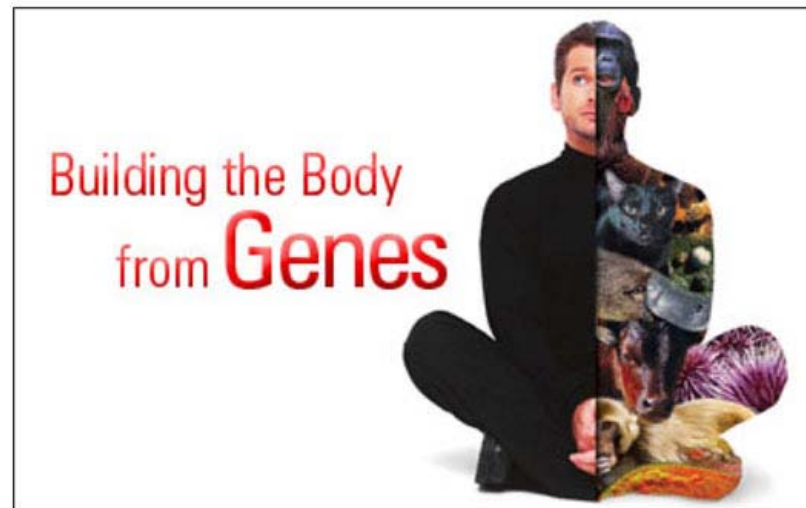
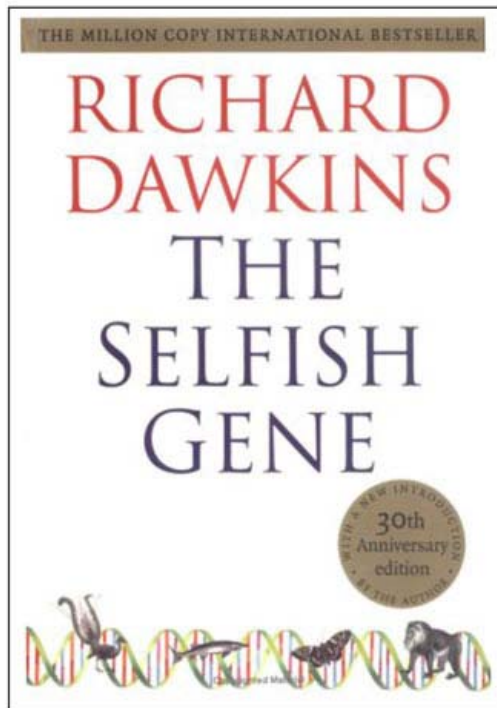
Some proteins are **Structural**

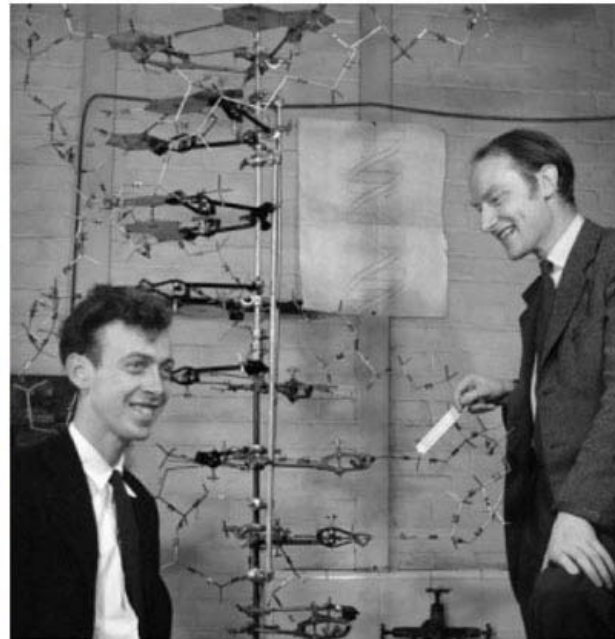
Most proteins are **Catalysts** that drive reactions forming life

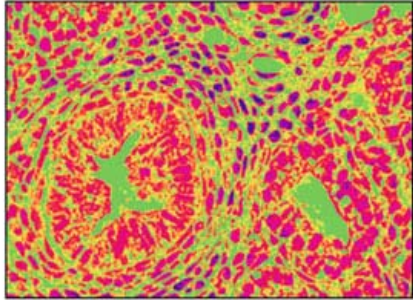
Studies of crystal geometry



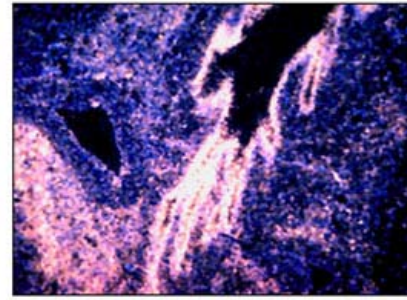




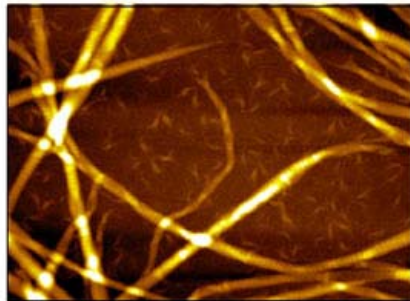




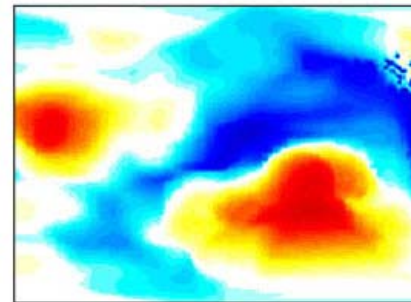
lung development



vascular disease

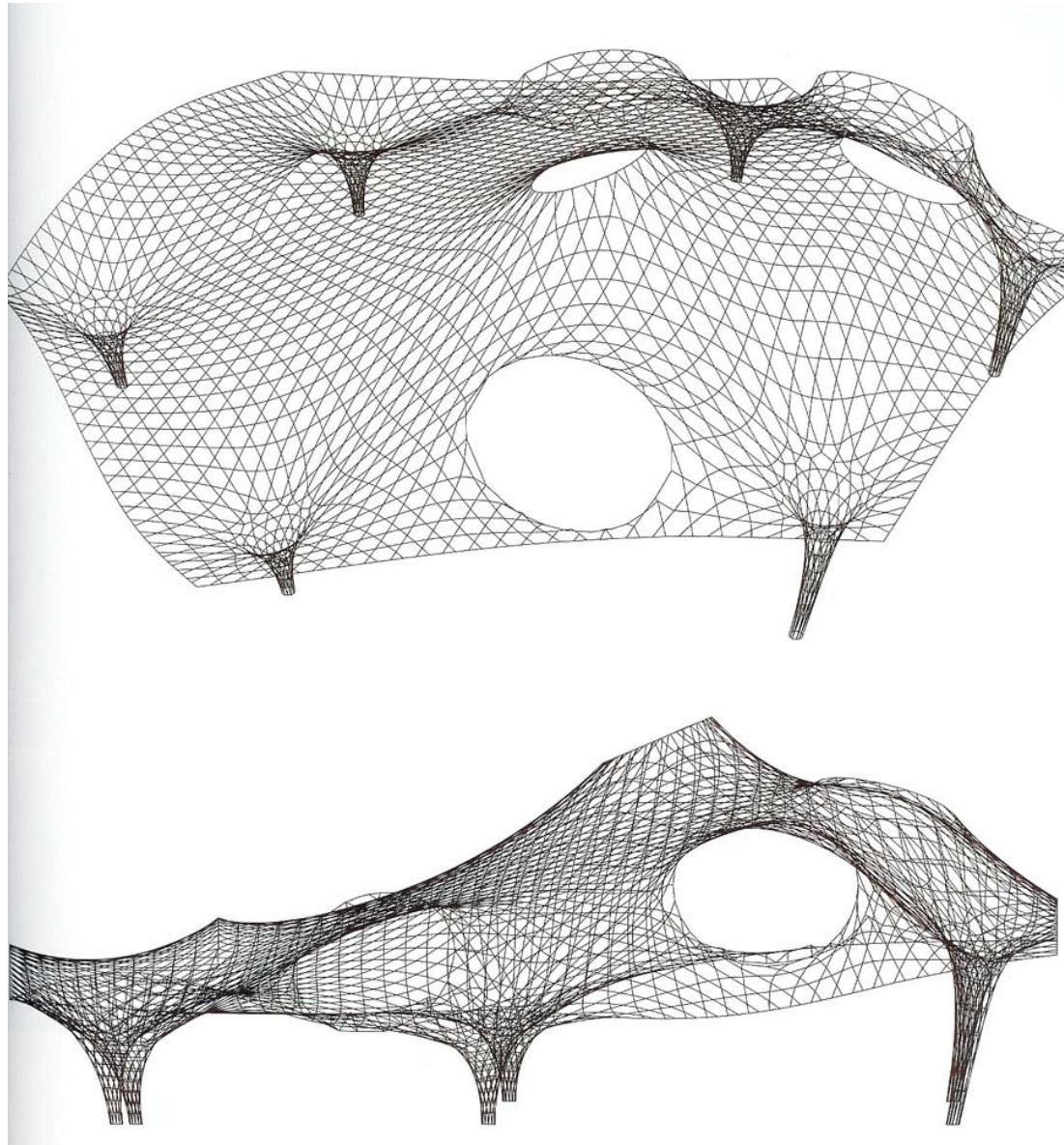


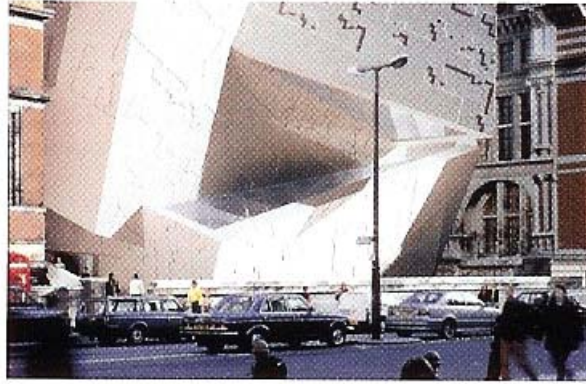
cell geometry &
surface design



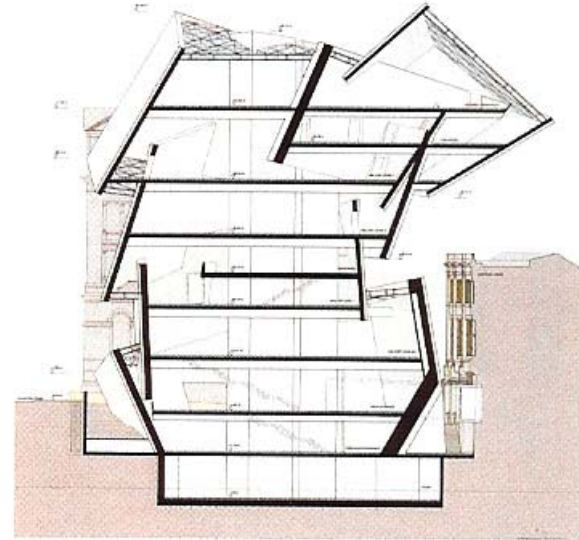
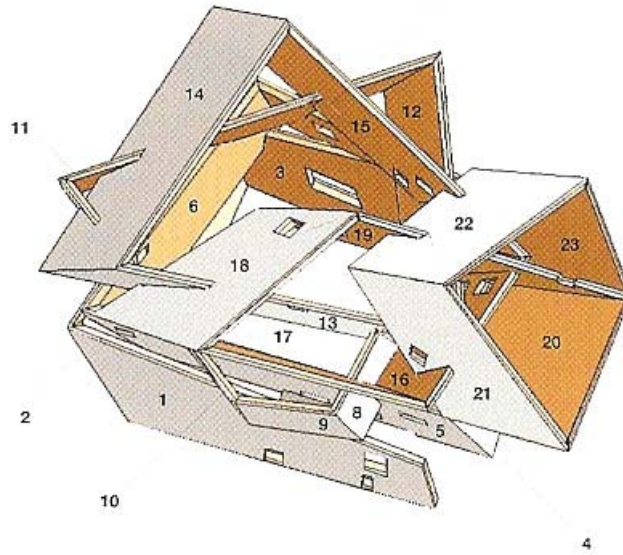
breast cancer

