PINO TROGU – SAN FRANCISCO STATE UNIVERSITY

BIOCLAMPING: ARISTOTLE'S LANTERN

GIORGIO SCARPA'S MODEL OF THE MASTICATORY APPARATUS OF THE SEA URCHIN... AND MORE.

ME411095: BIO-INSPIRED DESIGN

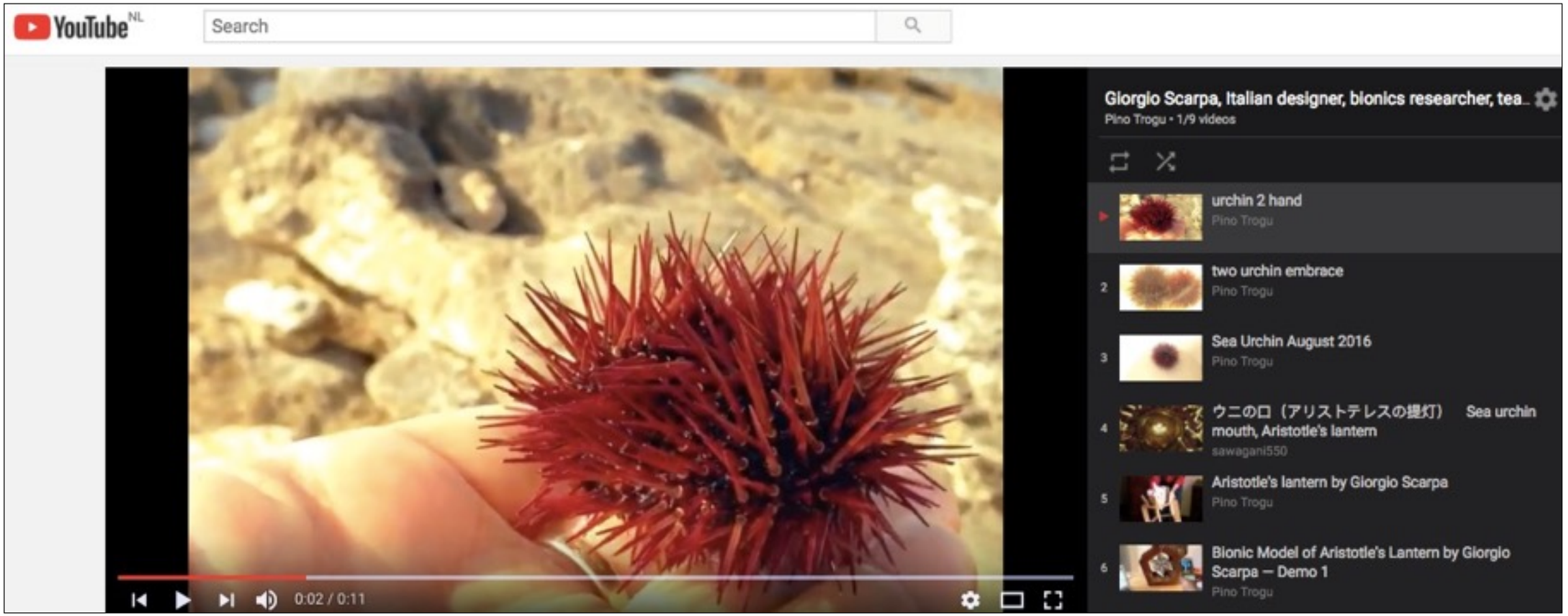
DELFT UNIVERSITY OF TECHNOLOGY

go to last slide

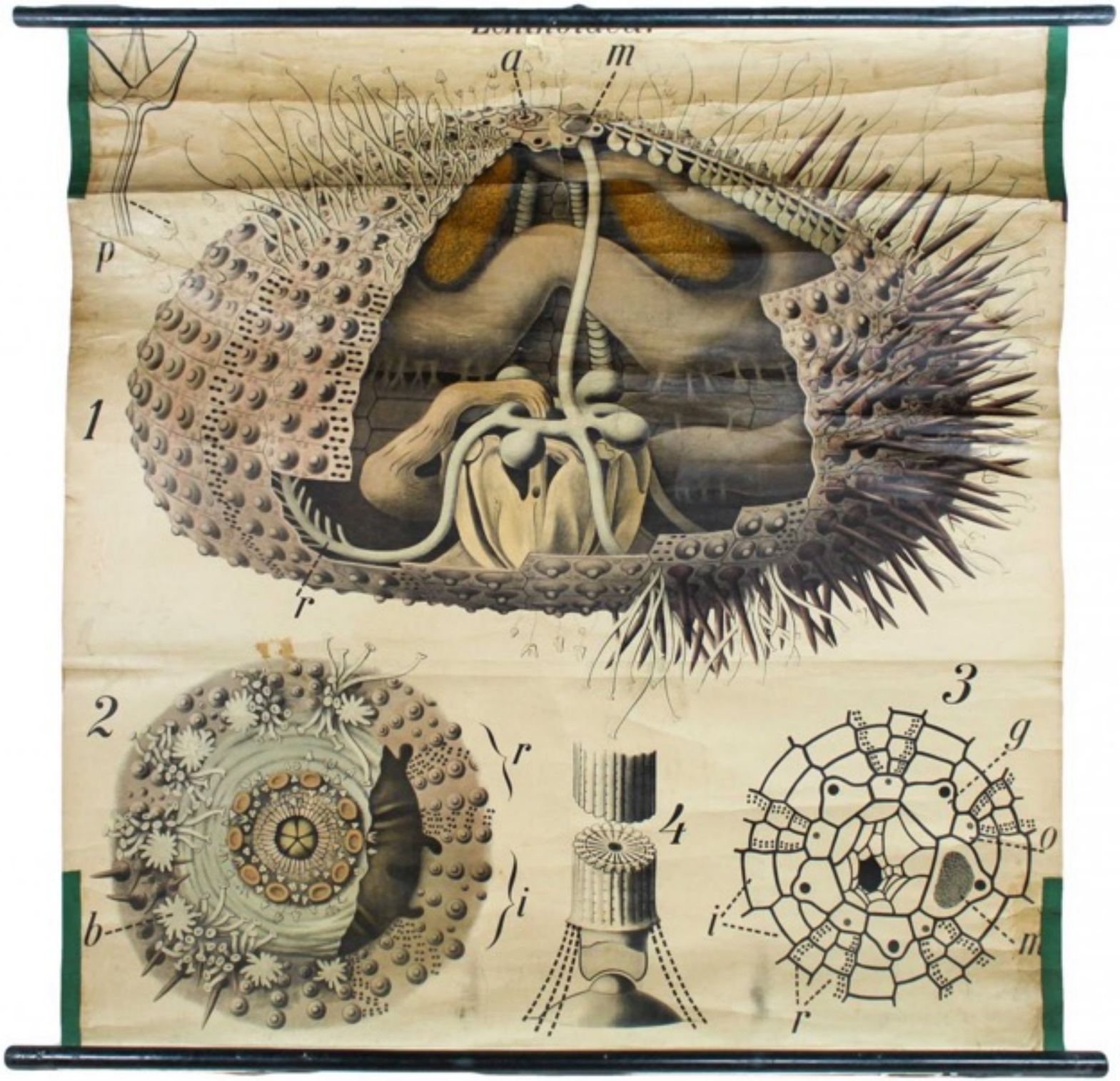
Lantern replicant 2. Delft, NL, 19 Oct. 2017

Giorgio Scarpa's bio-inspired and geometric folding models.

