

ARK-E2515 Parametric Design Form-Finding

Toni Kotnik

Professor of Design of Structures

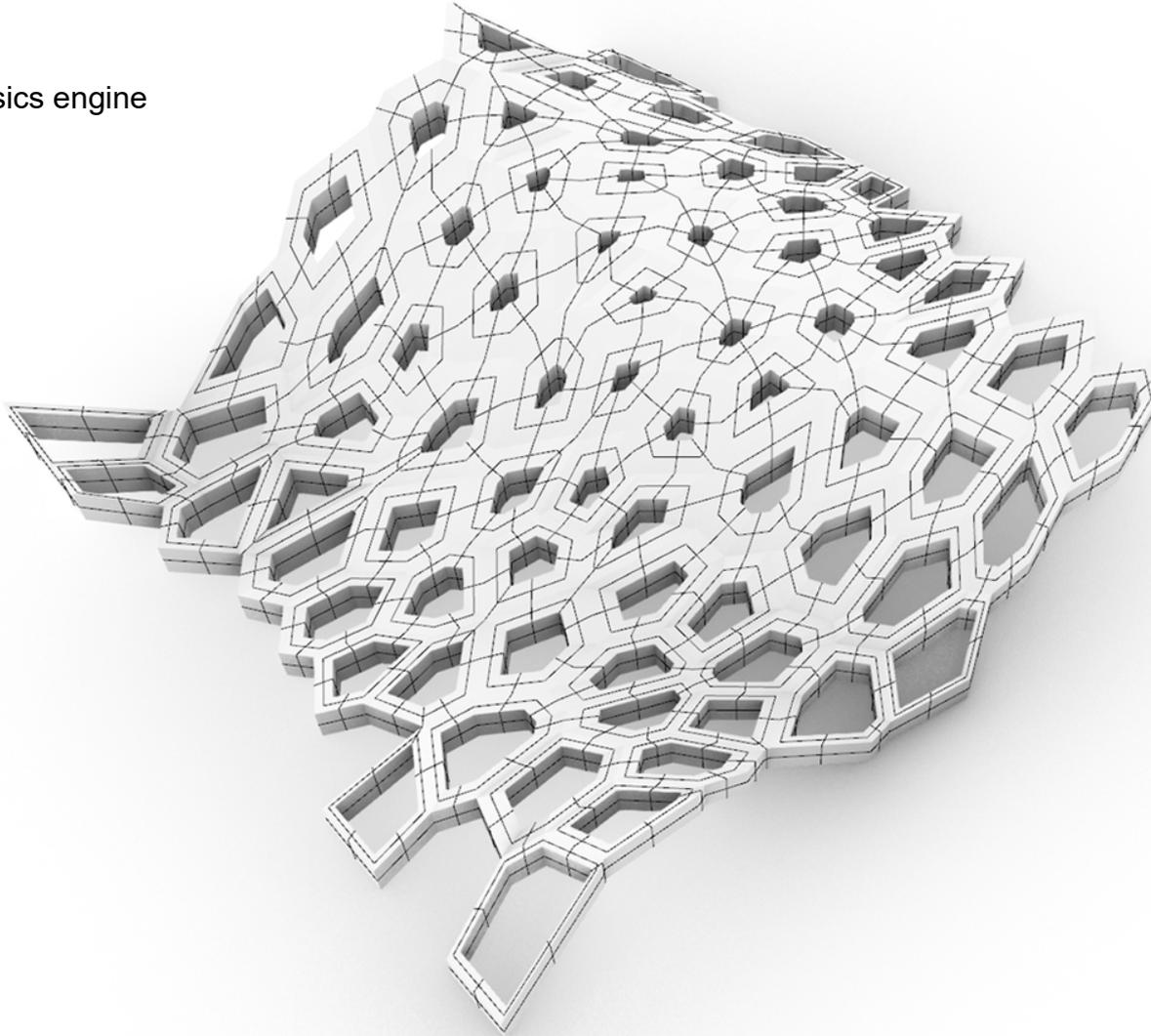
Aalto University
Department of Architecture
Department of Civil Engineering