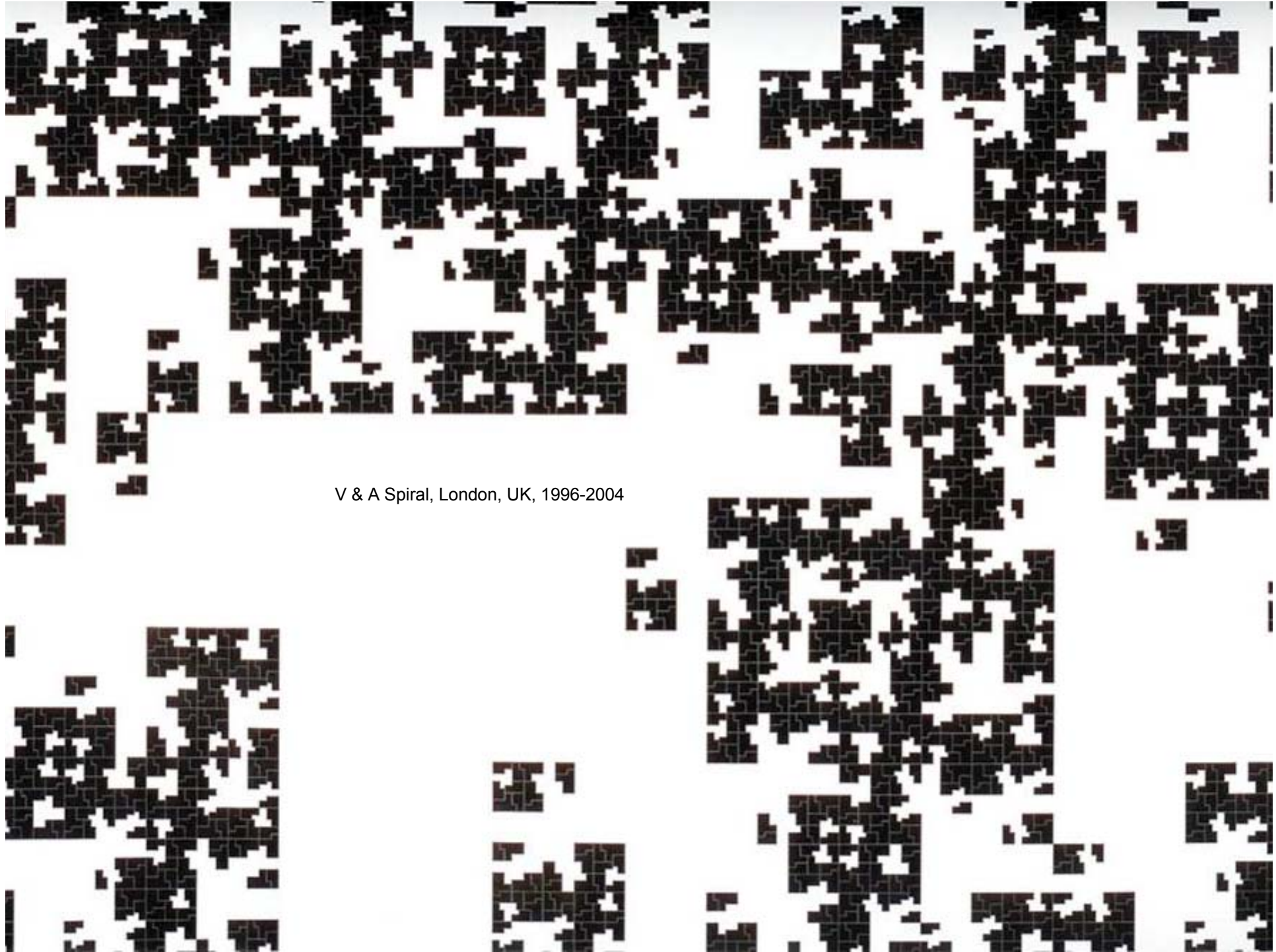
Centre Pompidou, Metz France 2004-2009



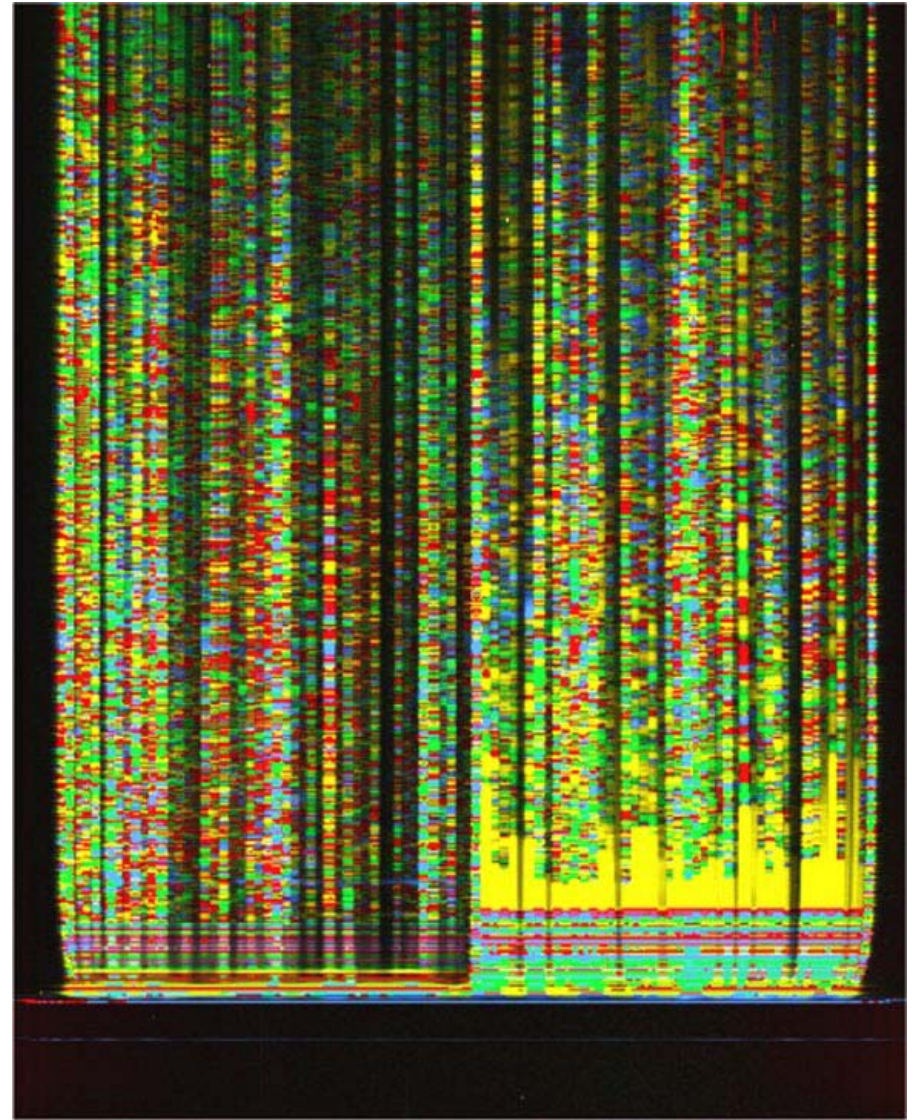
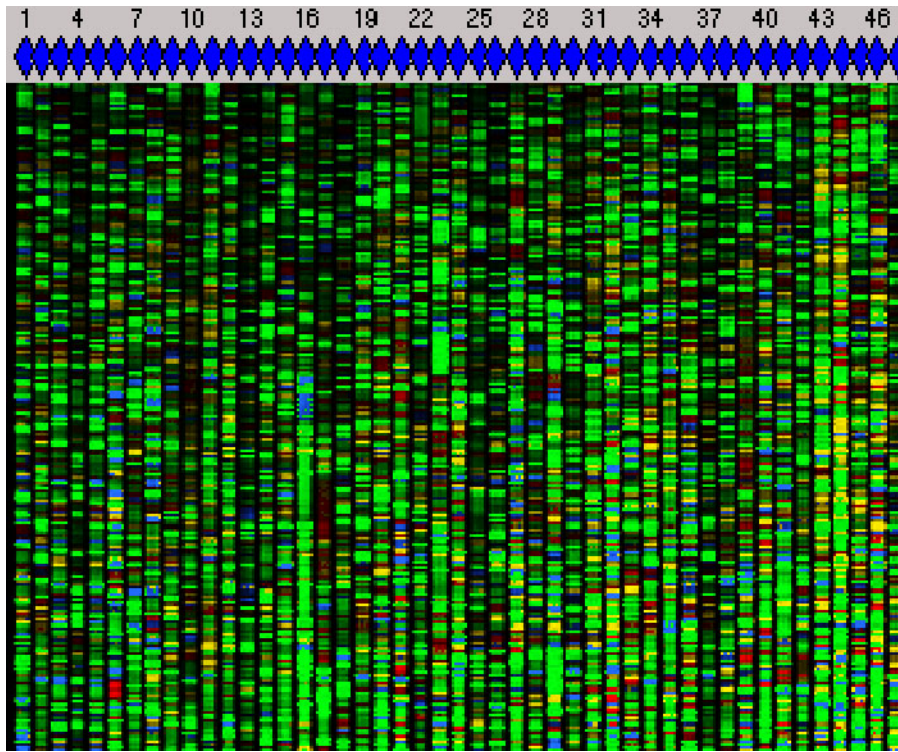


7

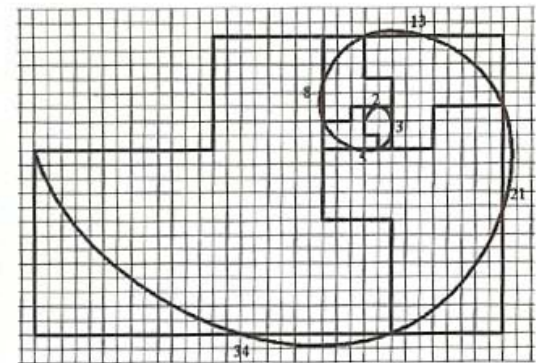
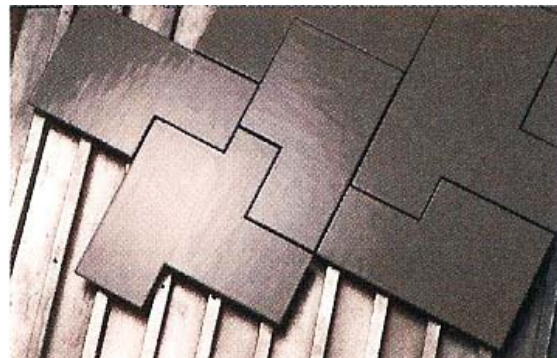
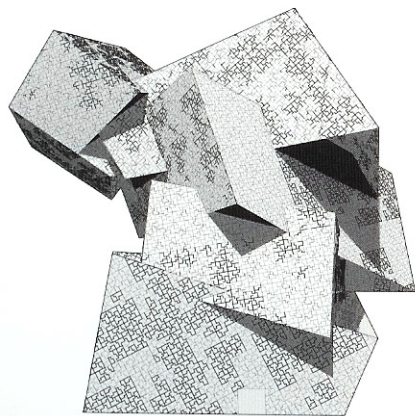




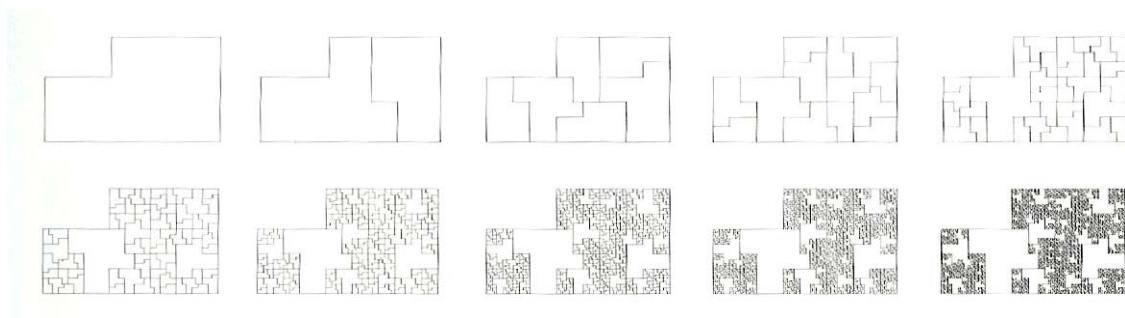
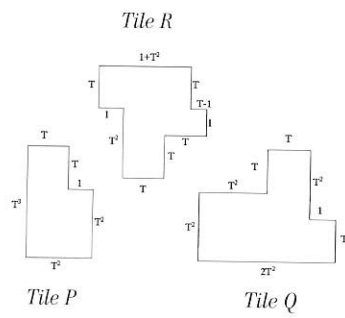
V & A Spiral, London, UK, 1996-2004