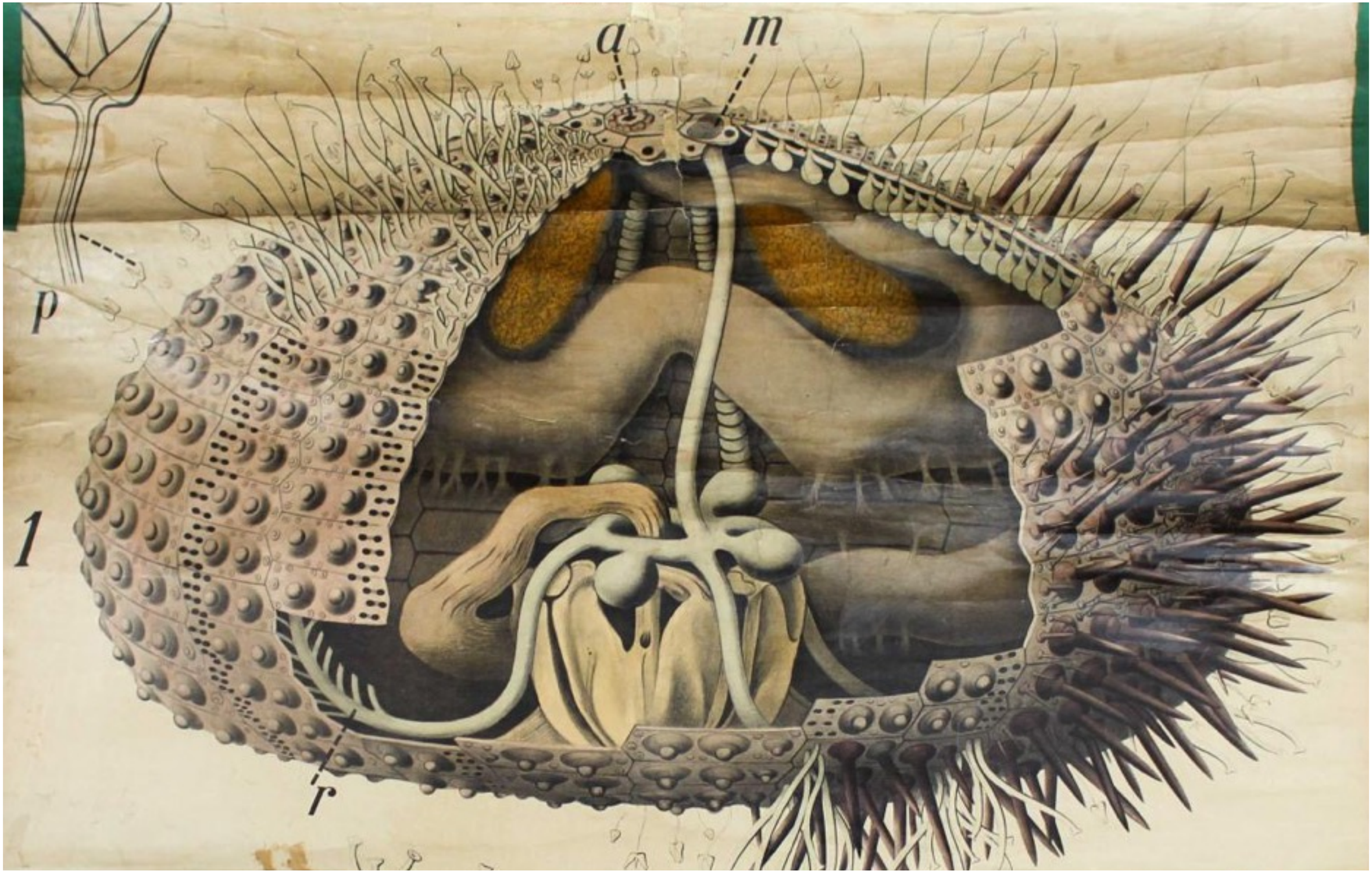
THE SEA URCHIN



[Scarpa YouTube Playlist: https://www.youtube.com/playlist?list=PLM4DV2CfgpjuCtWNJP3iQKRRlFbdMUvim](https://www.youtube.com/playlist?list=PLM4DV2CfgpjuCtWNJP3iQKRRlFbdMUvim)



[Chart Sea Urchin by Paul Pfurtscheller, 1907: https://www.pamono.com/antique-wall-chart-sea-urchin-by-paul-pfurtscheller-1907-1](https://www.pamono.com/antique-wall-chart-sea-urchin-by-paul-pfurtscheller-1907-1)



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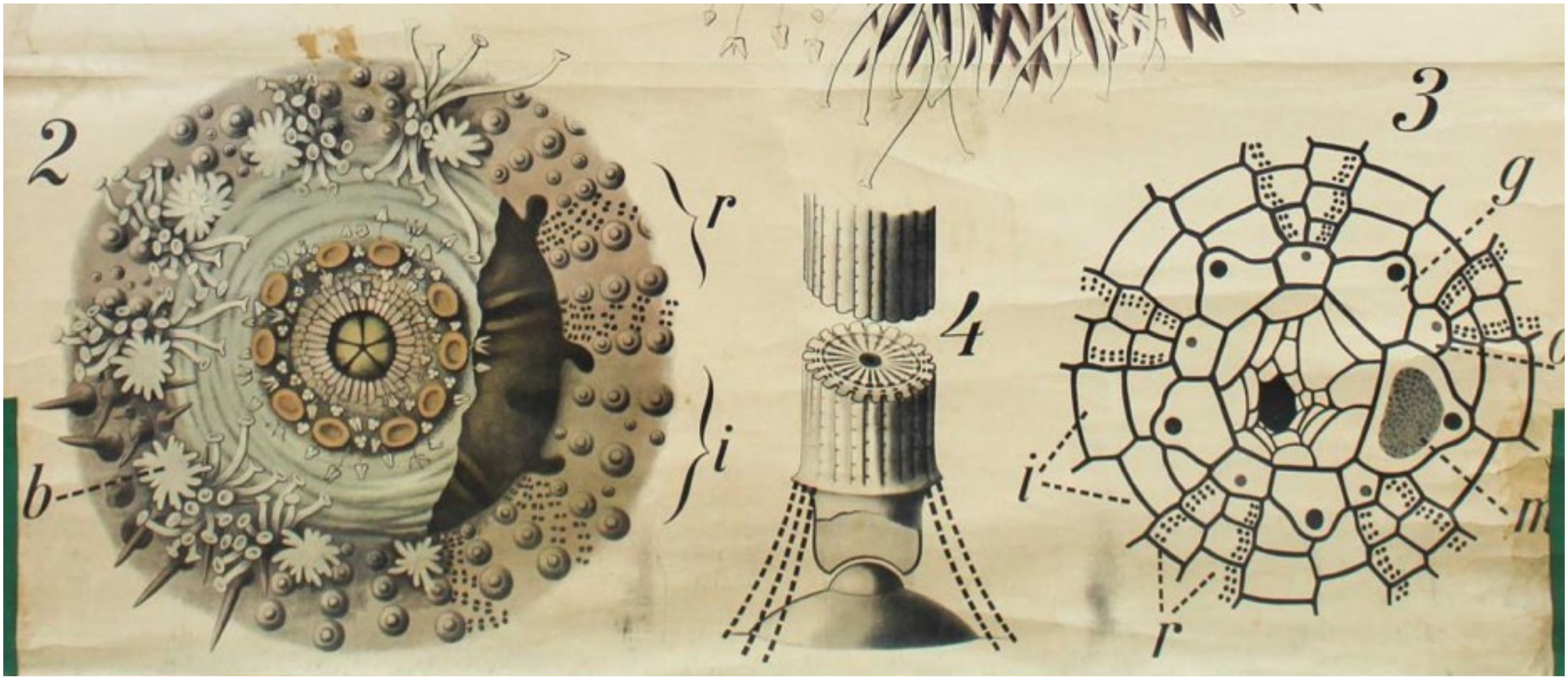

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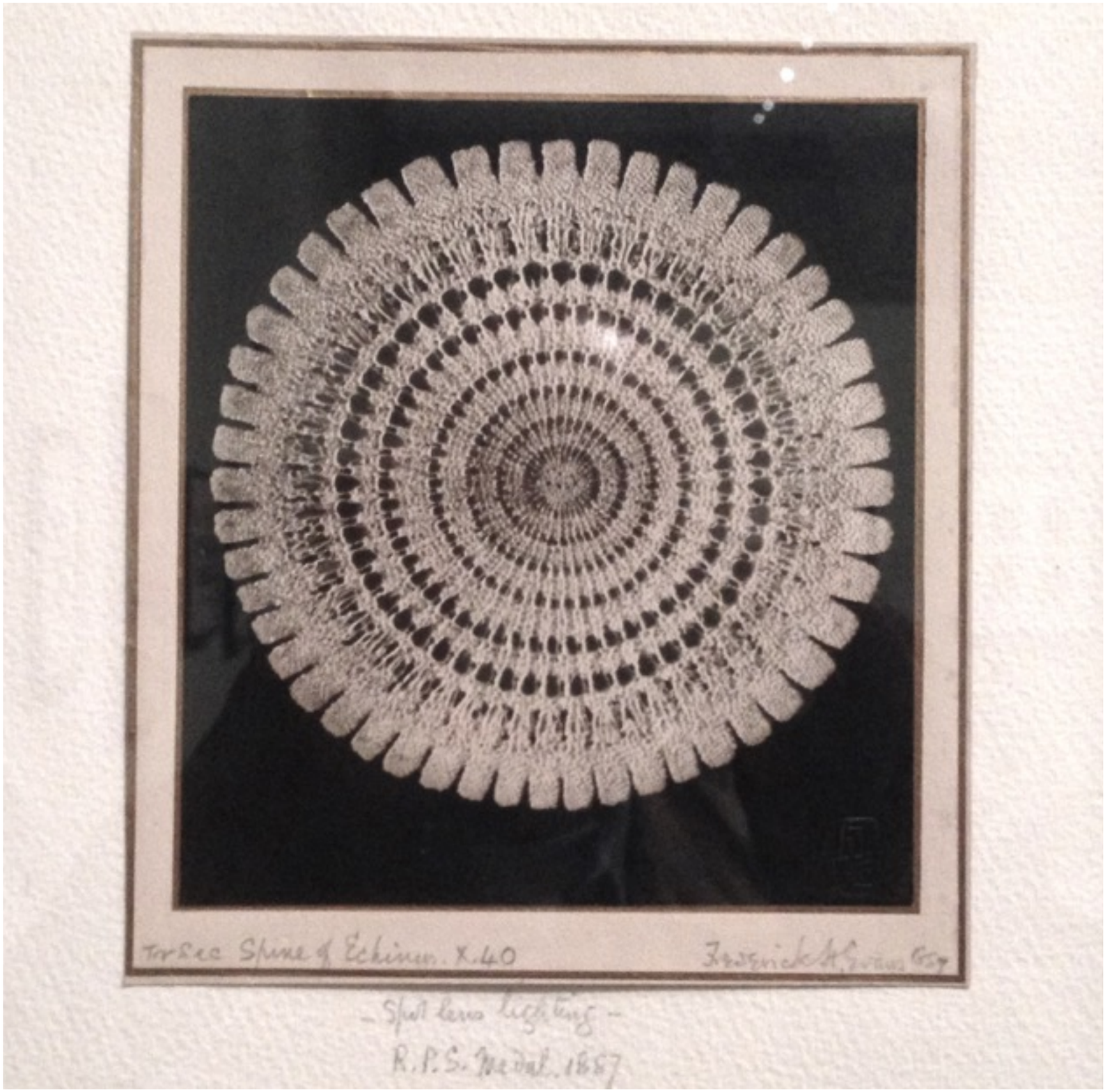