Geometric Data

+

Gravity

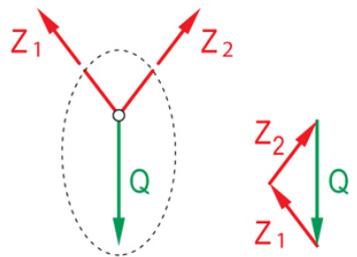
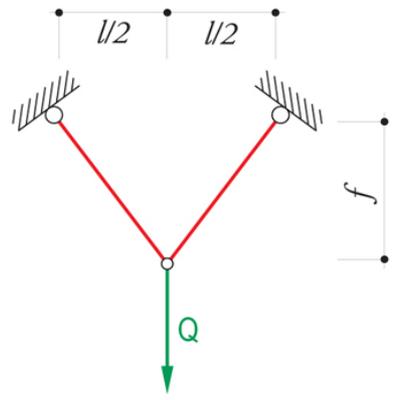
Kangaroo: live physics engine



Form-Finding



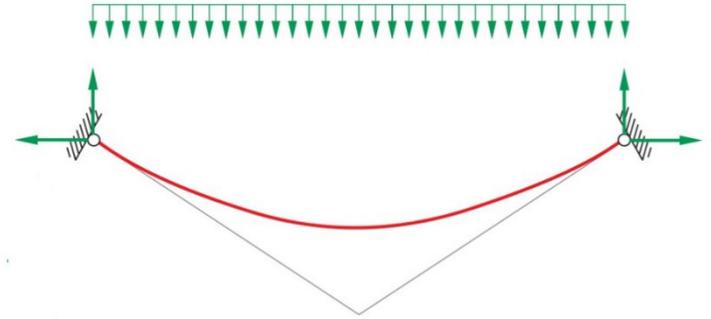
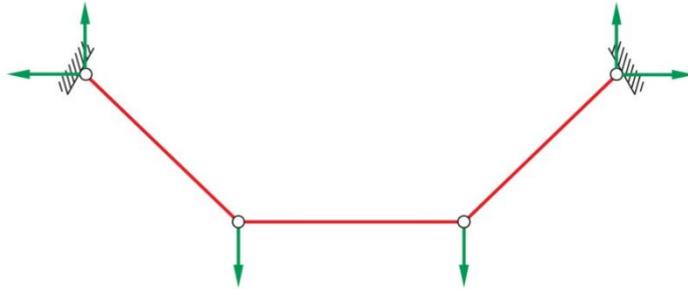
cable



Principle of Duality

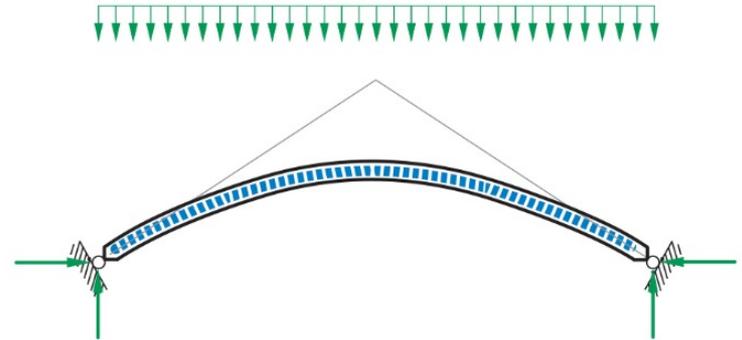
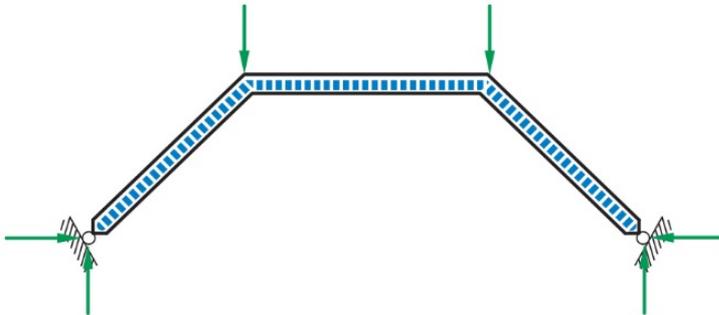
cable