V & A Spiral, London, UK, 1996-2004



1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144



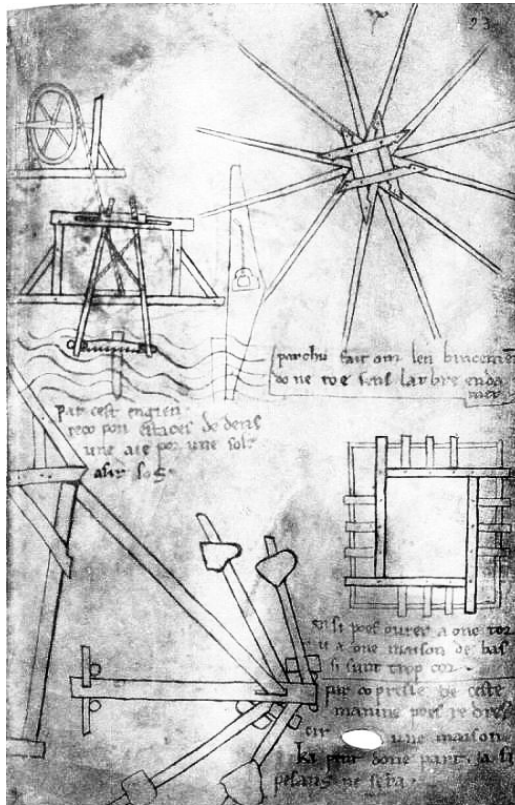
Serpentine Gallery Pavilion 2002



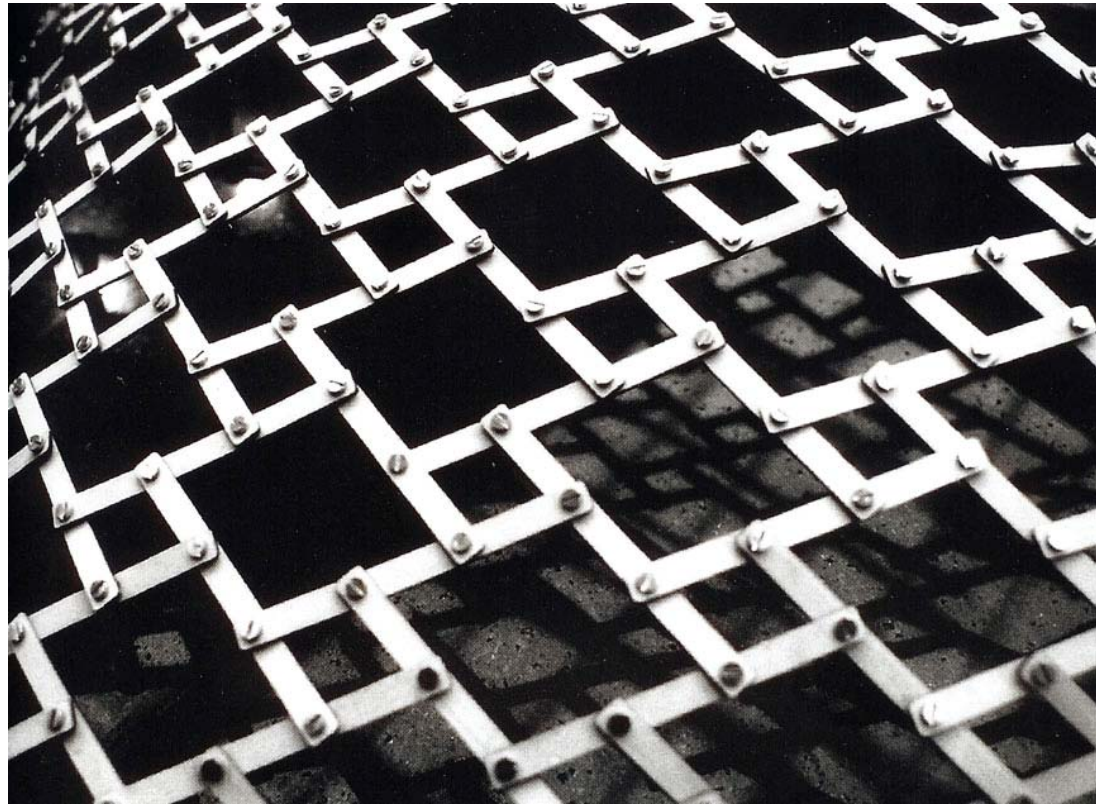
Serpentine Gallery Pavilion 2002



Reciprocal Networks

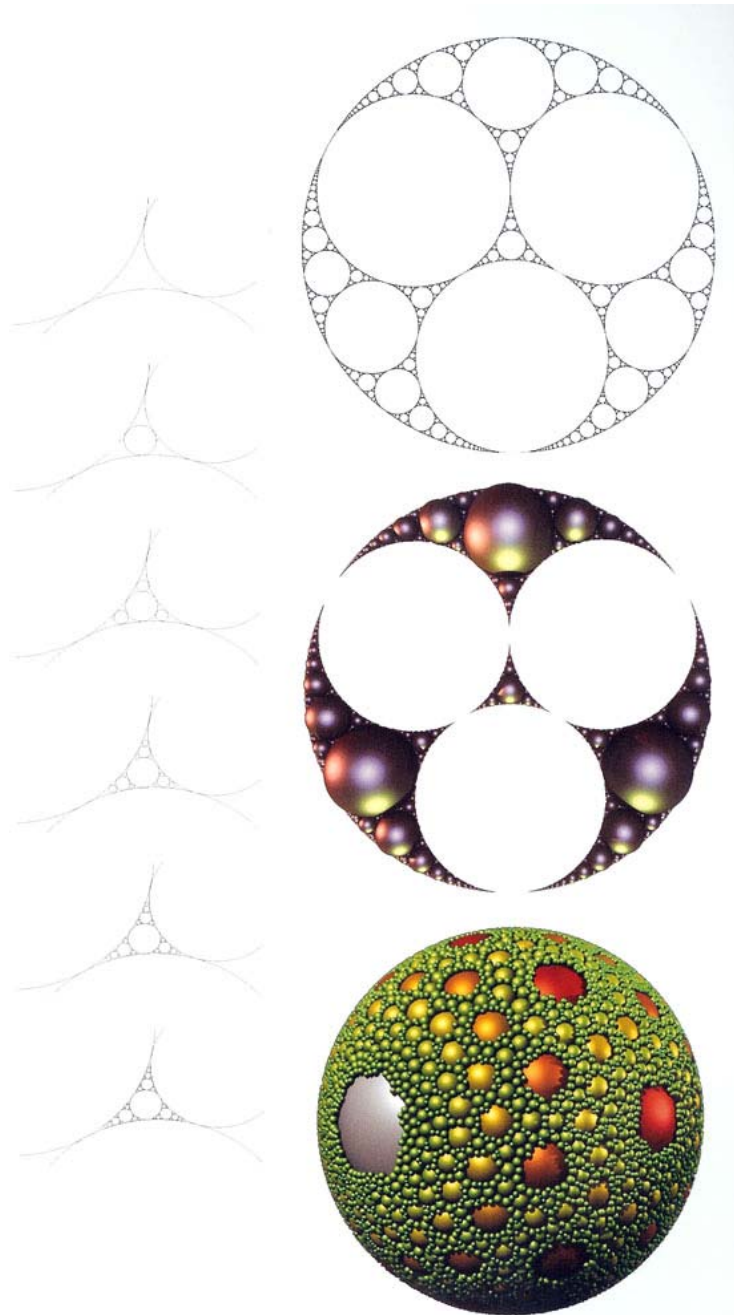


Villard de Honnecourt

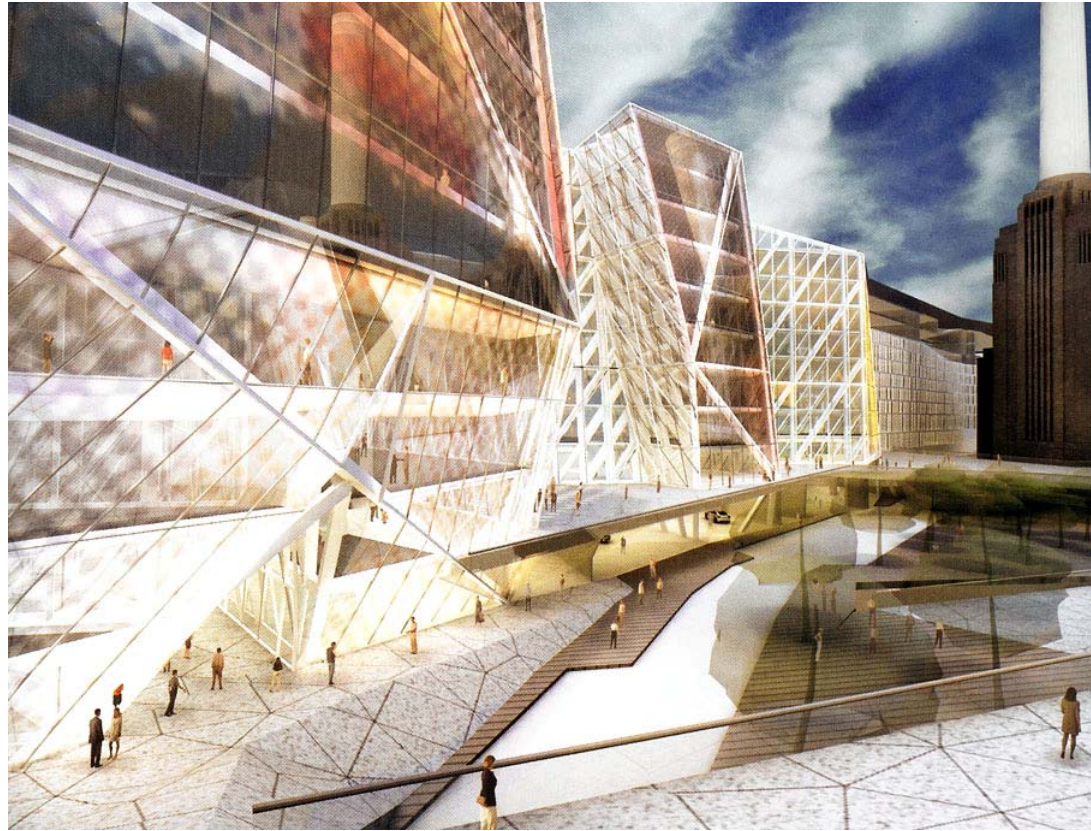


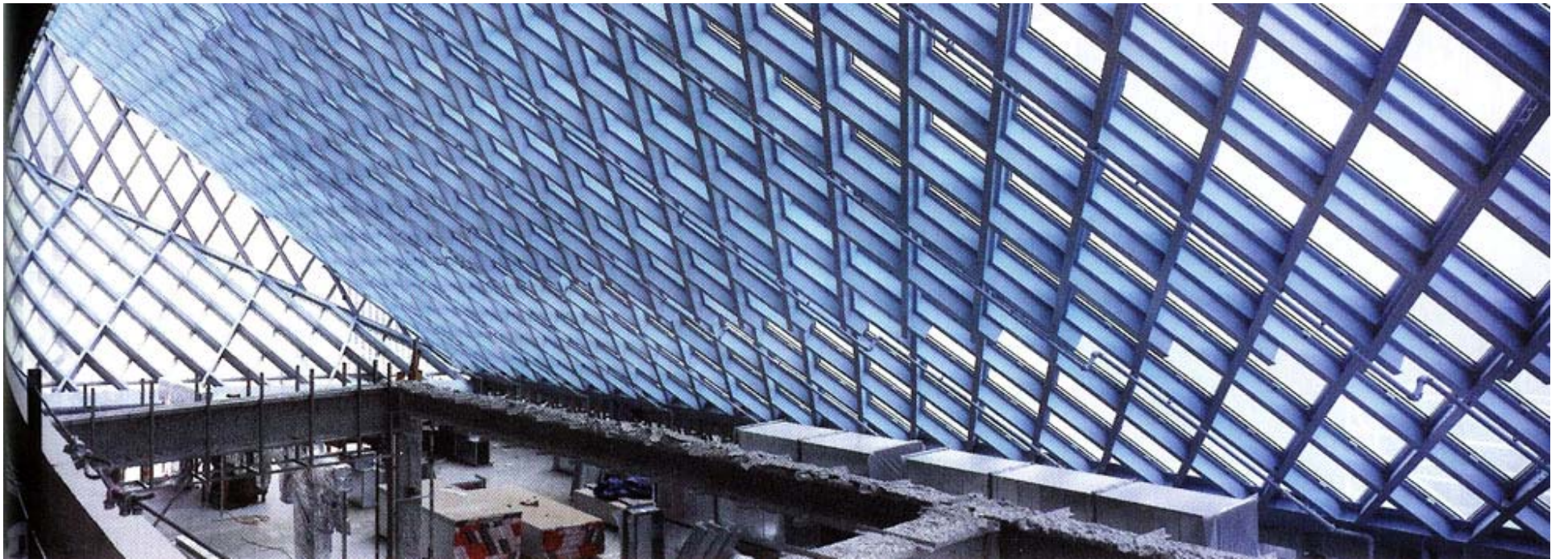
Cecil Balmond

2D Packing

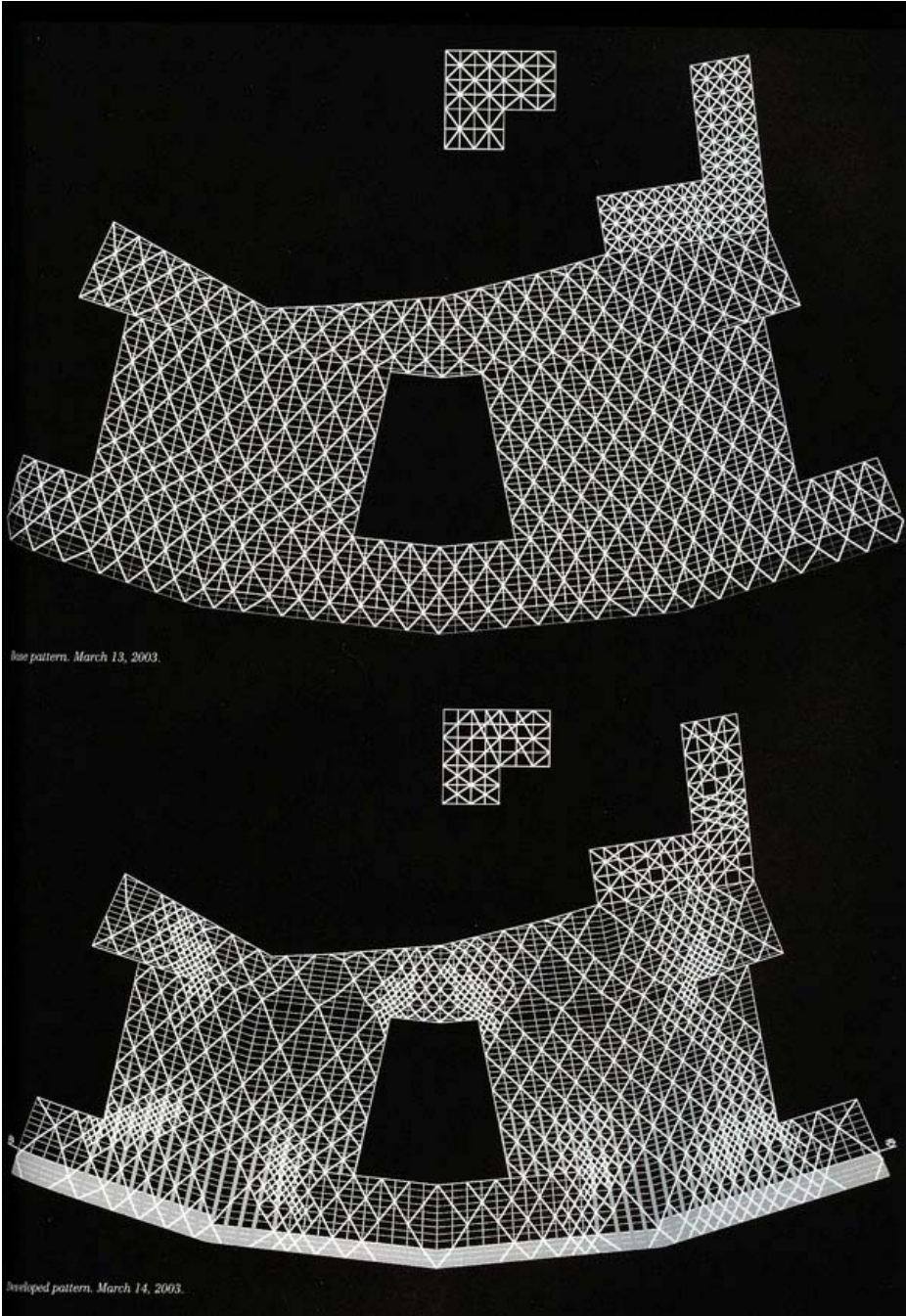


Battersea Power Station Redevelopment

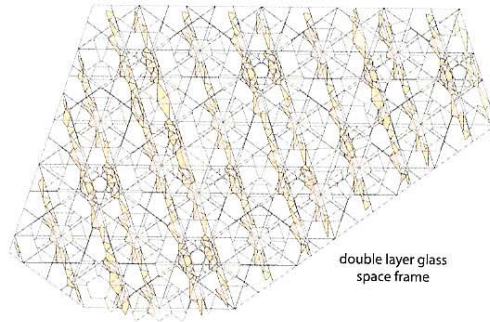




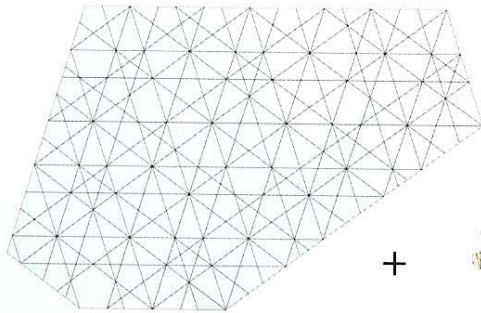
CCTV New Headquarters, Beijing, China 2003-2008





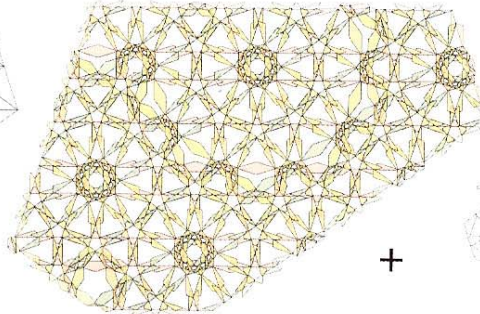


double layer glass
space frame



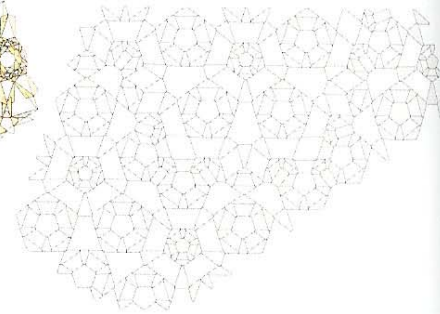
Top Chord
double glazed sealed full panes

+

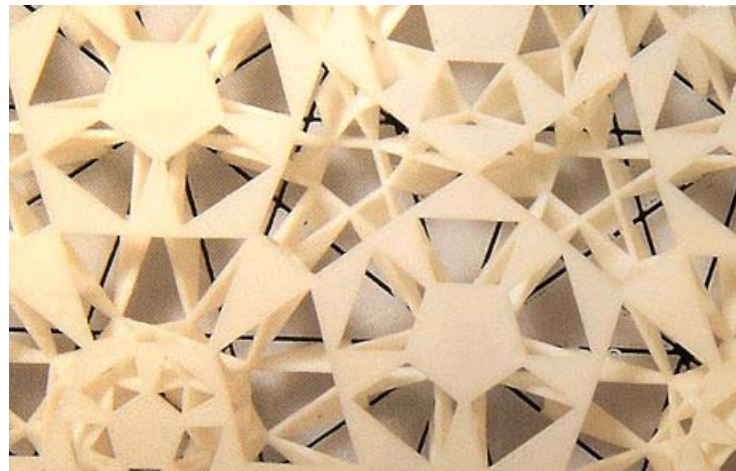


5 directions of web members
truncated panes

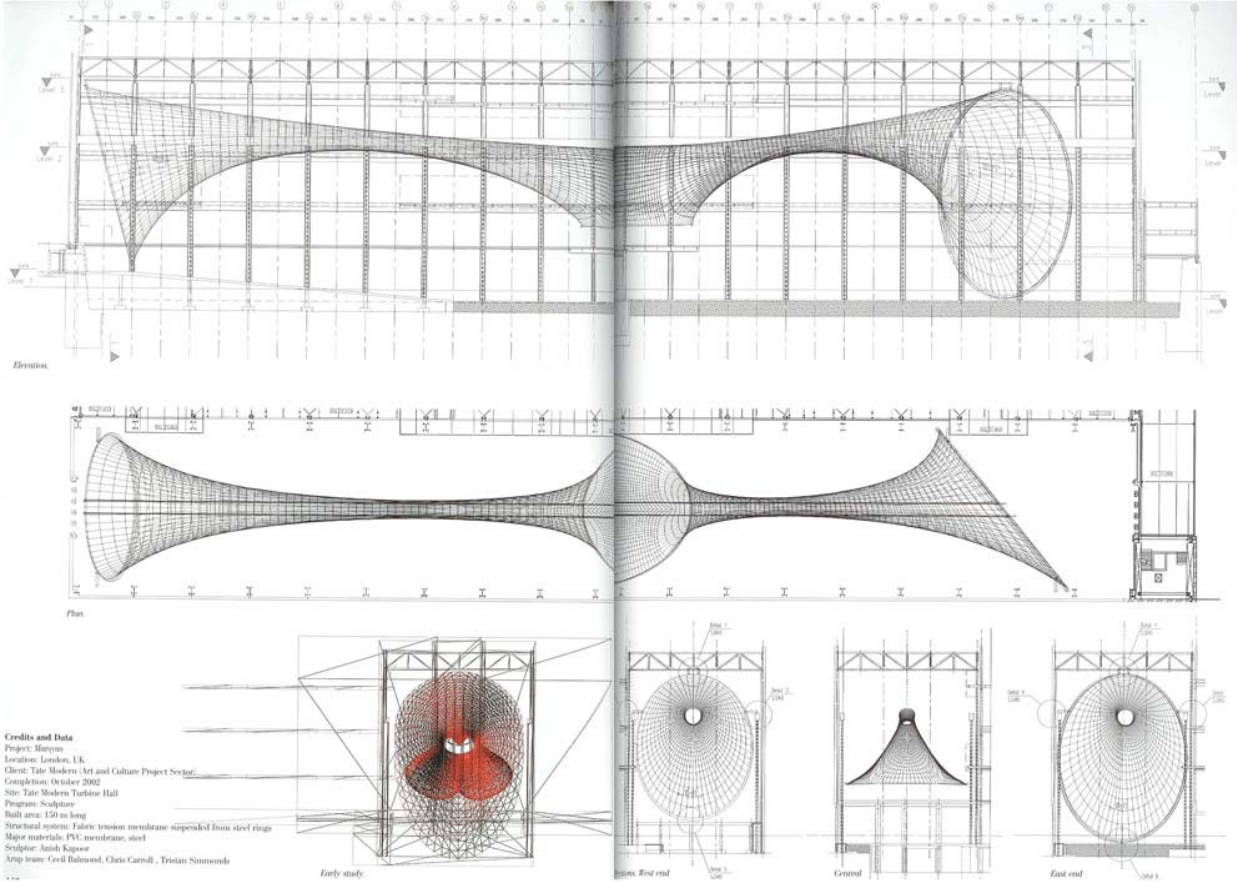
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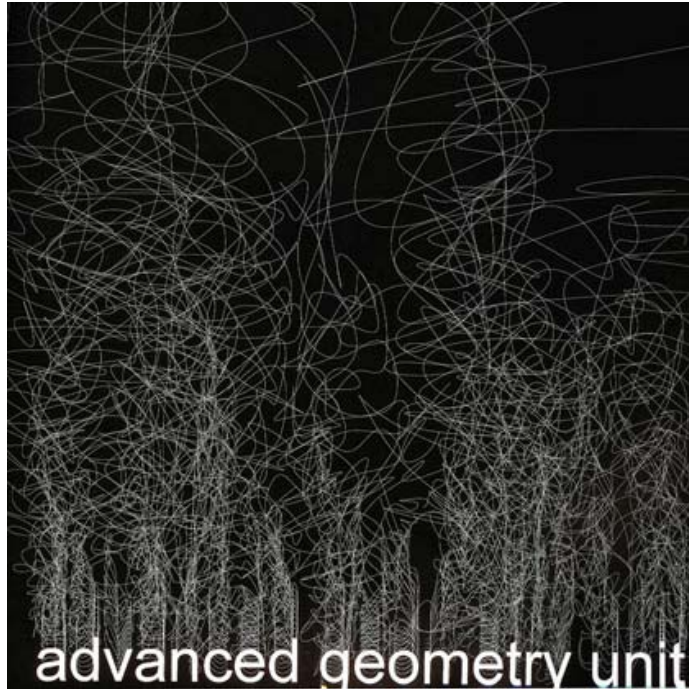


Bottom Chord
truncated panes



Marsyas, London, UK 2002





The Advanced Geometry Unit at Arup is a multidisciplinary group of architects, engineers and scientists working together on the making of buildings, structures and environments. We came together in 2000 as a small group of people that shared common interests in the definition of a new practice—architecture is either derivative of past models or pursuing sensation through exaggeration, usually engaged in the mimic of software-lofted surfaces—we wanted to build instead from first principles with our own prescriptions of forms based on interior dynamics.