Frederick H. Evans
British, 1853–1943

Tr. Sec. Spine of Echinus. X.40, 1887

Gelatin silver print

GEORGE EASTMAN MUSEUM, PURCHASE

Morgan Library & Museum, New York

[Scarpa Flickr Album: https://www.flickr.com/photos/pinotrogu/albums/72157661343652018](https://www.flickr.com/photos/pinotrogu/albums/72157661343652018)

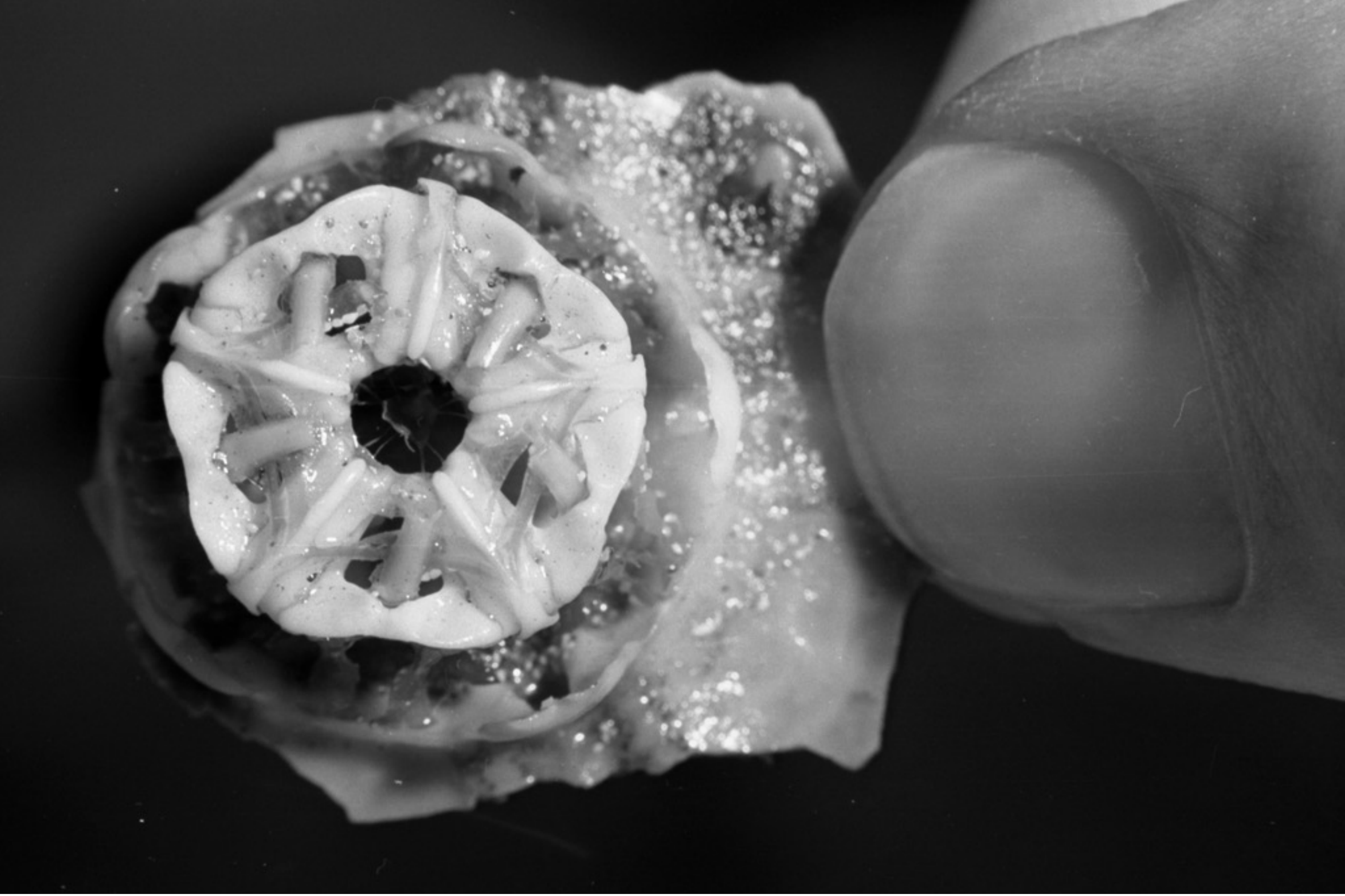

Photo: Giorgio Cireddu