only tension as
inner forces

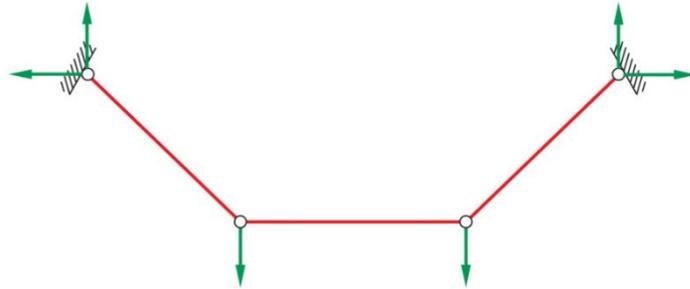


arch

only compression
as inner forces

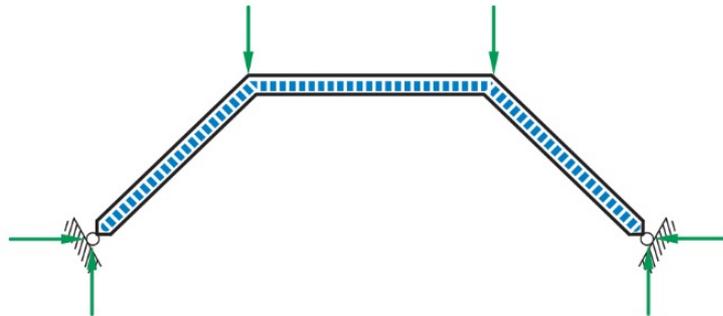


Principle of Duality



cable

only tension as
inner foces



arch

only compression as
inner foces



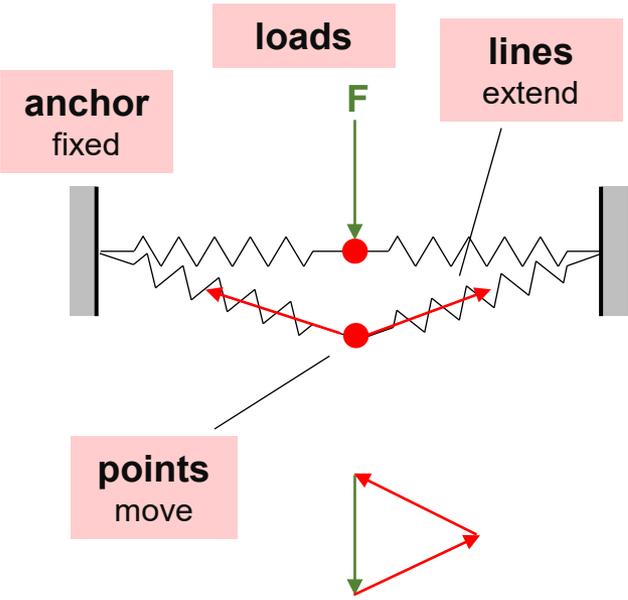
Antoni Gaudi: hanging model
Sagrada Familia, Barcelona, Spain
around 1889