The approach is to accept as irreducible the notion of complexity: a holistic view, one that is different from the traditional methods of drawing sections and plans and then extruding or patching them to make buildings. For the AGU a form is not only a building but also a master plan, structure or sculpture, any organization that interrogates space in new ways.

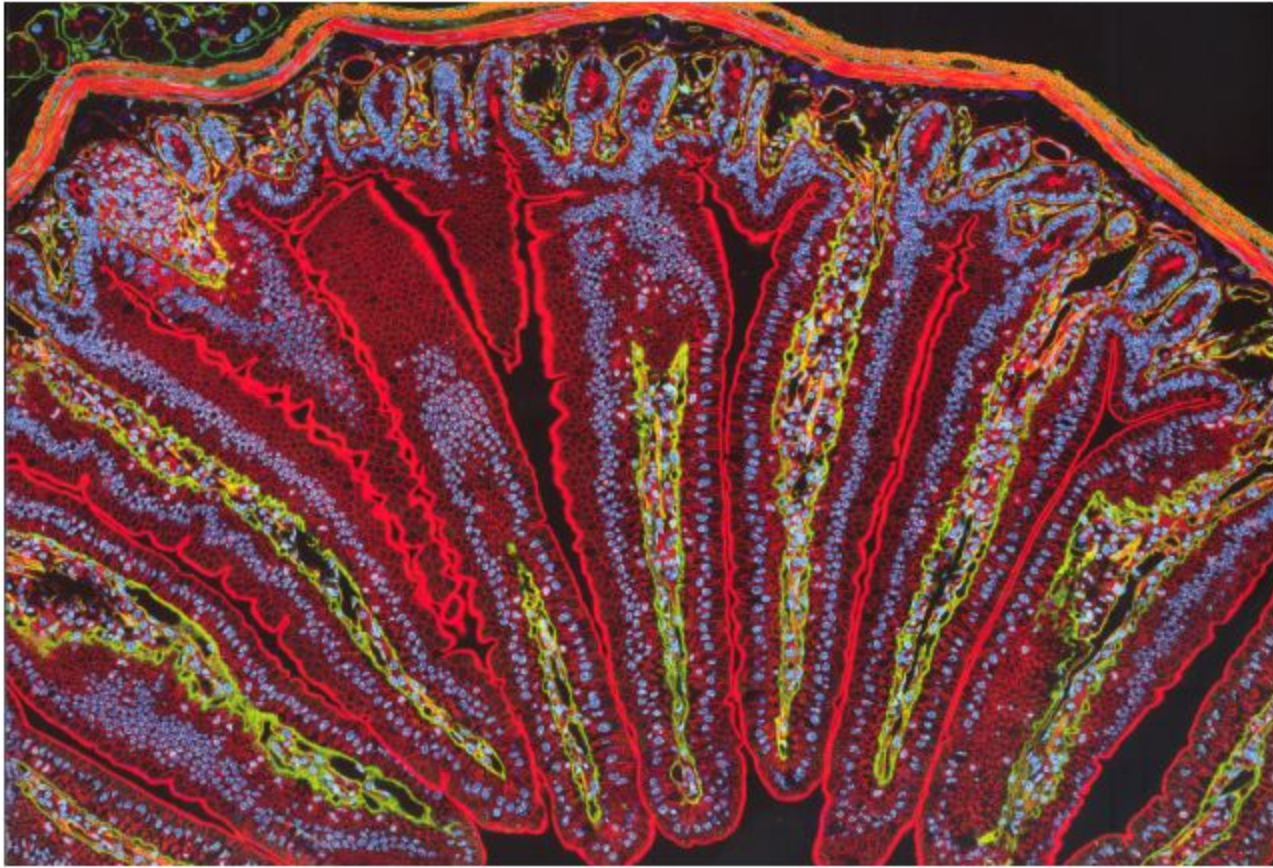
We carry out our own designs and also collaborate with other architects and designers. I see the AGU as an investigation into a new aesthetic.



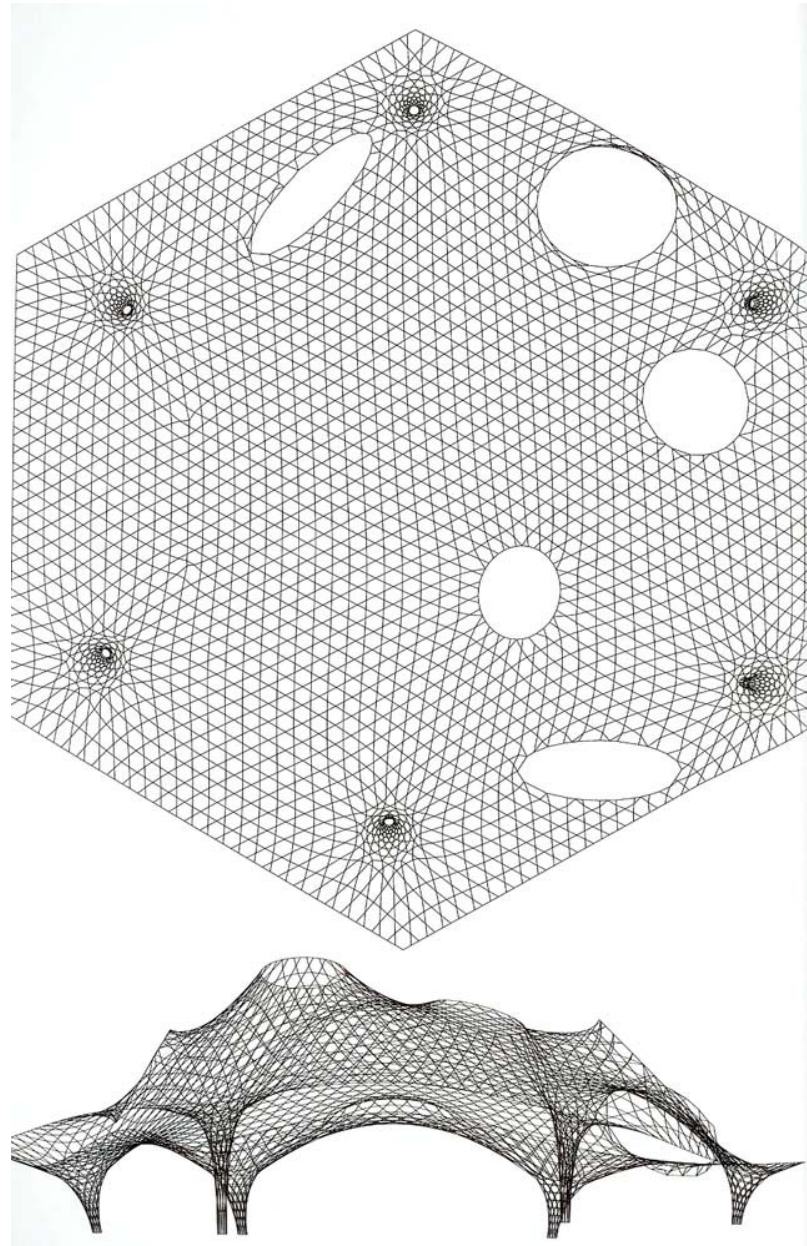
Tensegrity Bridge, Washington DC, 2003







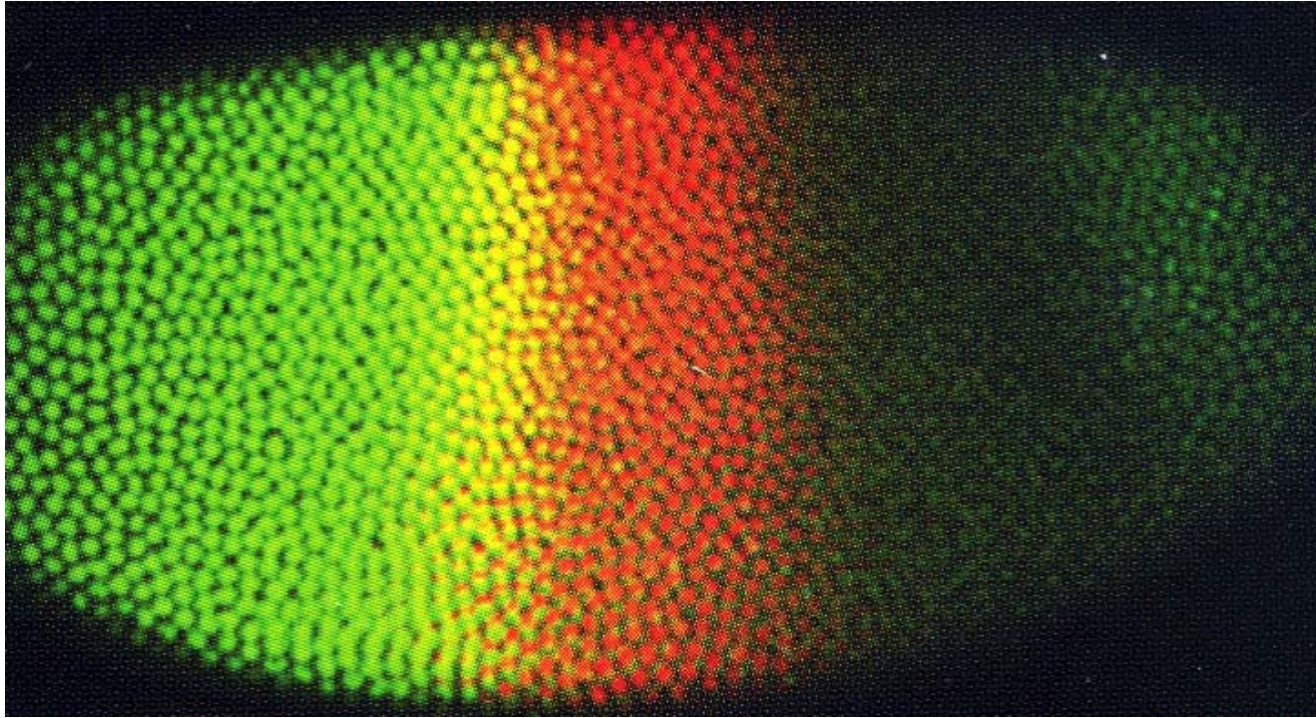
Centre Pompidou, Metz France 2004-2009

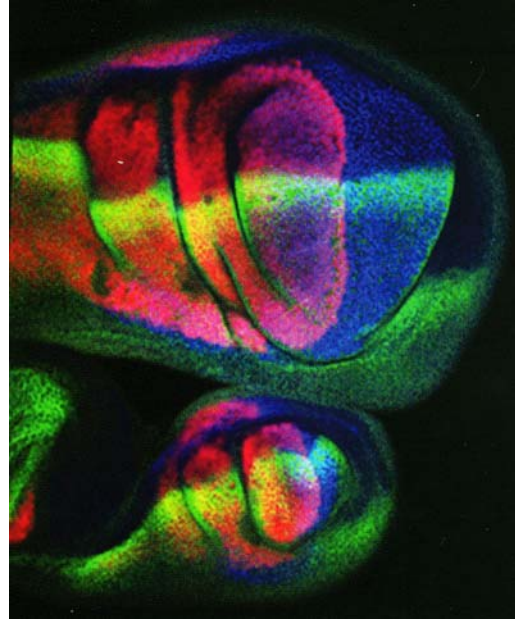




Serpentine Gallery Pavilion 2005







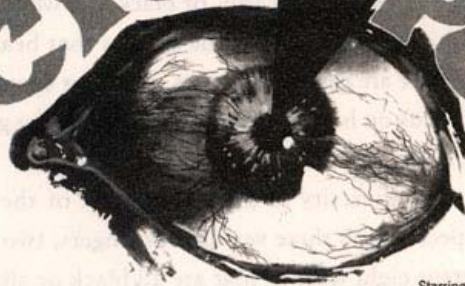
**NATURE
GONE MAD!**

A world of terror
—it was a monster
yet it was a man!
You'll hardly
believe what
your own
eyes see!