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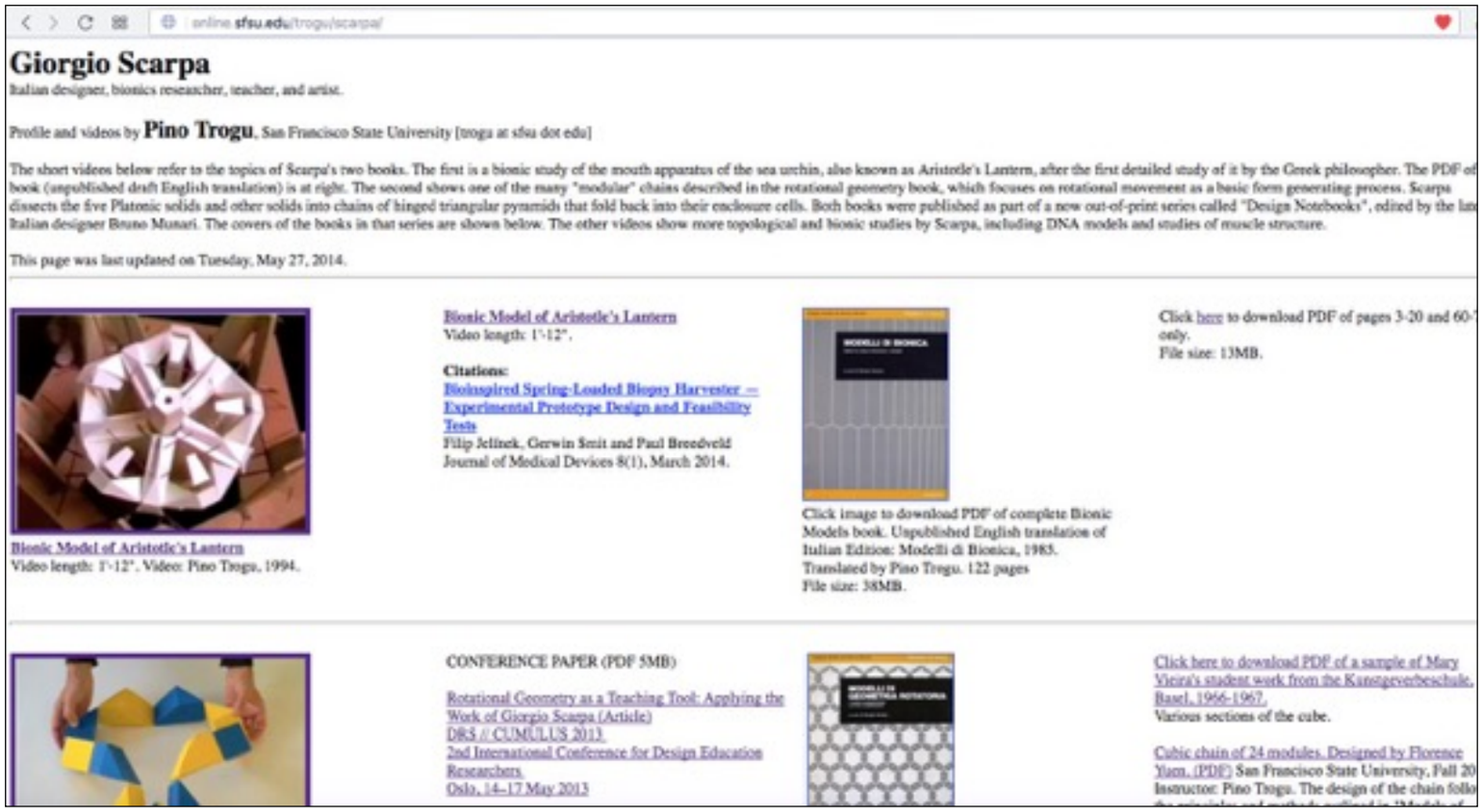
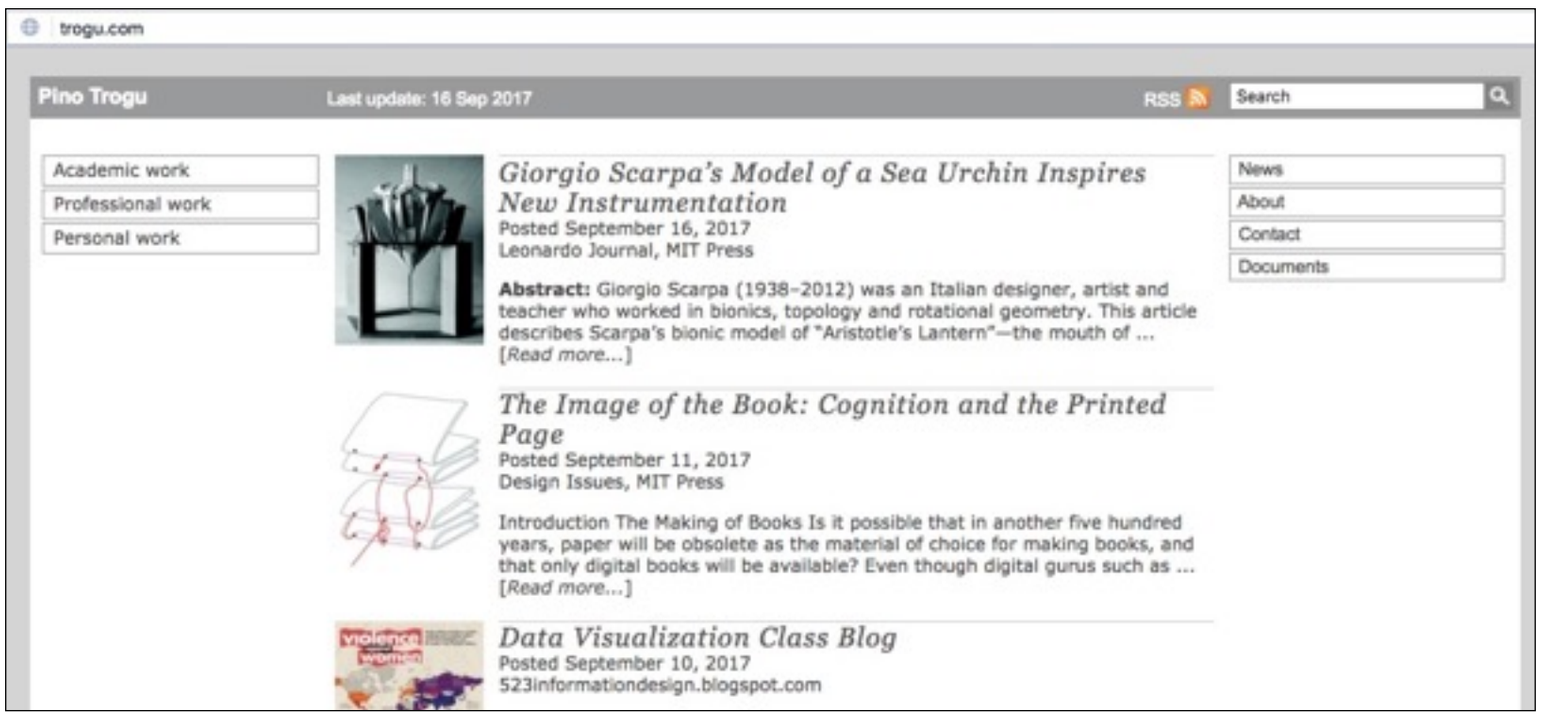
BIONIC MODEL OF ARISTOTLE'S LANTERN



http://online.sfsu.edu/trogu/scarpa/



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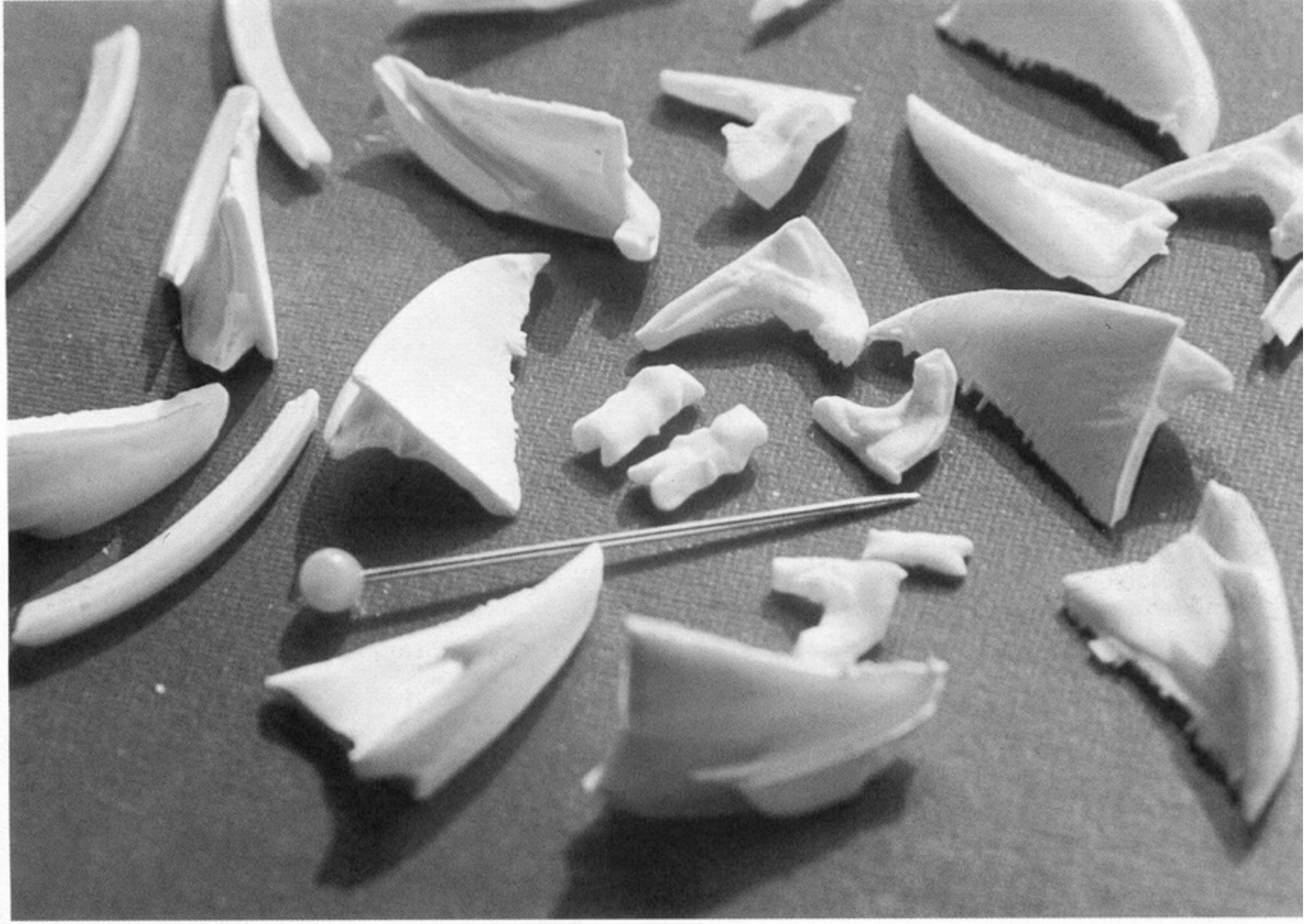

Calcareous pieces which form the skeletal structure. The pin shows the dimensions of the parts.