Principle of Duality



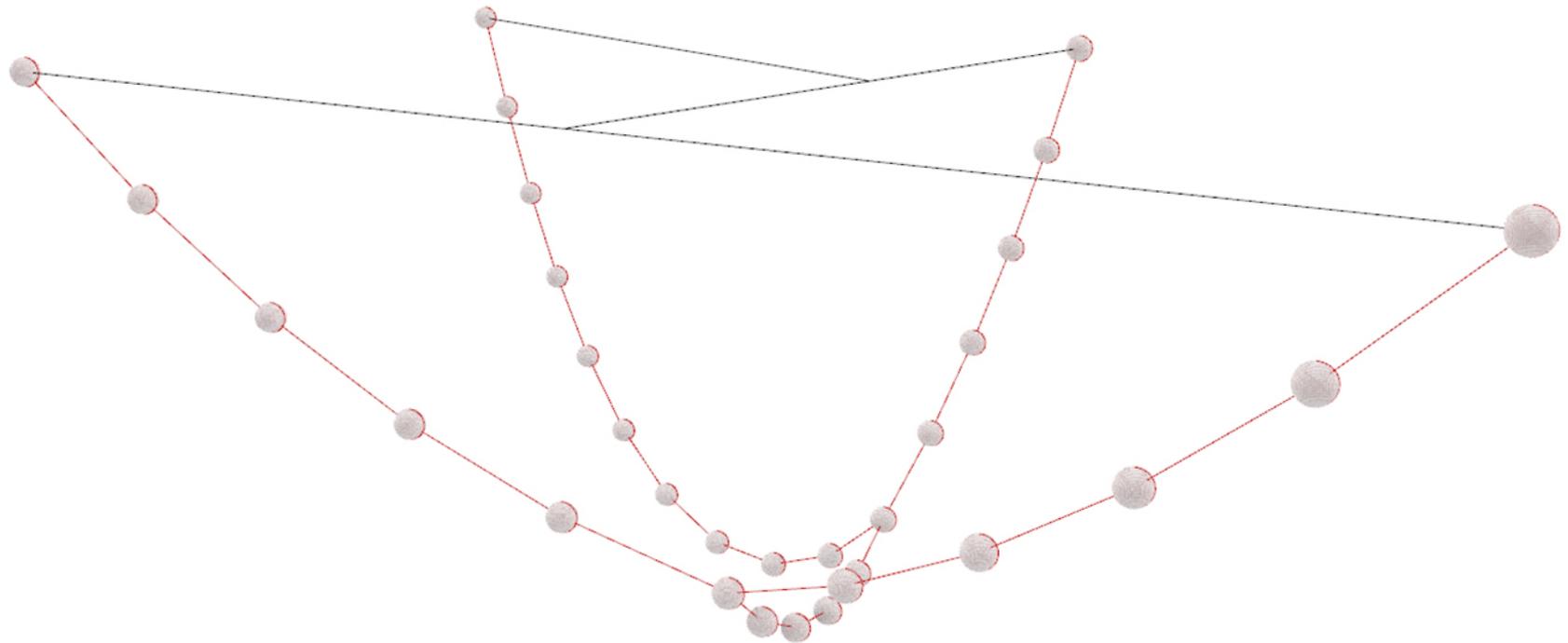
Antoni Gaudi: hanging model
Sagrada Familia, Barcelona, Spain
around 1889

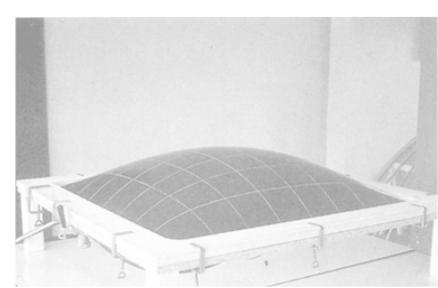
Particle-Spring System



Antoni Gaudi: hanging model
 Colonia Güell, Barcelona, Spain
 around 1900

Check 13: construct a hanging chain model out of three connected lines.





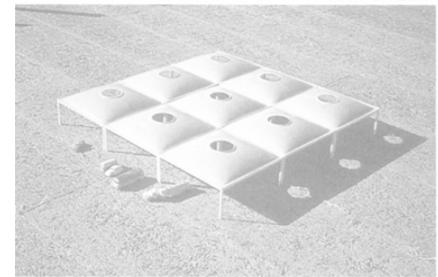
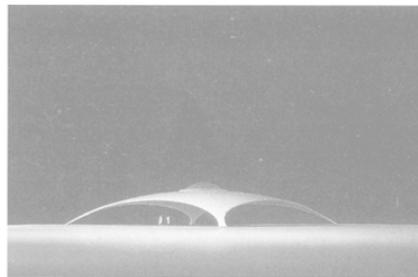
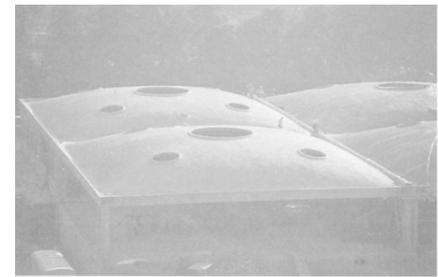
Pneumatic Membrane