**THE STRANGEST
MONSTER
THE WORLD HAS
EVER SEEN...**

The
CYCLOPS

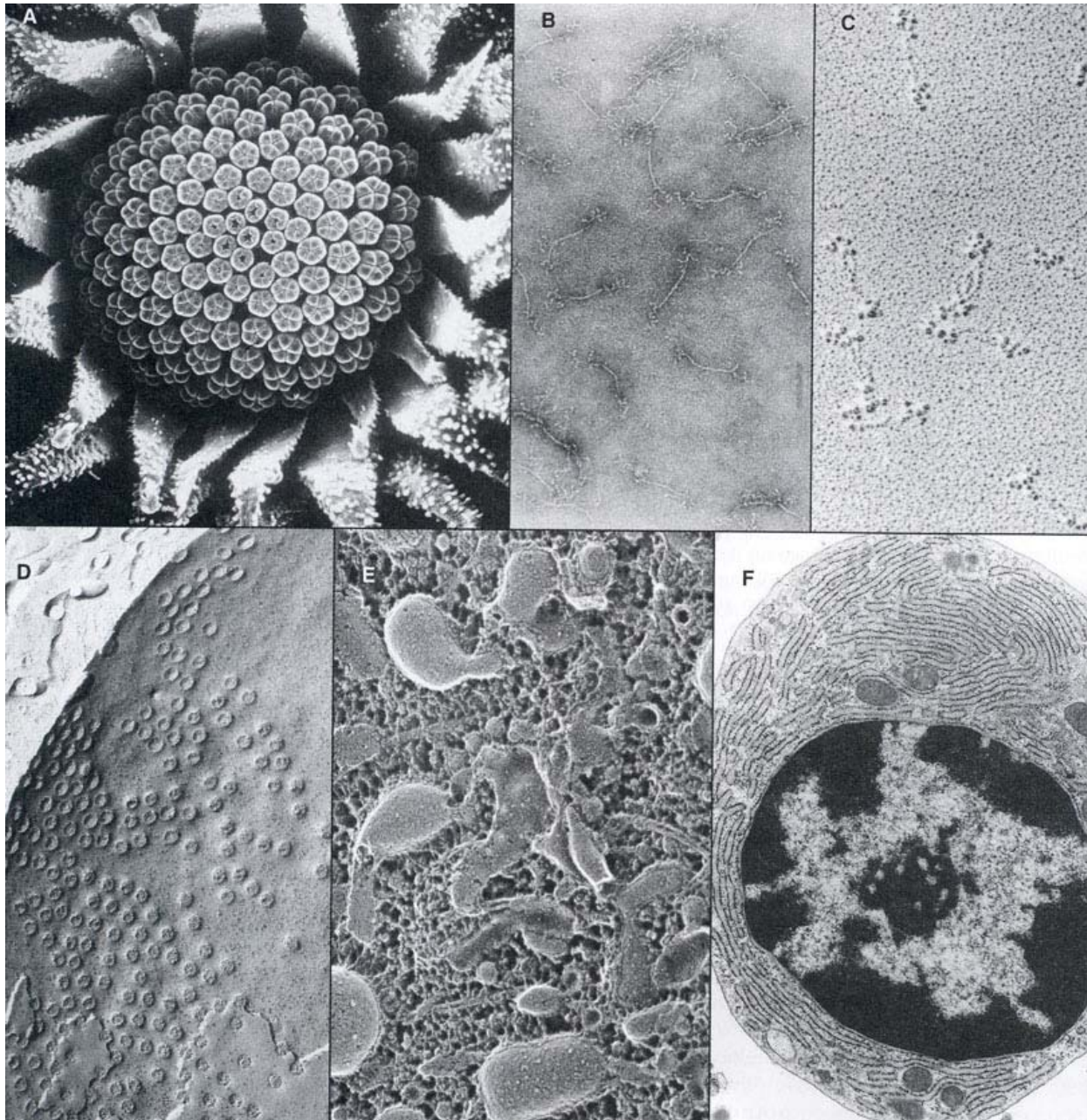


Starring

JAMES CRAIG

Written, Produced
and Directed by **BERT I. GORDON**

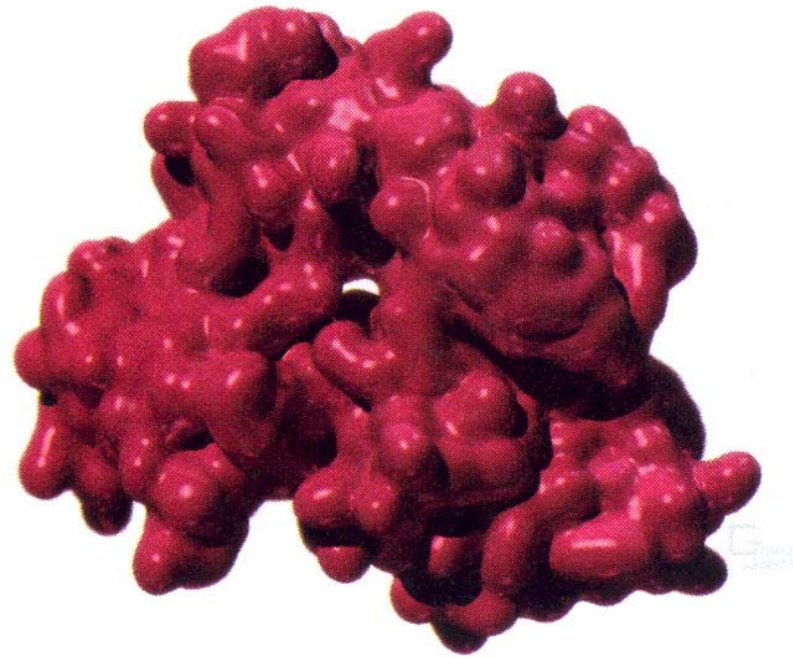






H-Edge, Artists Space, 2006





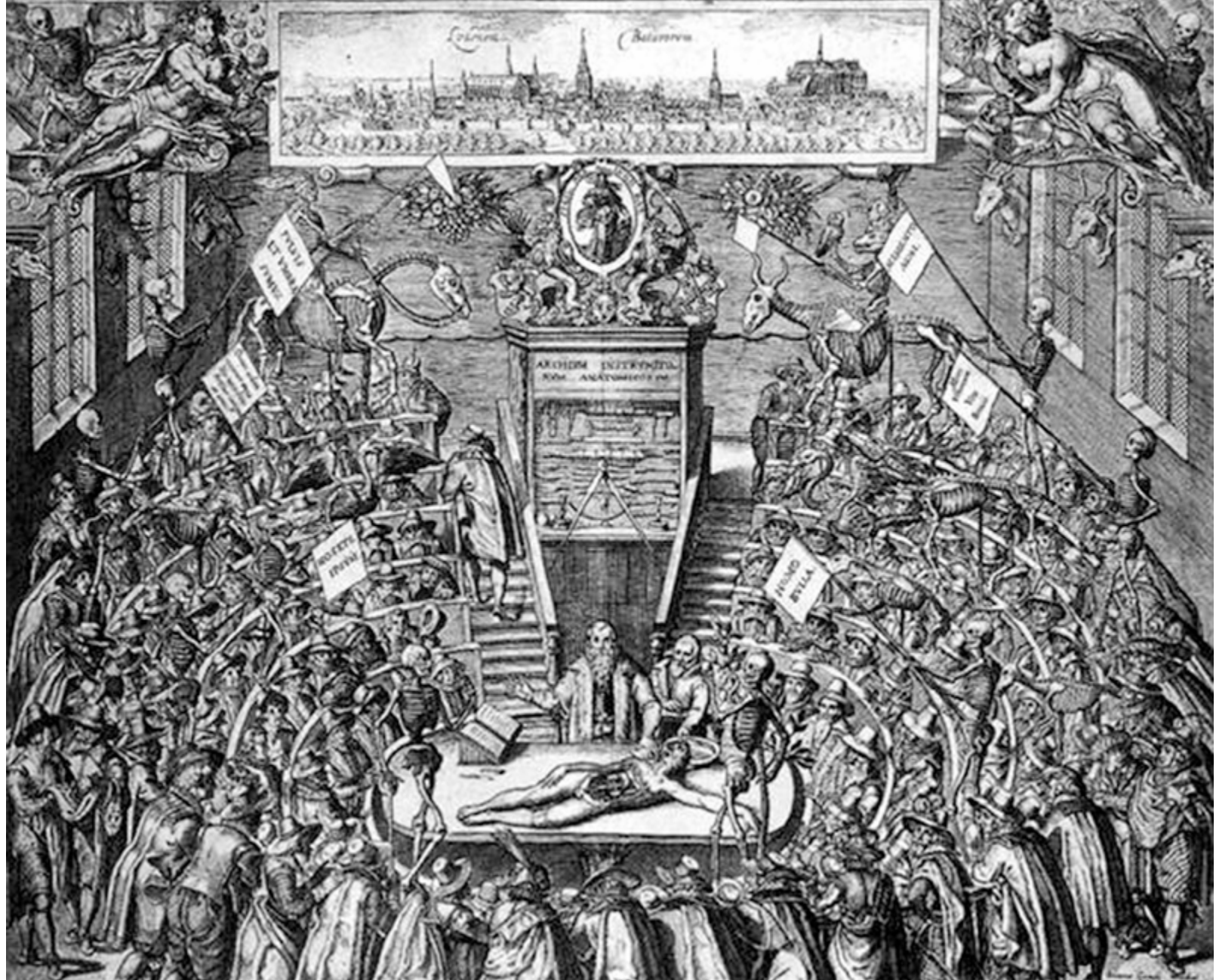
CCTV New Headquarters, Beijing, China 2003-2008

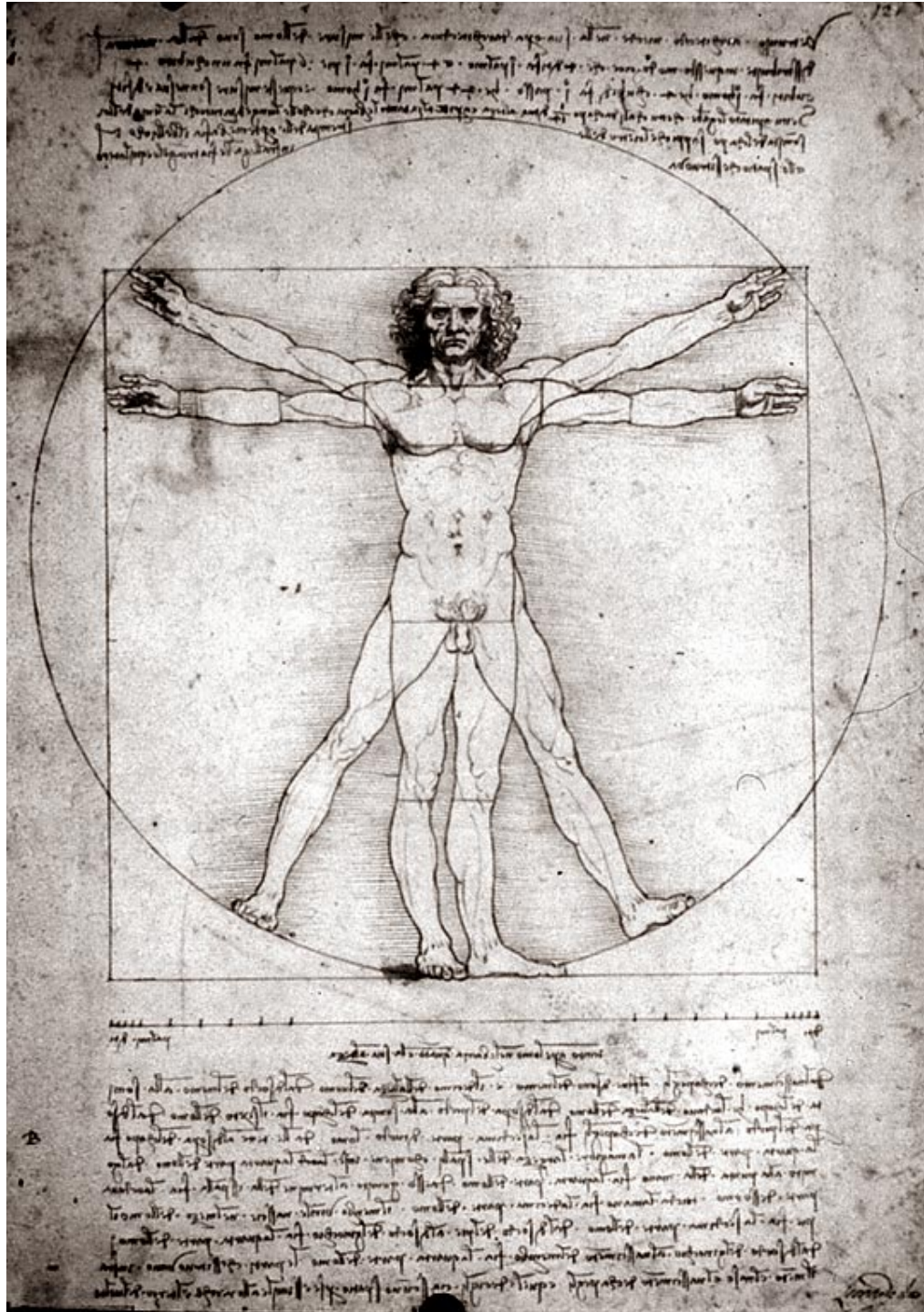


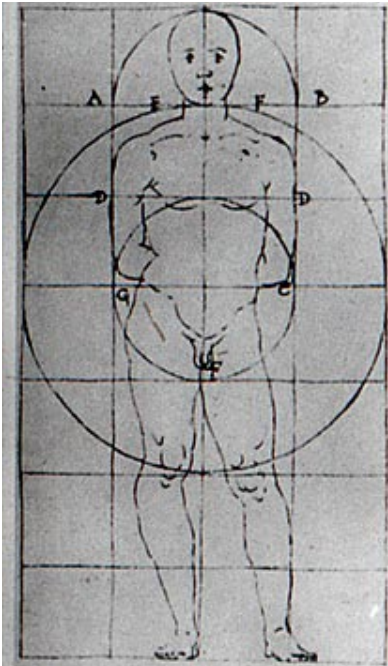


CCTV New Headquarters, Beijing, China 2003-2008

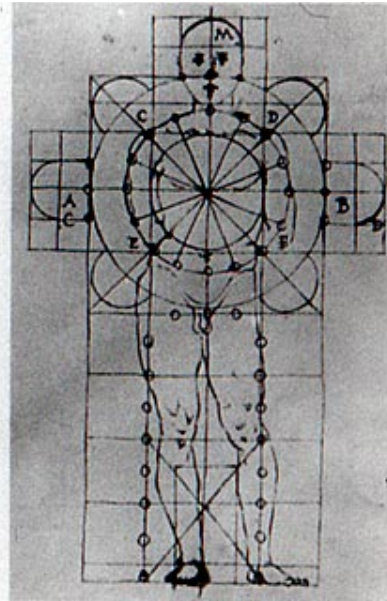
AGG. THEATRUM ANATOMICVM LVDVNO BATAVORVM.



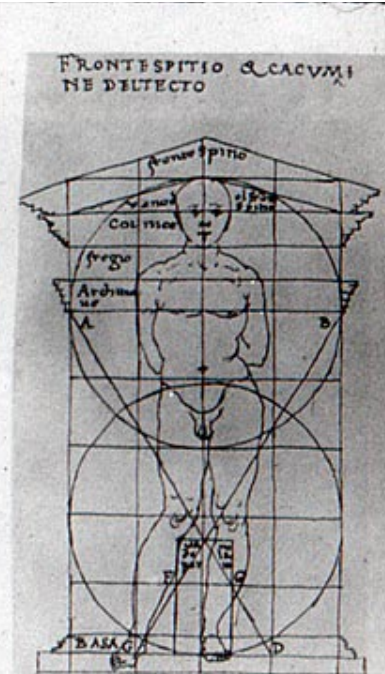




1. Fol. 42v

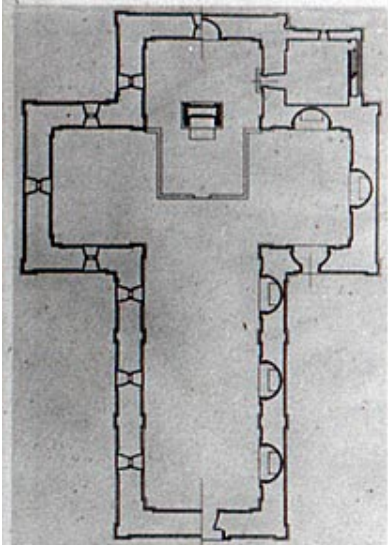


2. Fol. 42v

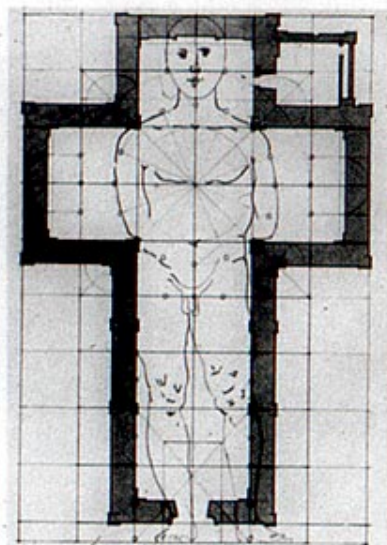


3. Fol. 39v

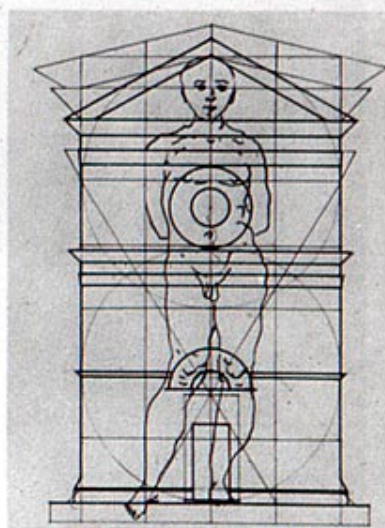
1-3. Francesco di Giorgio, *Trattato*. Florence, Bibl. Naz., MS II.I.141