Scarpa, Giorgio, Modelli di bionica: capire la natura attraverso i modelli. Quaderni di design 13, ed. B. Munari (Bologna: Zanichelli, 1985).

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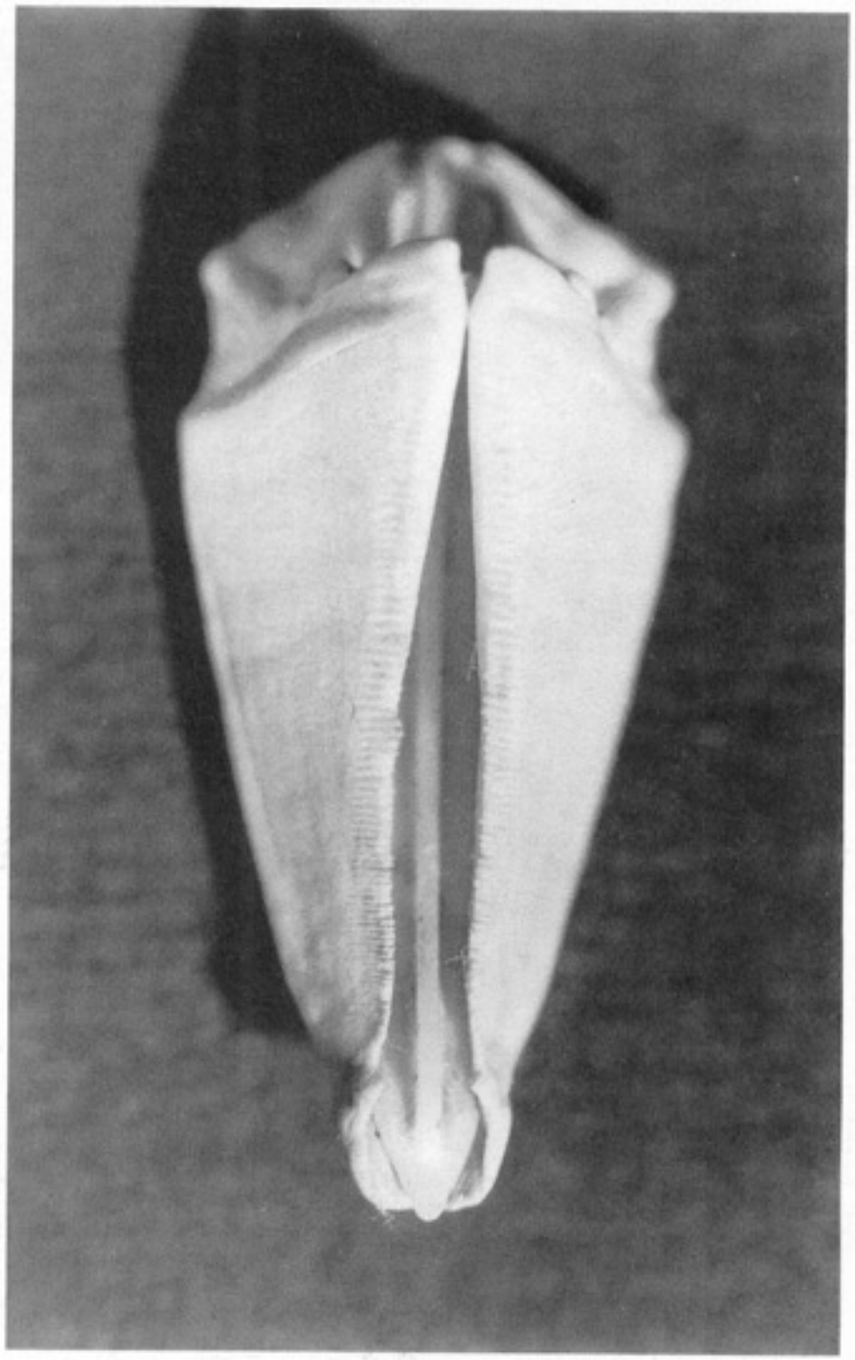
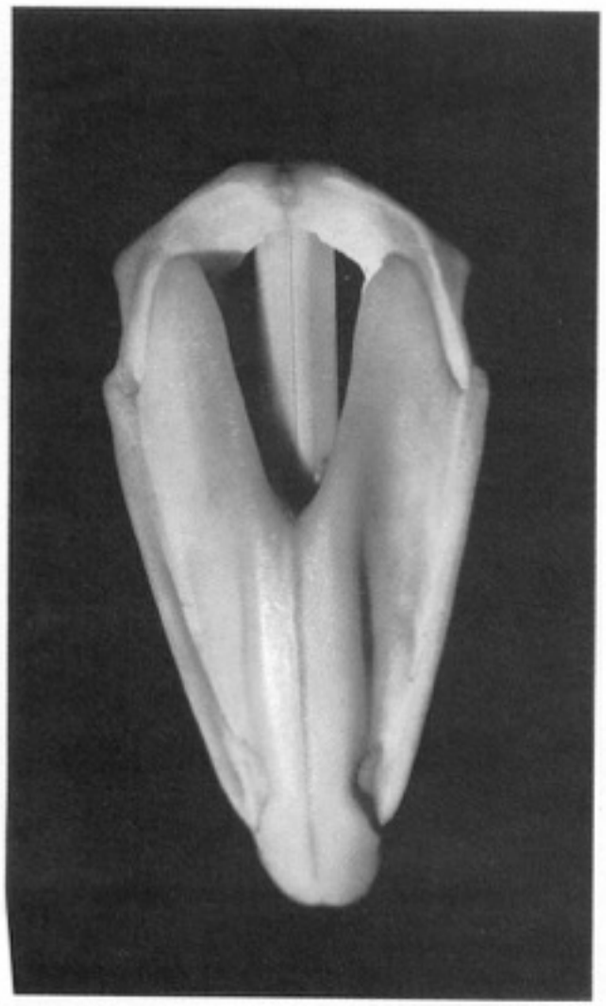
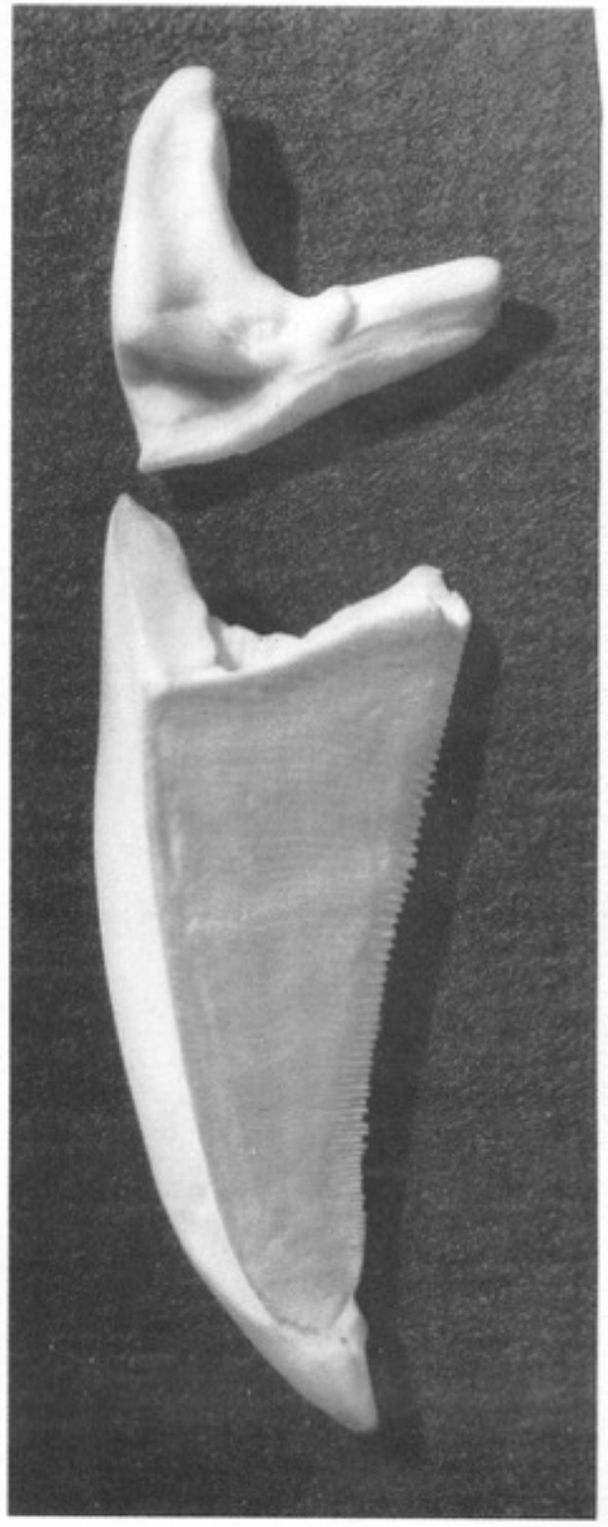
One of the jaws seen in front view.
A tooth housed in the inside is
partially visible.