Hanging Form



Flow Form

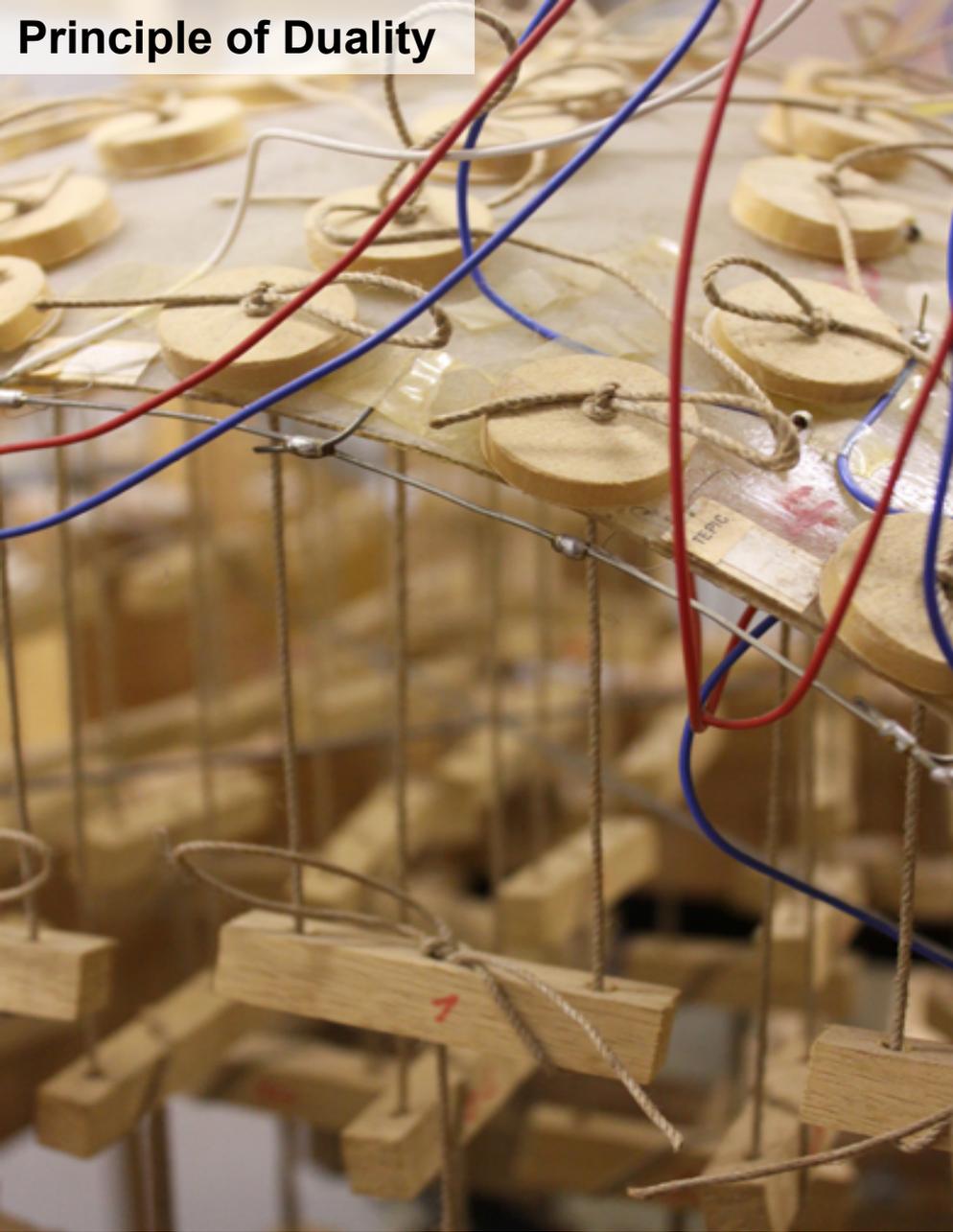


Heinz Isler: New Shapes of Shells
IASS Conference, Madrid, 1955

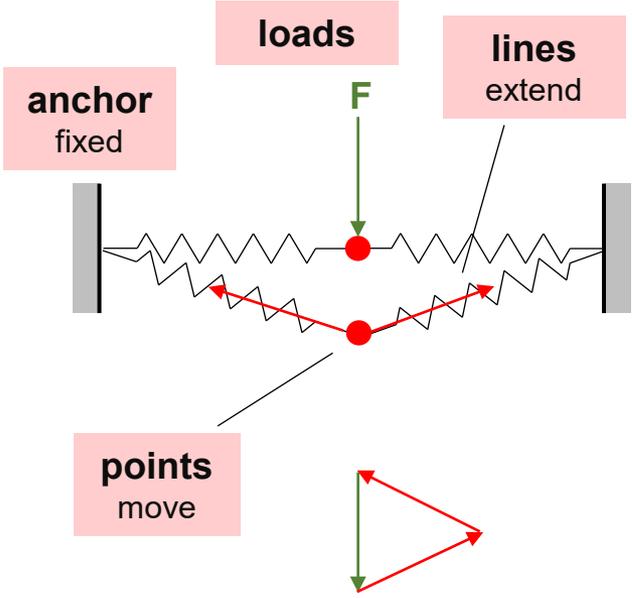