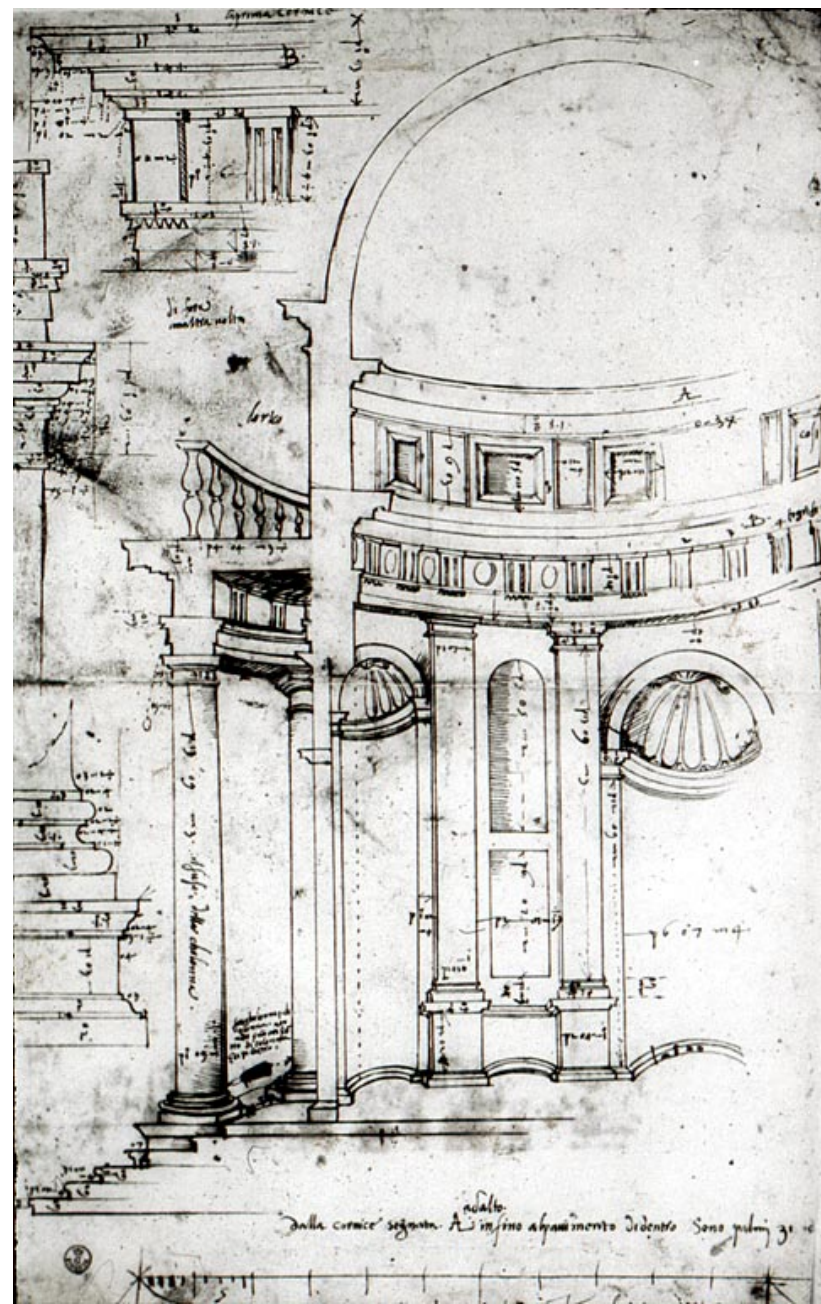
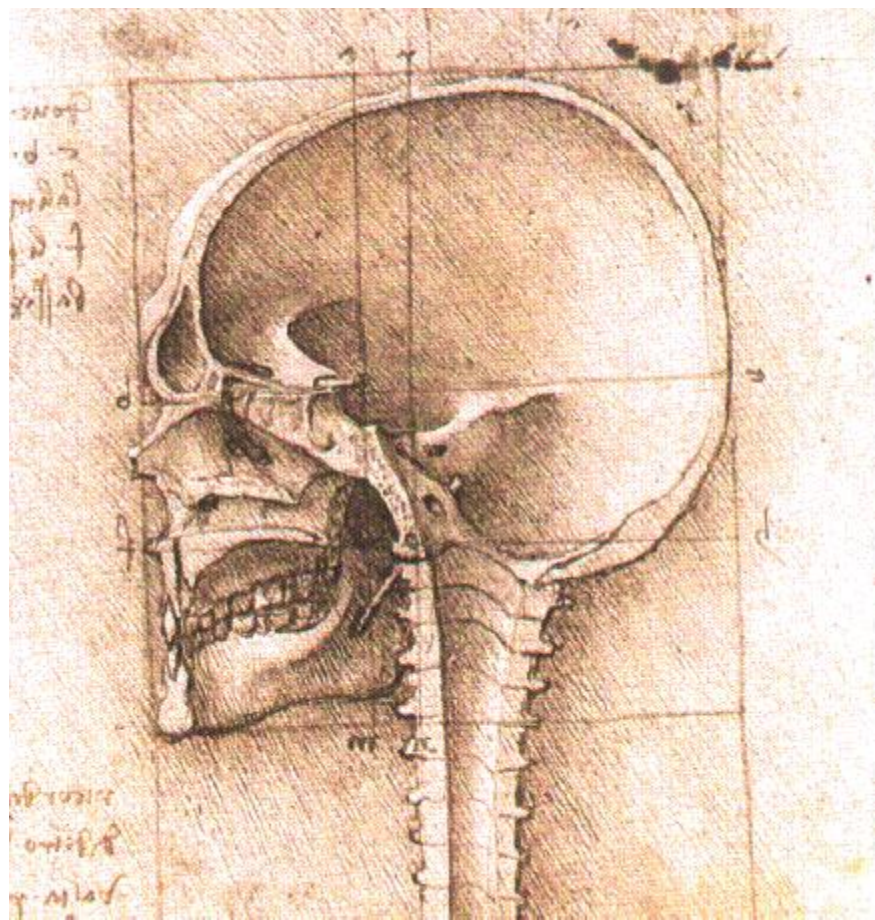
4. S. M. delle Grazie, Calcinaio near Cortona, architect, Francesco di Giorgio. Plan (from Papini, *Francesco di Giorgio Architetto*, III, pl. LV1)



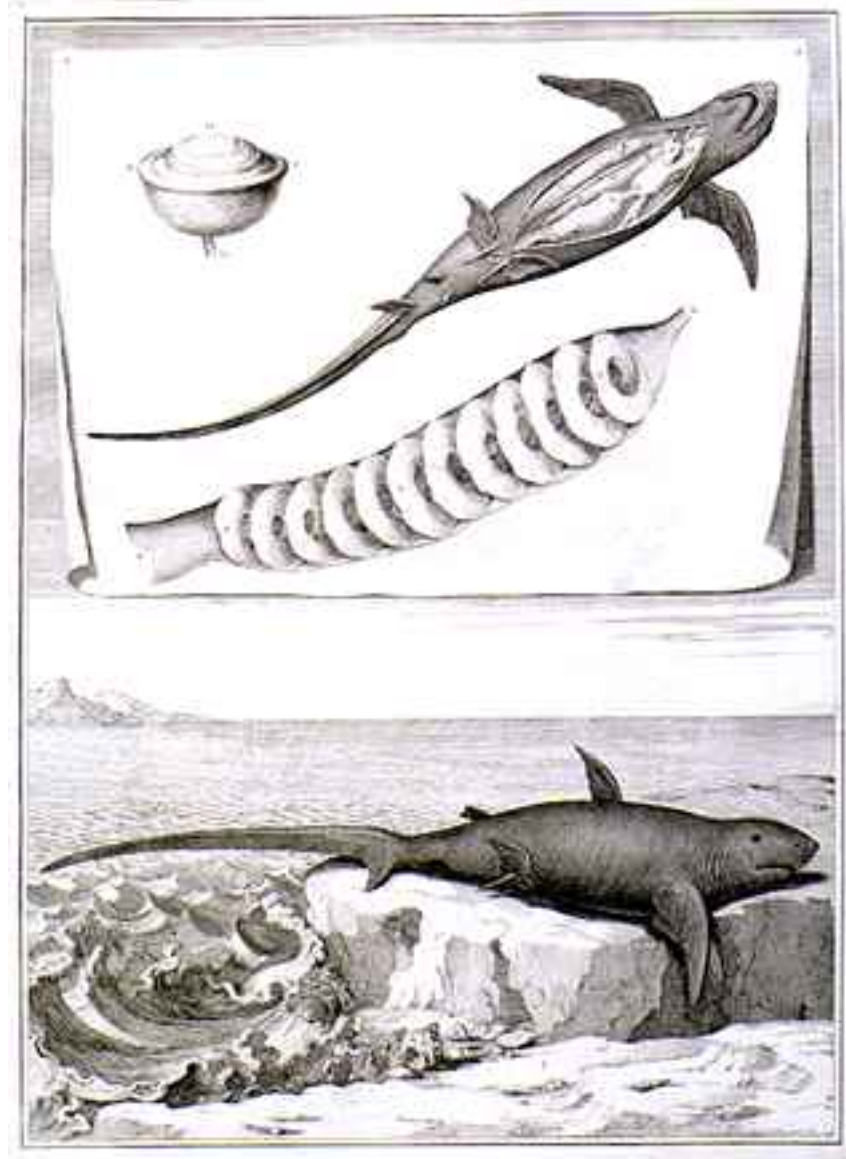
5. Fig. 2 superimposed on Fig. 4 (author's drawing)



6. Fig. 3 superimposed on façade elevation of S. M. delle Grazie, Calcinaio (author's drawing)









0.0T 001P01MR01

S

Ex: 674000

CORONAL TSE

Se: 4/9

Im: 3100101/23

Cor: A58.2

12:37:25.50

256 x 256

Mag: 1.0x

R

ET: 1

TR: 2875.8

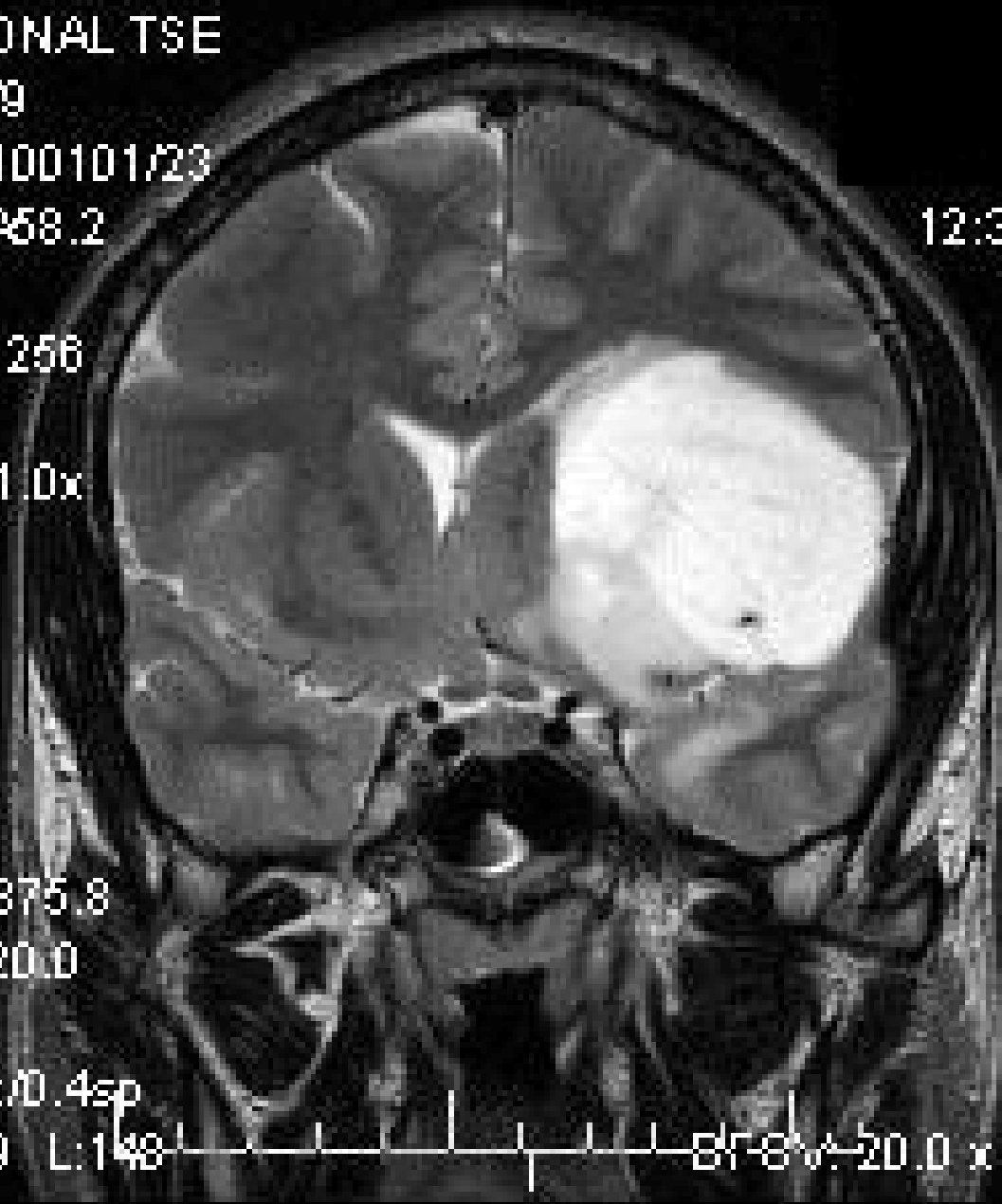
TE: 120.0

H

4.0thk/0.4sp

W:279 L:148

87.8% 20.0 x 20.0cm



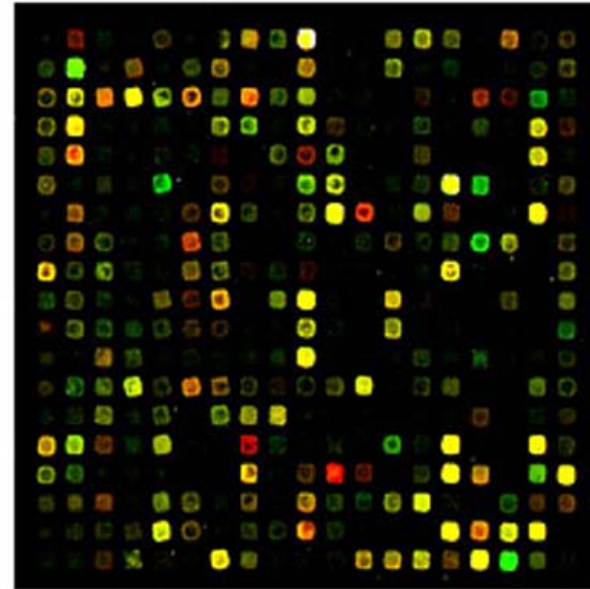
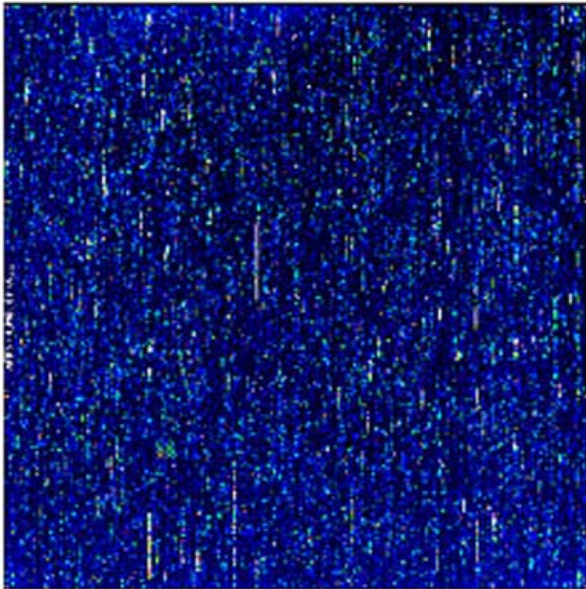
1989-870