The same jaw seen from the opposite
side.





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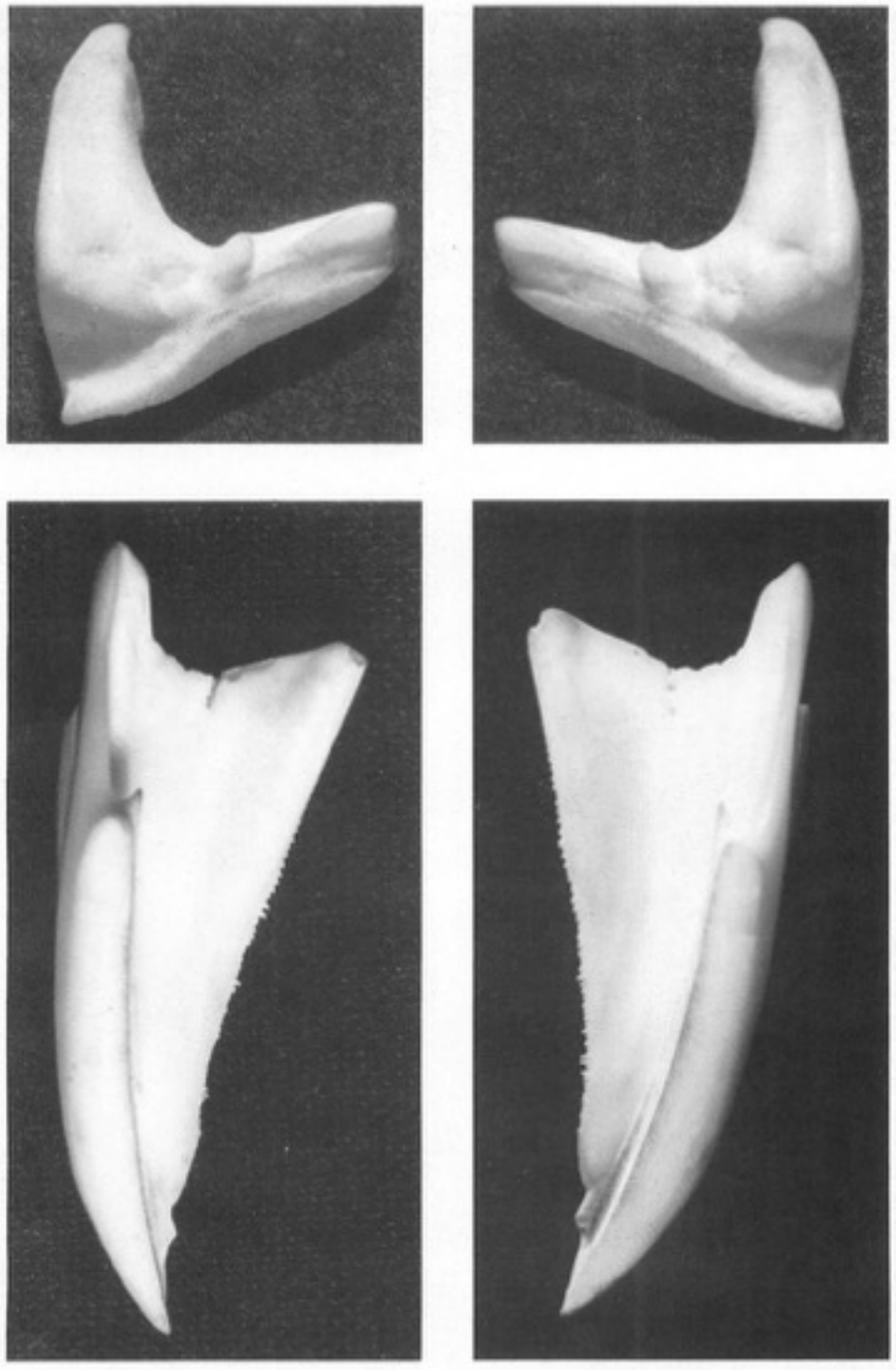
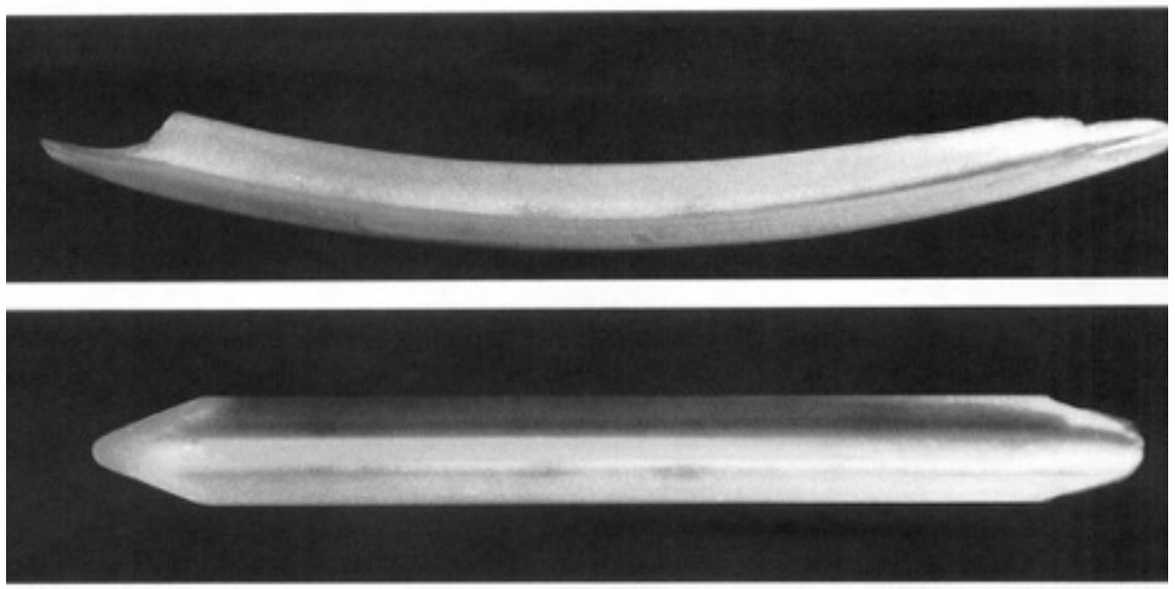
Scarpa, Giorgio, Modelli di bionica,1985.

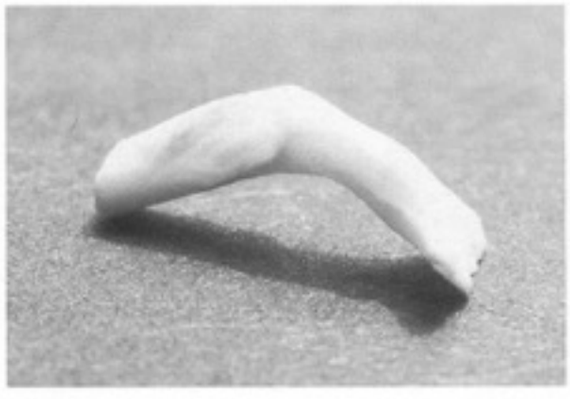


Each jaw can "break up" spontaneously or be decomposed into four parts.