Heinz Isler: experimental setup for form-finding of hanging forms

Principle of Duality



Mesh 2d particle-spring system



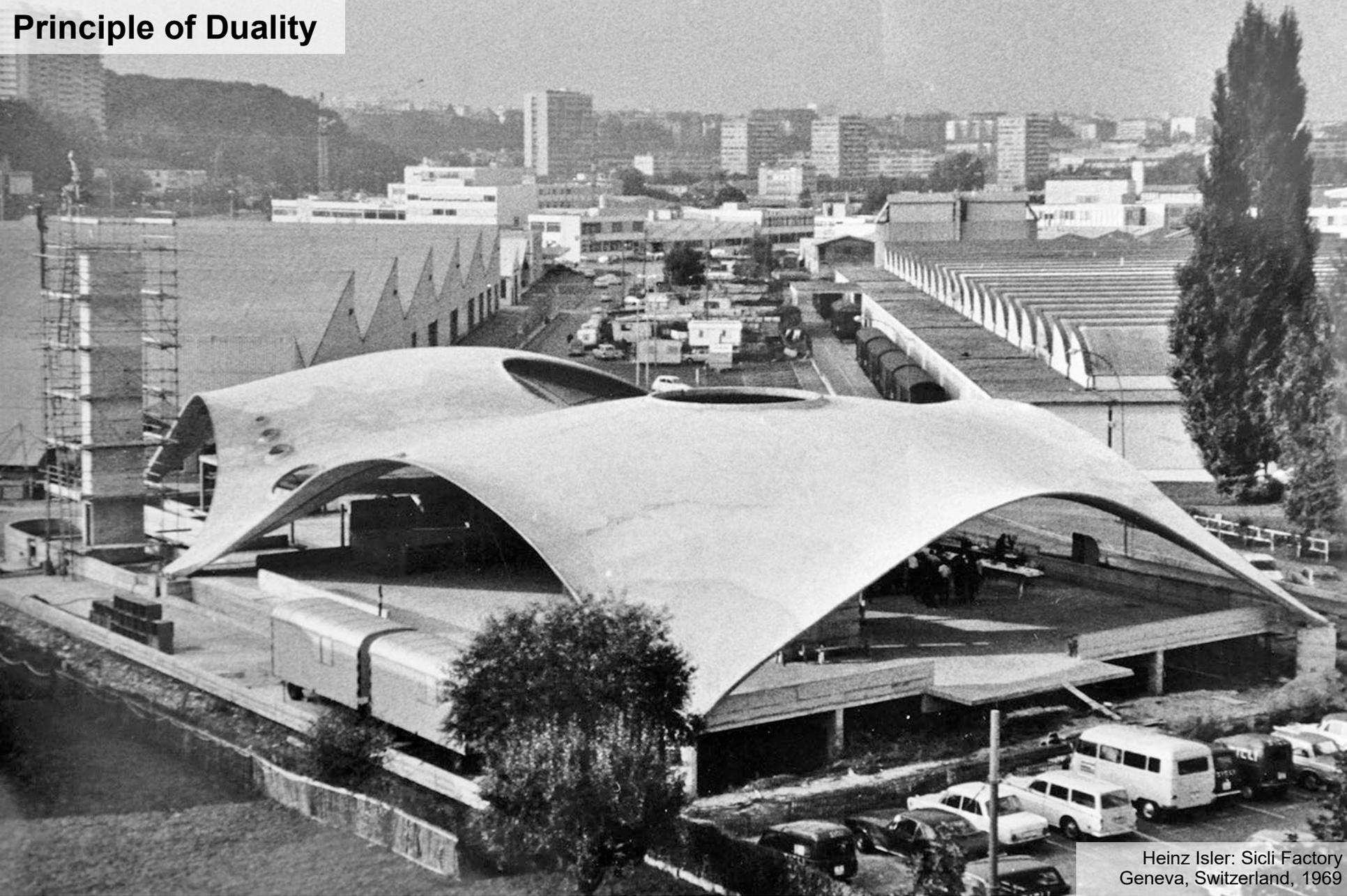
Heinz Isler: experimental setup for form-finding of hanging forms