5427 V233 blot x 233.15 sub 11.4 in wet (opt com)
1x556 62° 3 days no sweat





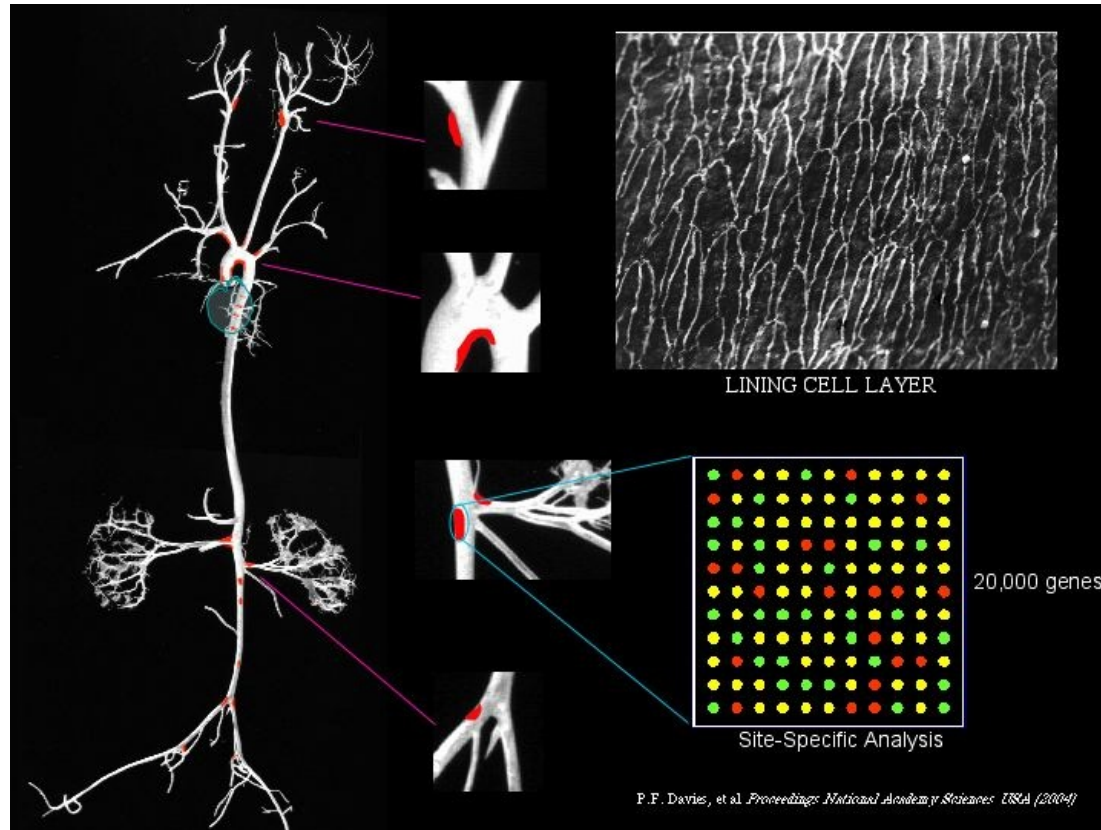
the fog and the connection of events



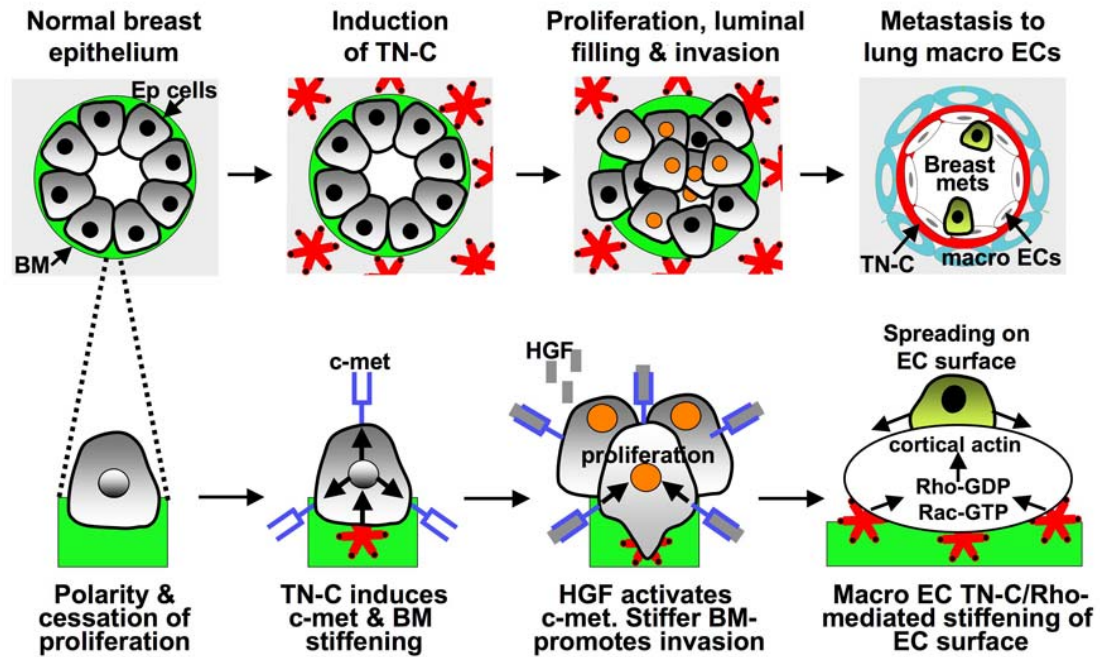
“What is beautiful in science is the same that is beautiful in Beethoven. There is a fog of events and suddenly you see a connection. It expresses a complex of human concerns that goes deeply to you, that connects things that were always in you that were never put together before.”

Victor Weisskopf, physicist

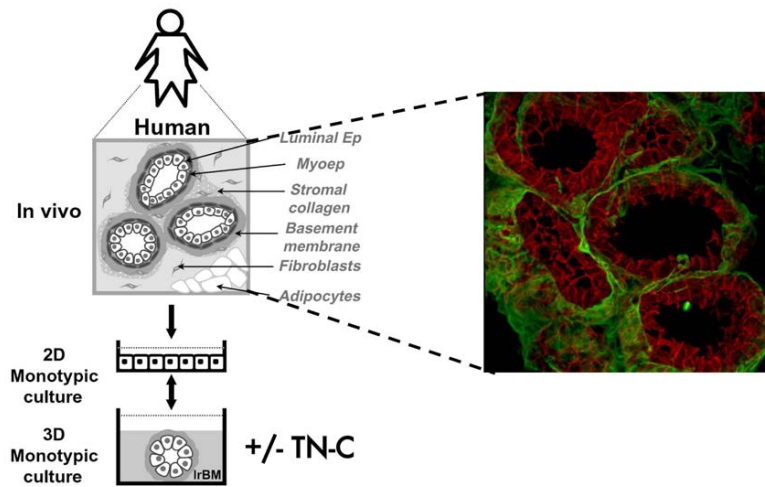
the fog and the connection of events



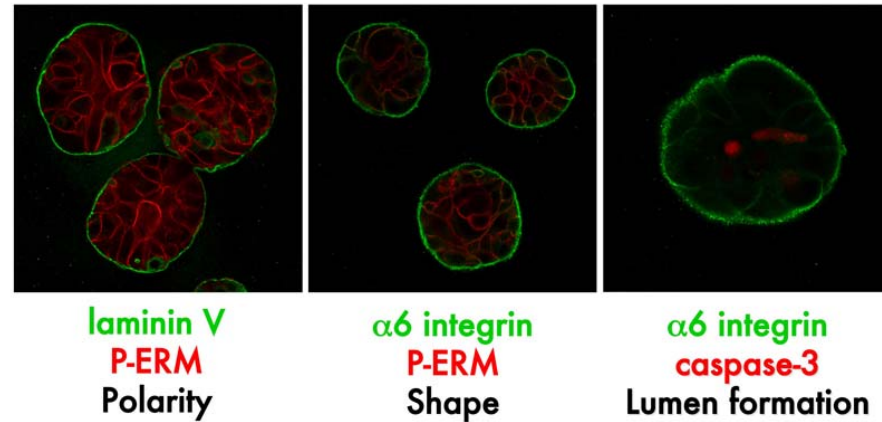
Observation, experiment and design



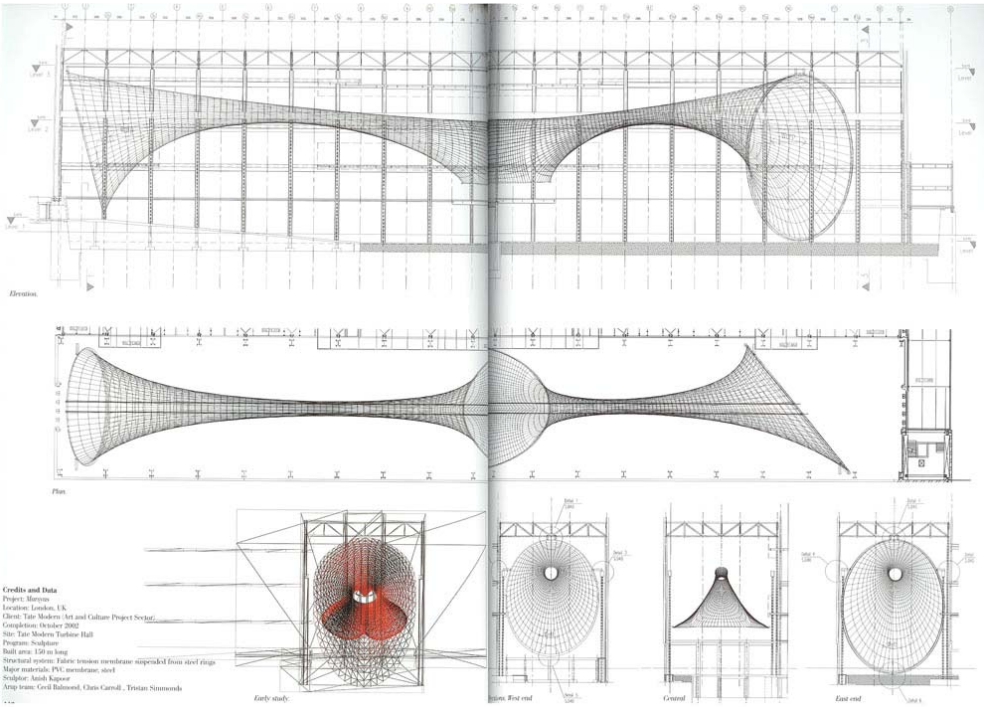
designing microenvironments



normal 3-D morphogenesis



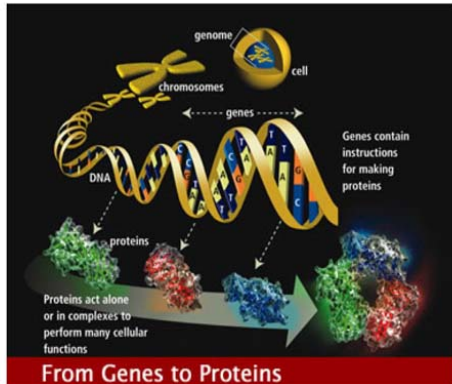
Observation, experiment and design



Credits and Data
Project: Blenheim
Location: London, UK
Client: Tate Modern Art and Culture Project Society
Completion: October 2002
Site: Tate Modern Turbine Hall
Program: Sculpture
Hall area: 150 m long
Structural system: Fabric tension membrane suspended from steel rings
Major materials: PVC membrane, steel
Sculptor: Anish Kapoor
Arch team: Gorr Robinson, Chris Carroll, Tristan Simmonds

the linear and non-linear

“central dogma”



DNA → RNA → Protein → Form & Function

Gene is a short stretch of **DNA** & each encodes a different protein

DNA is chemical language that stores genetic information

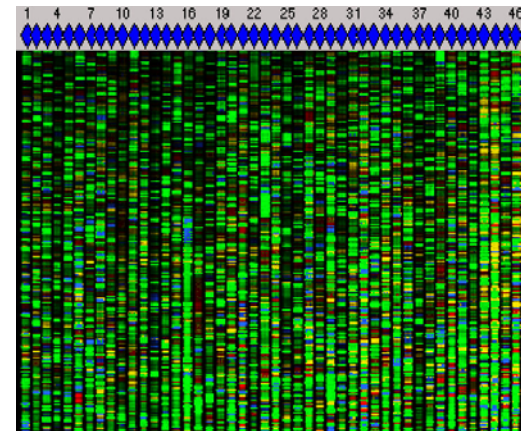
Genome refers to the total genetic material

RNA is transcribed from DNA

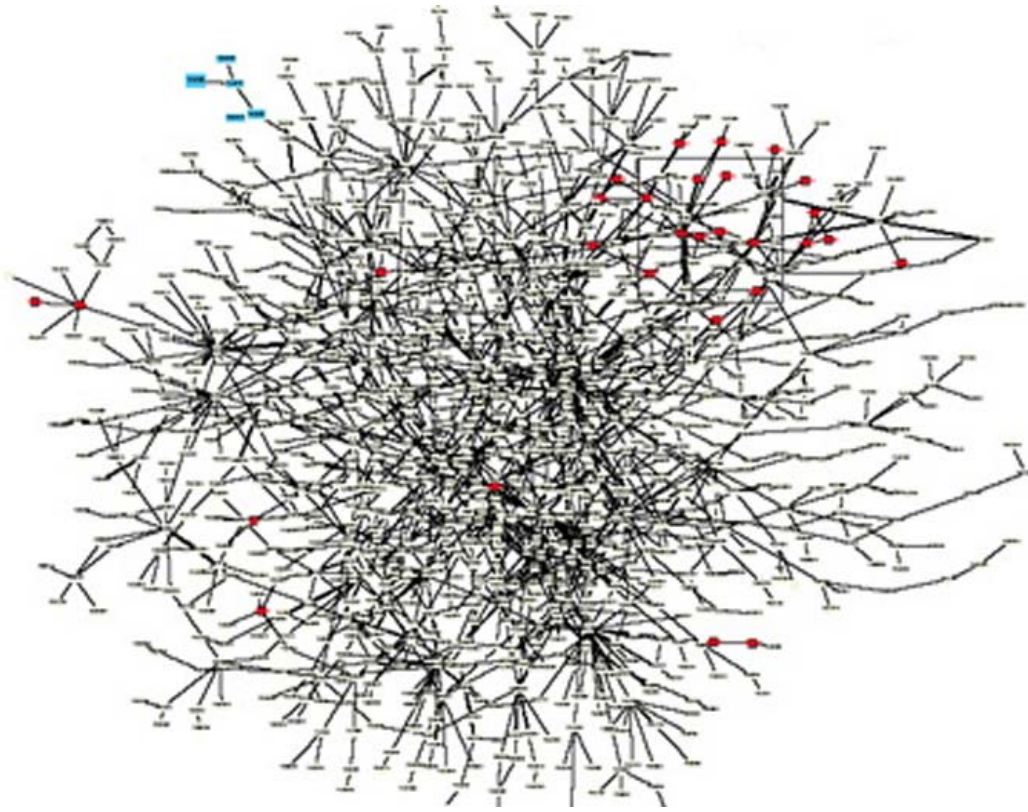
Proteins are translated from RNA

Some proteins are **Structural**

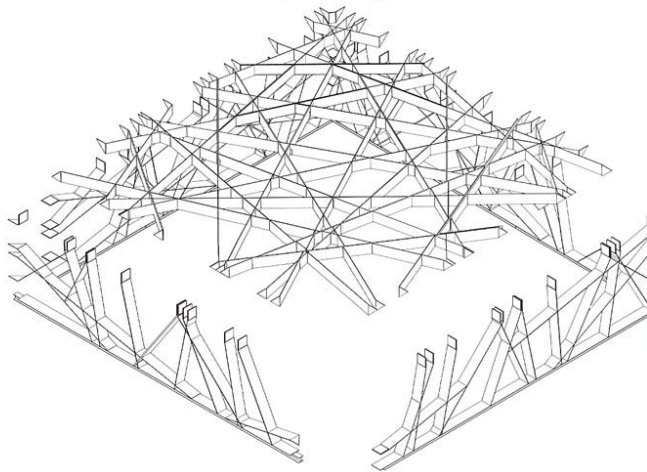
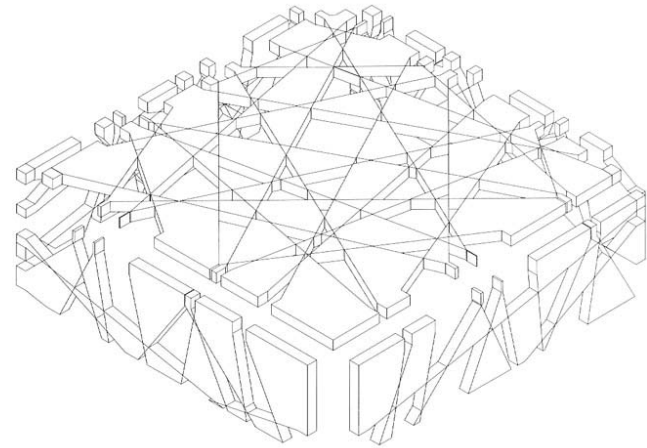
Most proteins are **Catalysts** that drive reactions forming life