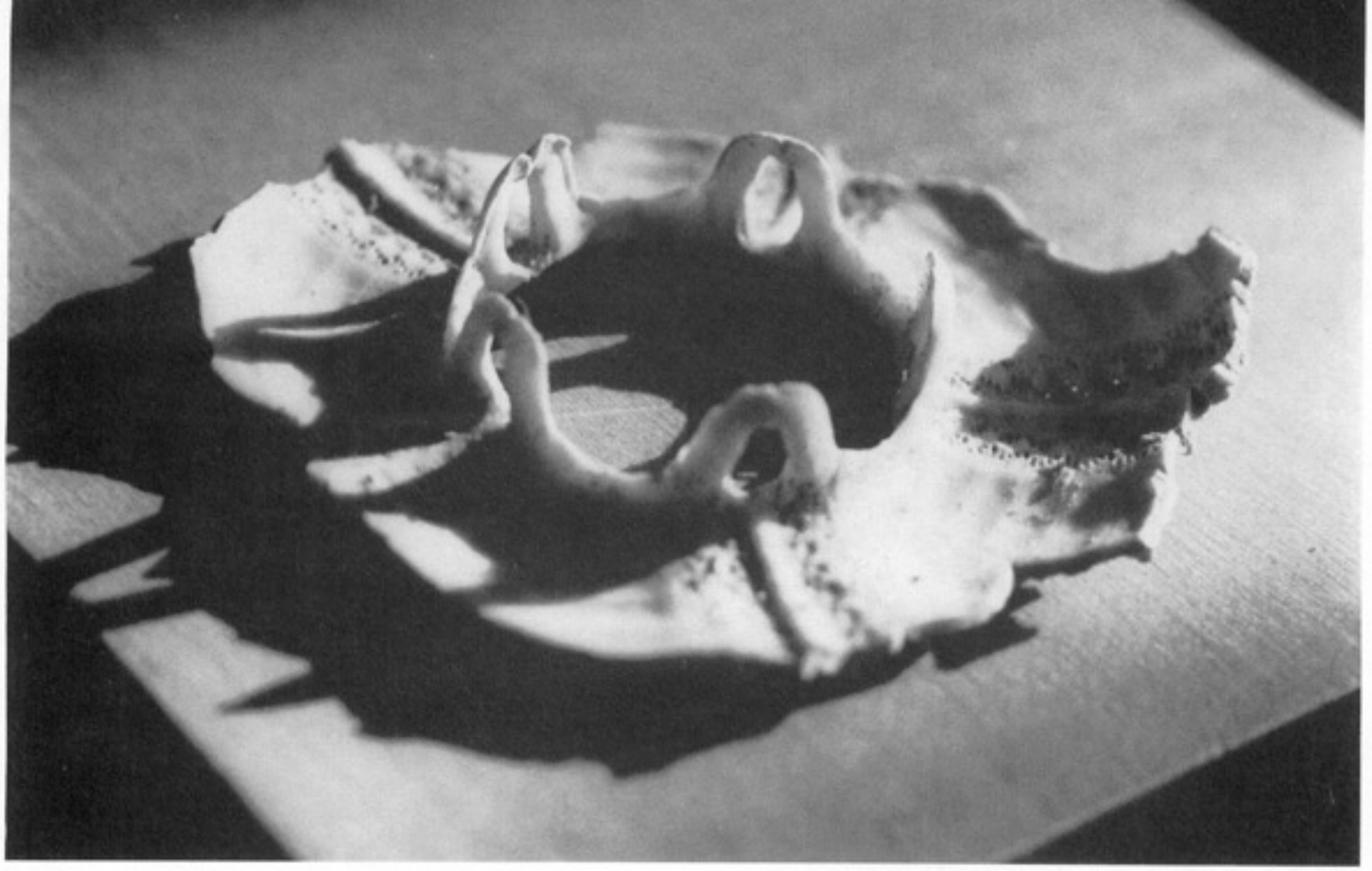


One of the five teeth belonging to each jaw, seen in front and side views.

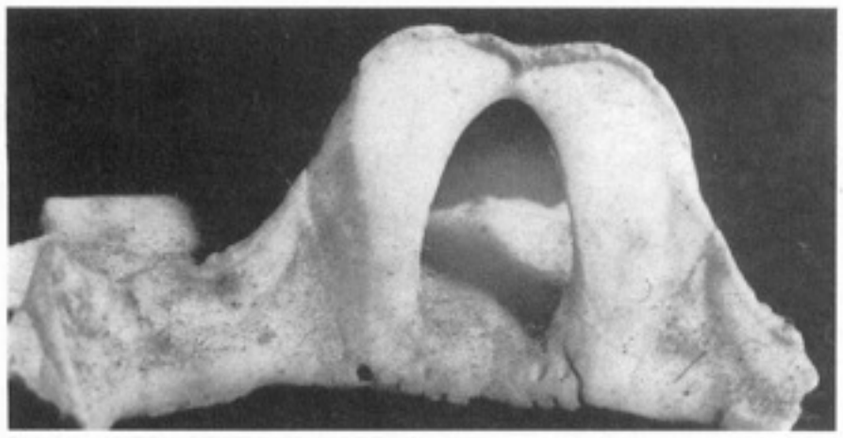
he forms shown above are found in the pper part of the lantern.



Scarpa, Giorgio, Modelli di bionica,1985.



Inside the shell, a crown-like structure, surrounding the mouth opening, holds the muscular structure to which the lantern is connected.



One the five "ridges" to which the muscles are attached - forming the crown - seen here from the front and the side.

Scarpa, Giorgio, Modelli di bionica,1985.

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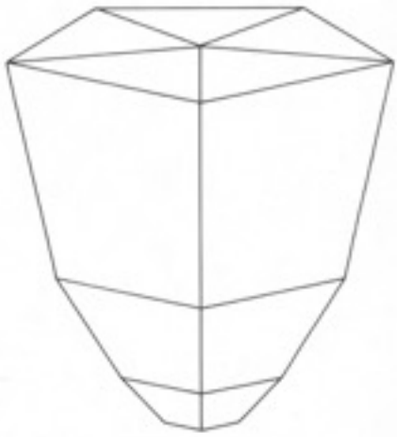
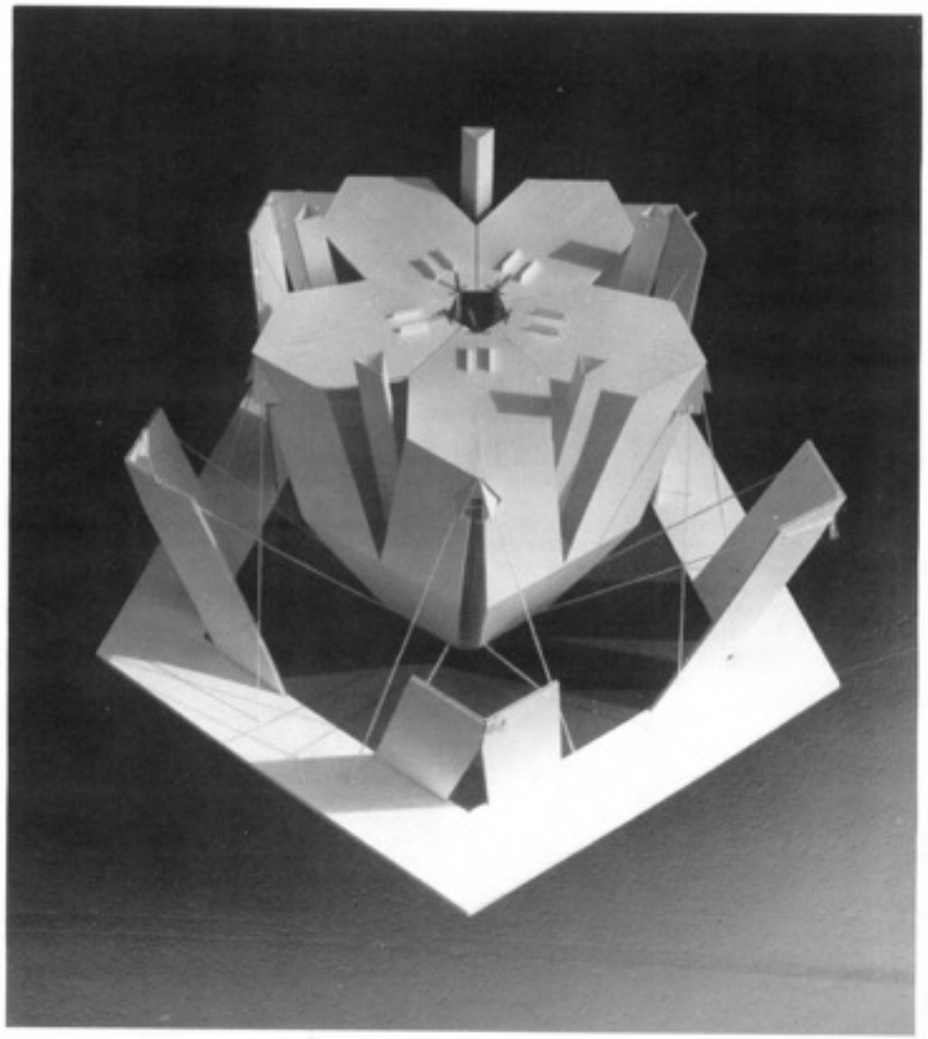
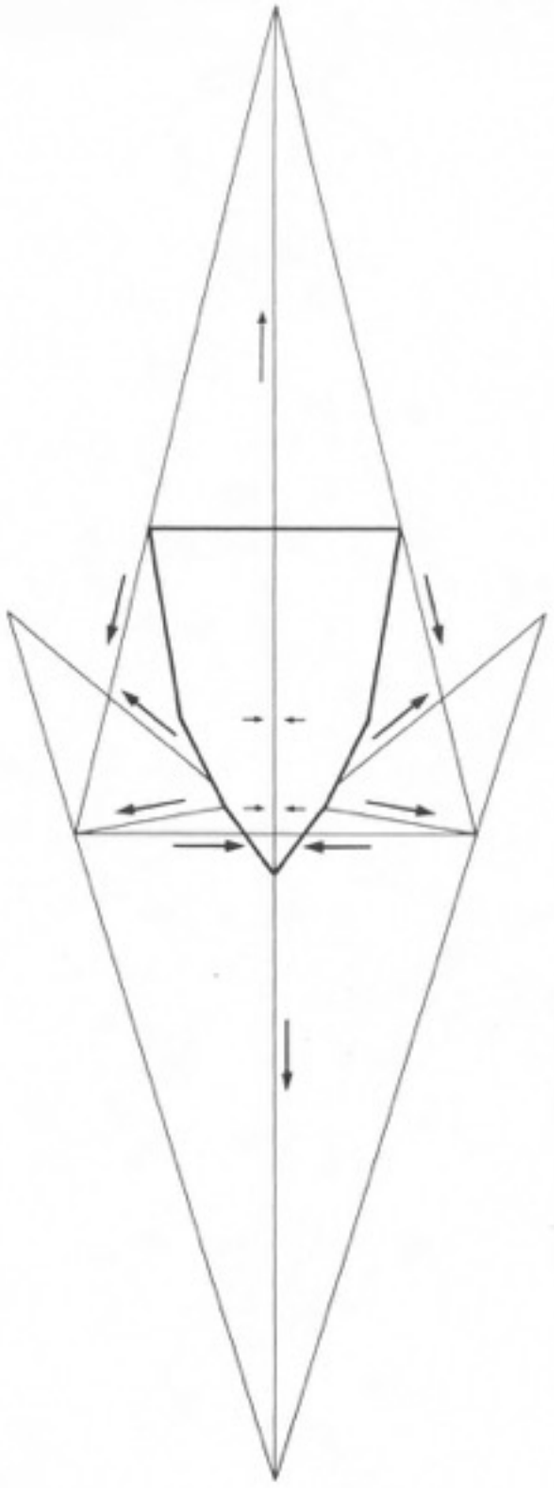
Drawing of a model of jaw.