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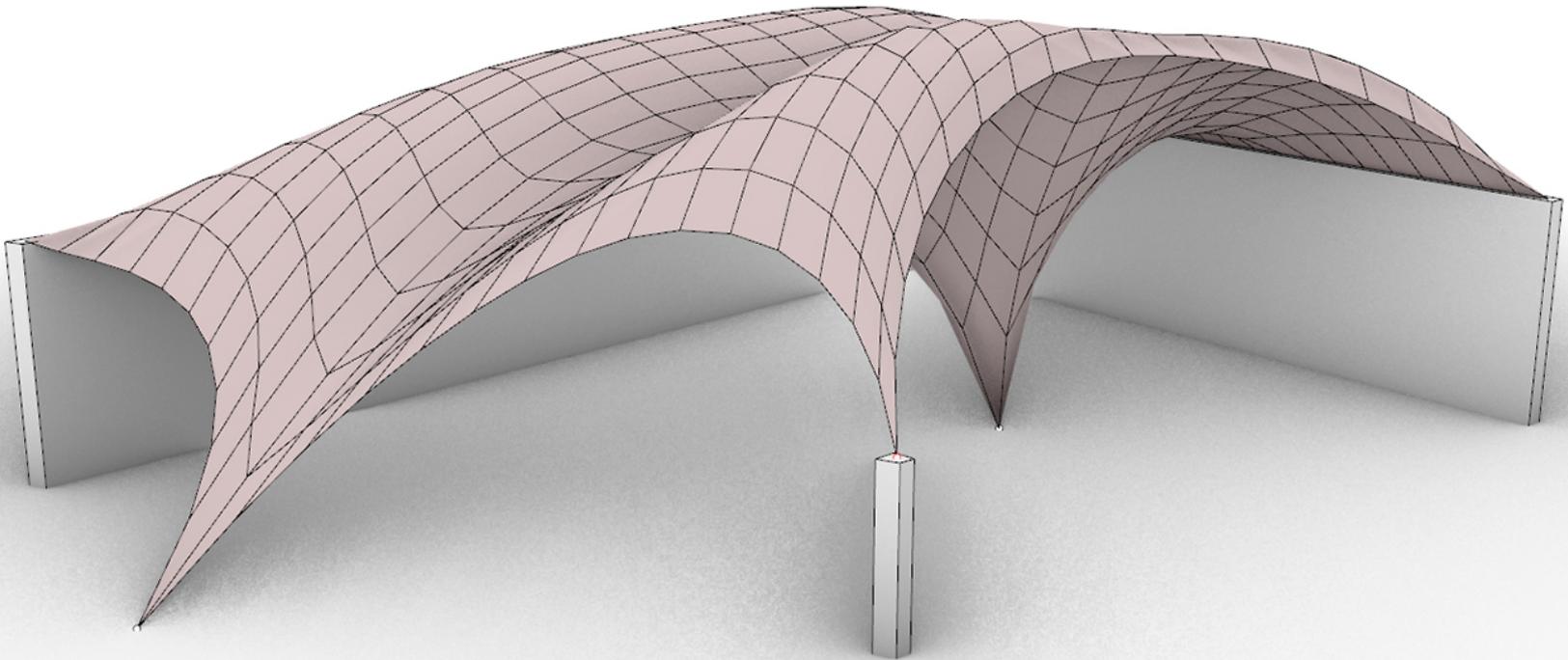
Heinz Isler: Wyss Garden Center
Solothurn, Switzerland, 1962