the linear and non-linear



the linear and non-linear

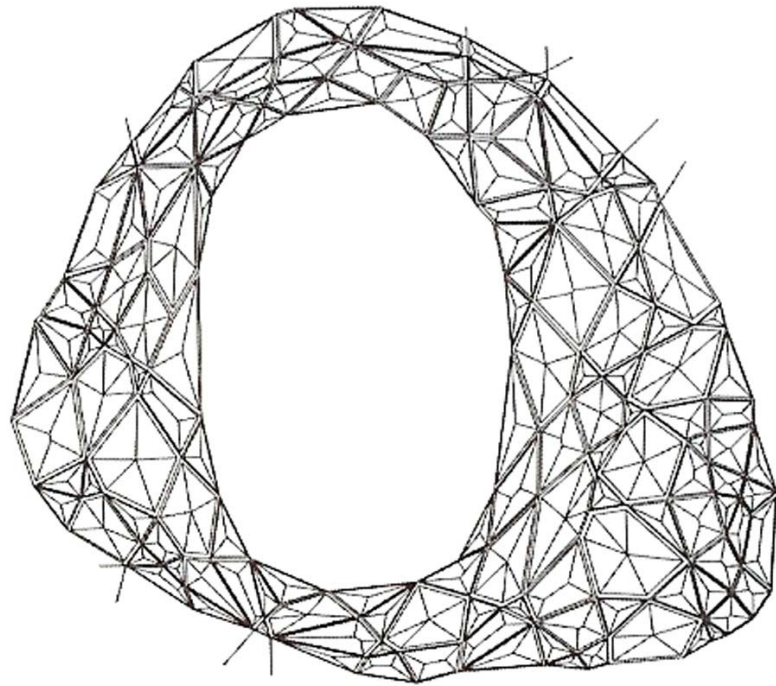


scale

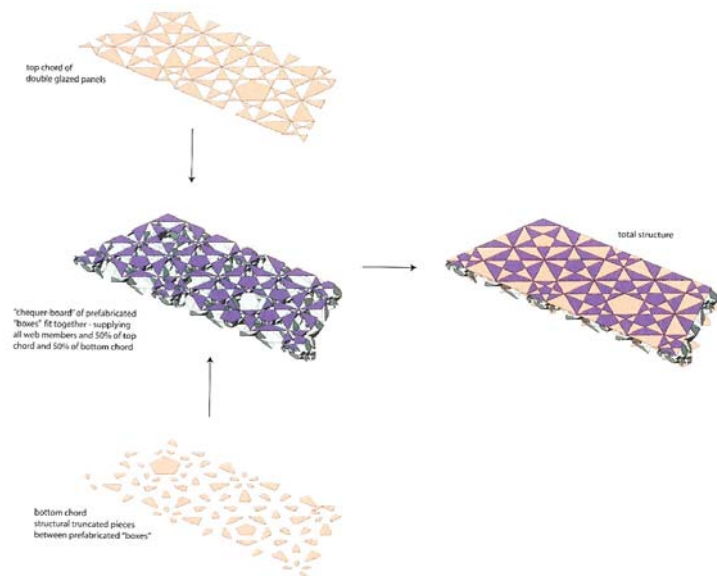


Skeleton of a hummingbird hanging below the hollow femur of an extinct elephant

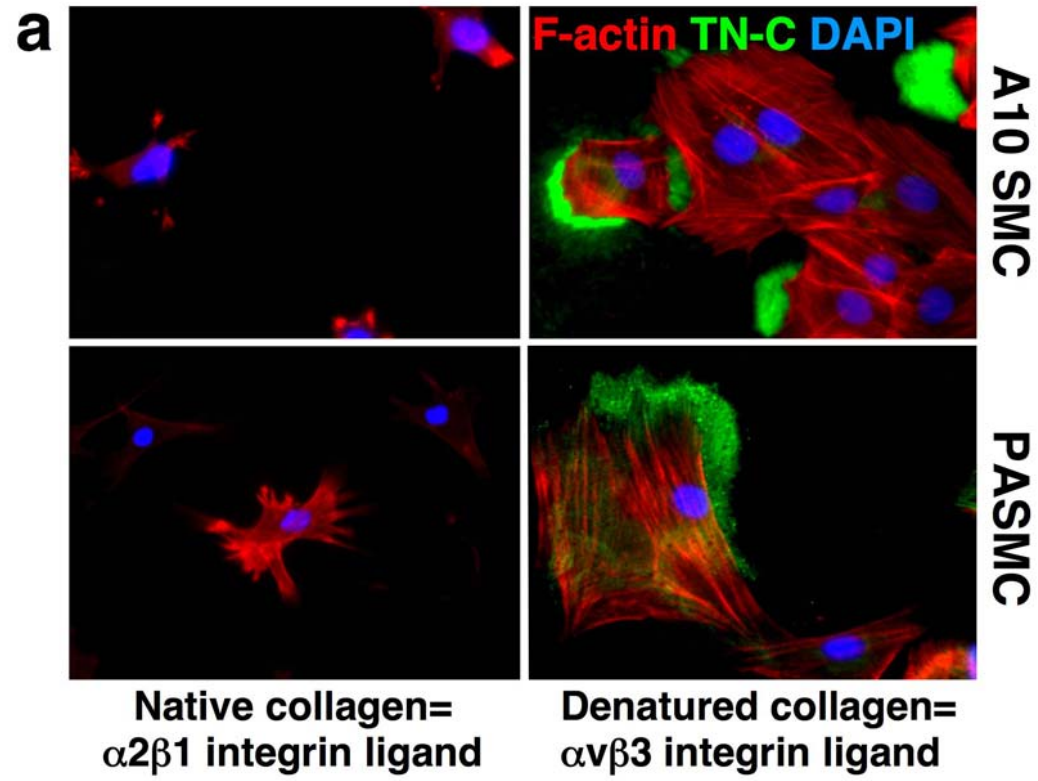
scale



form

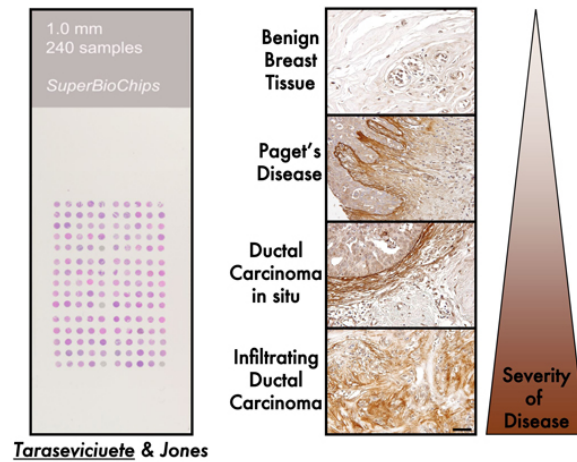


form



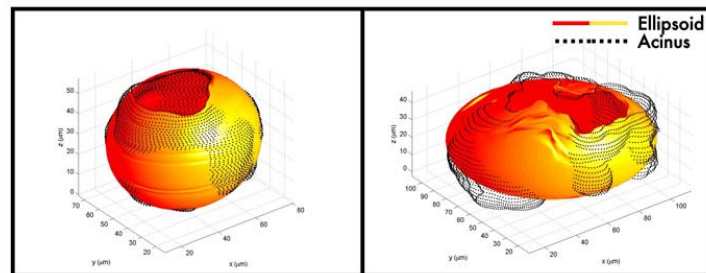
instability, failure, uncertainty

TN-C is induced & spreads with breast cancer

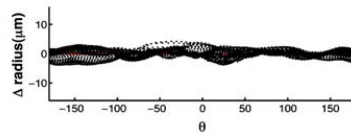


instability, failure, uncertainty

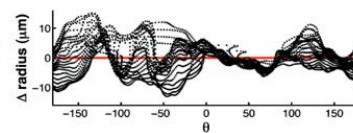
TN-C increases surface roughness



-TN-C
RMS=1.42



+TN-C
RMS=4.88



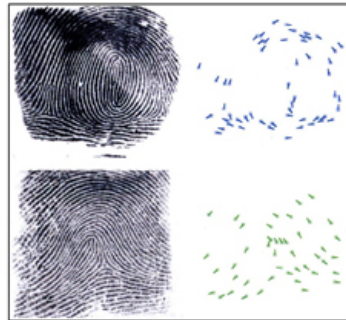
Modeling the stable and unstable



Uncertainty and intuition

code

identical genomes: distinct phenotypes



Jain et al. (2002)
Pattern recognition

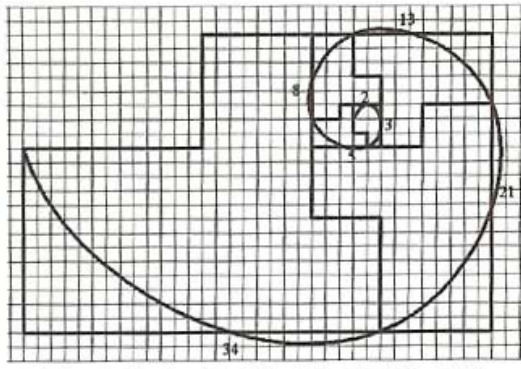
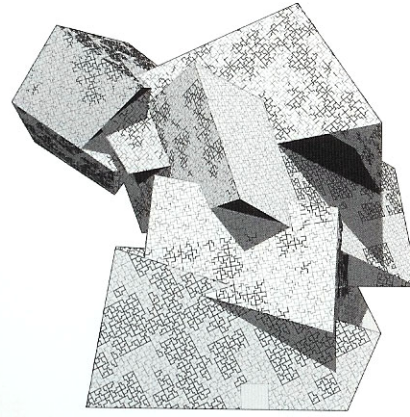


Hall (2006)
UNSW

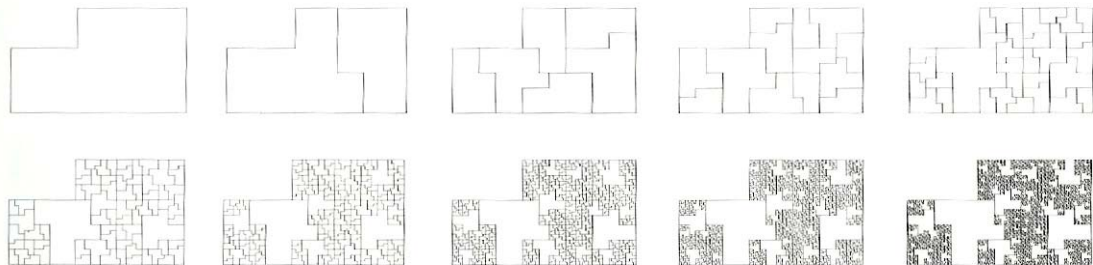
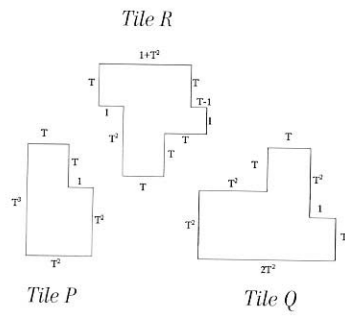
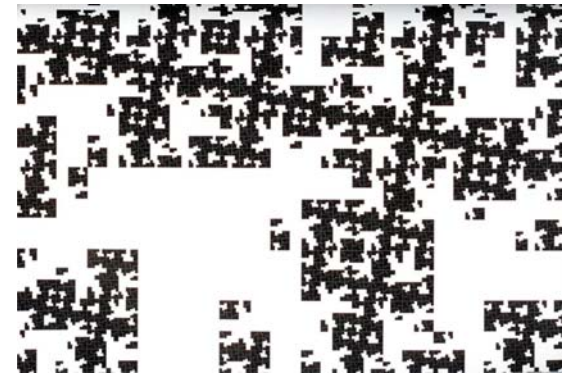
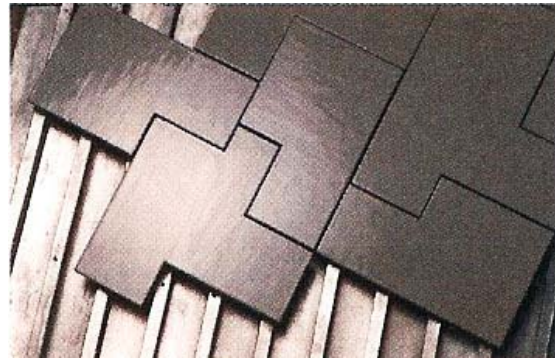


Clone 6LL3/Dolly
Wilmut et al (1996)

code



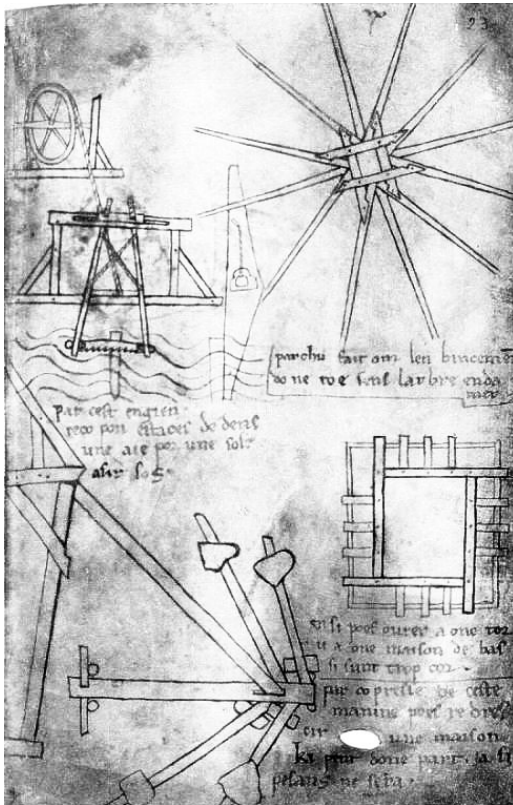
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144



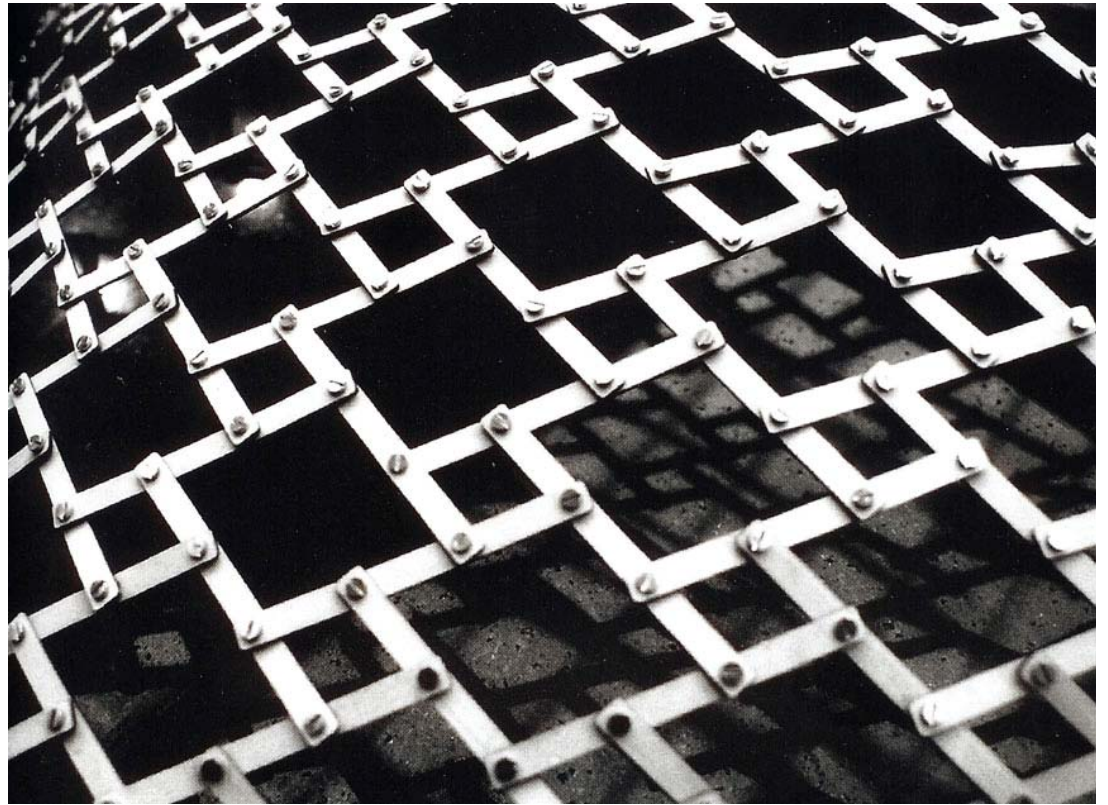
V & A Spiral, London, UK, 1996-2004

models

Reciprocal Networks



Villard de Honnecourt



Cecil Balmond

Science laboratory



Studio laboratory