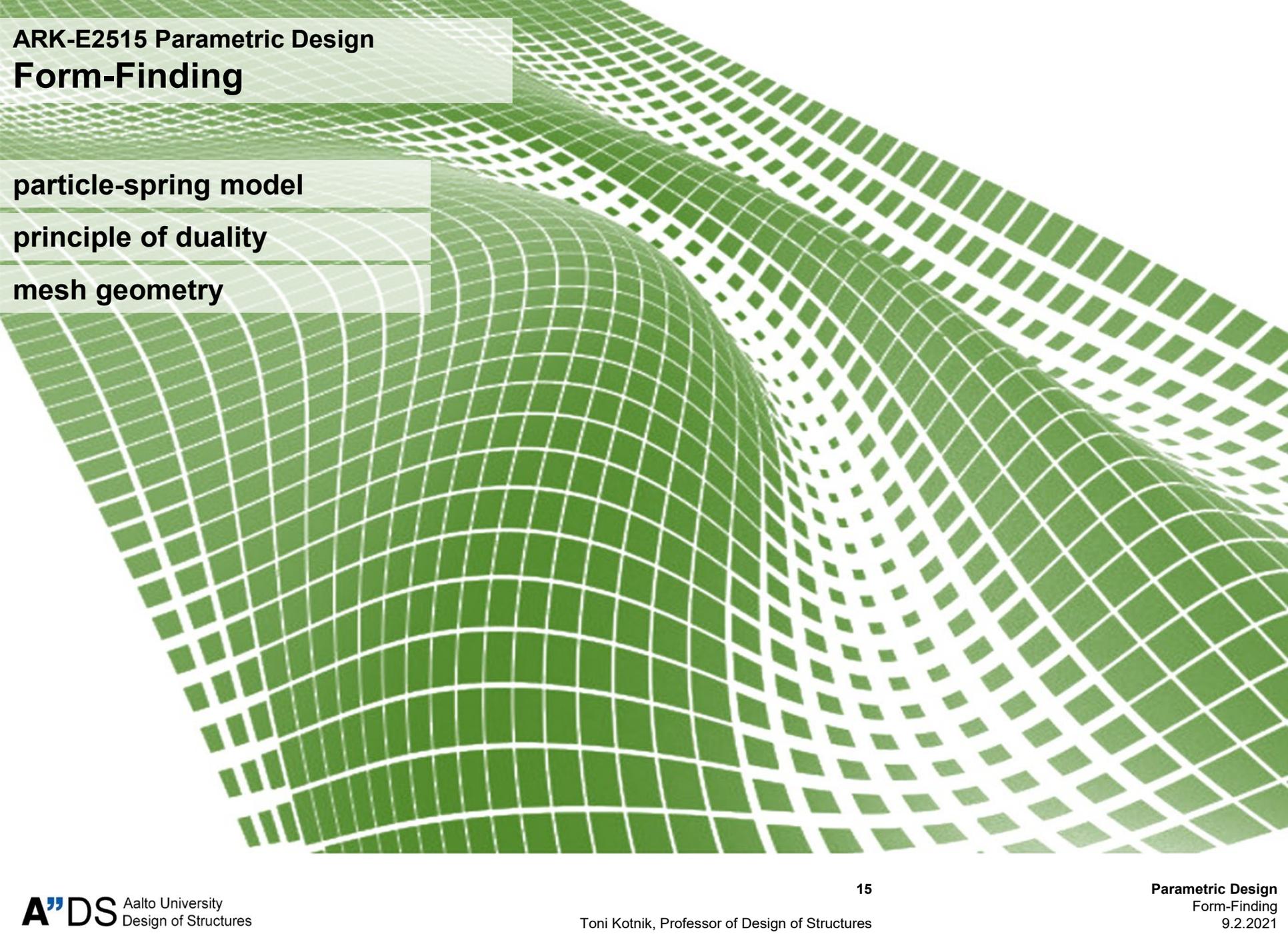
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Heinz Isler: Sici Factory
Geneva, Switzerland, 1969

Check 14: design a shell along a given perimeter with additional support points for spatial differentiation.





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particle-spring model

principle of duality

mesh geometry