Five models combined together.



Overall model, complete with all the parts.



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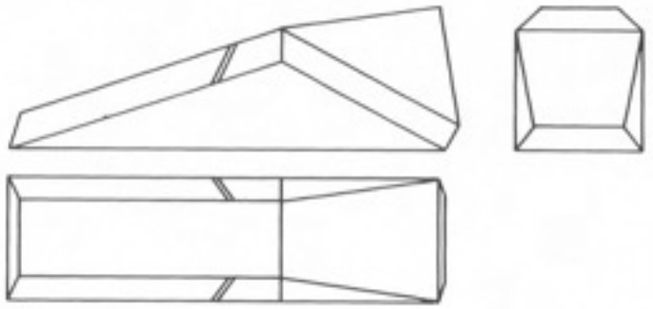
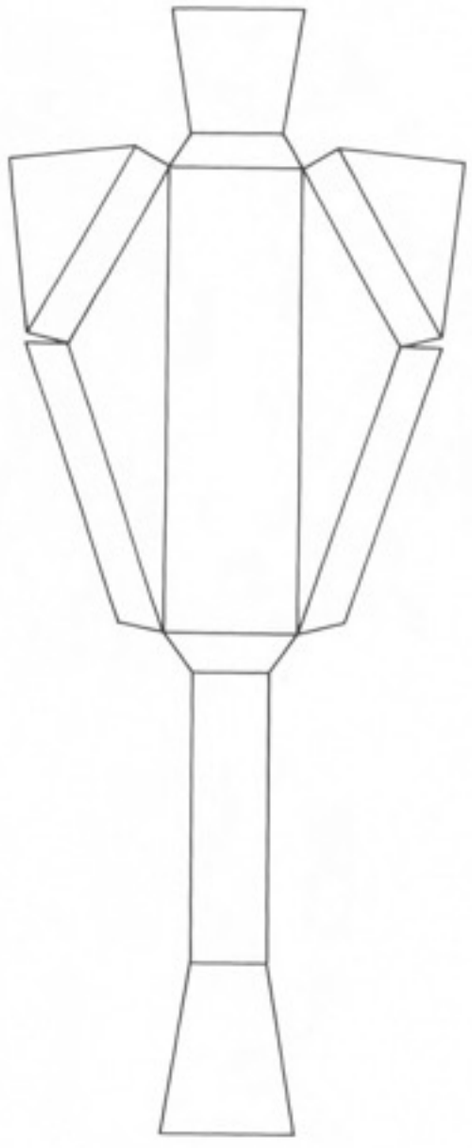
Scarpa, Giorgio, Modelli di bionica,1985.

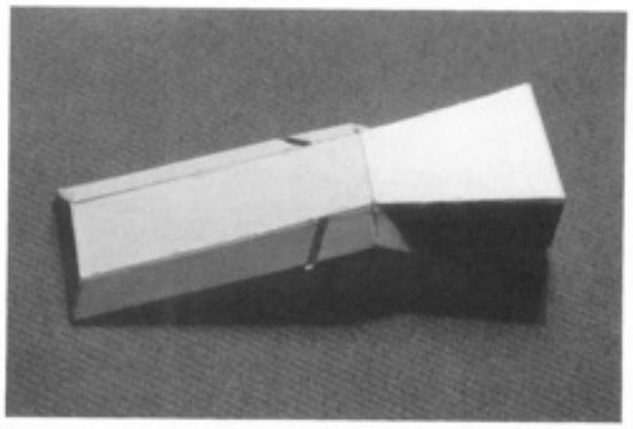
In the light of these new observations, the construction of a new model of the bridge-plate will have to be based on a clearer definition of its functions. In fact, compared to the first model, the new one will be supplied with appropriate slots where the complementary forms - belonging to the jaw models - will be able to rotate.



Top, front, and side view drawing of the new model.

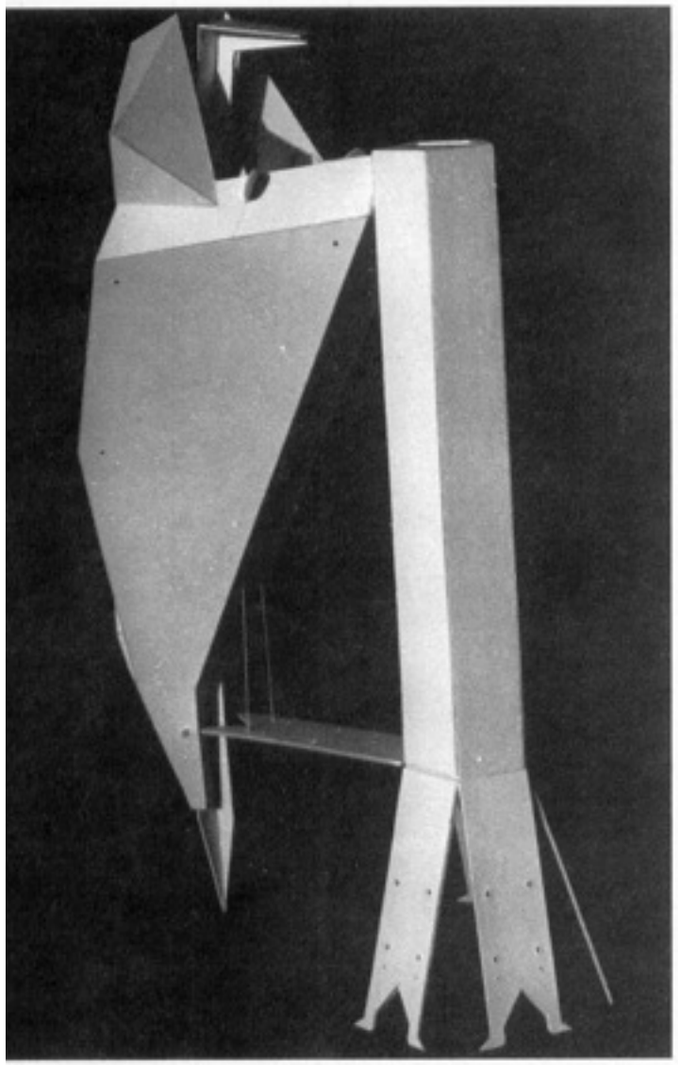


Fold-out

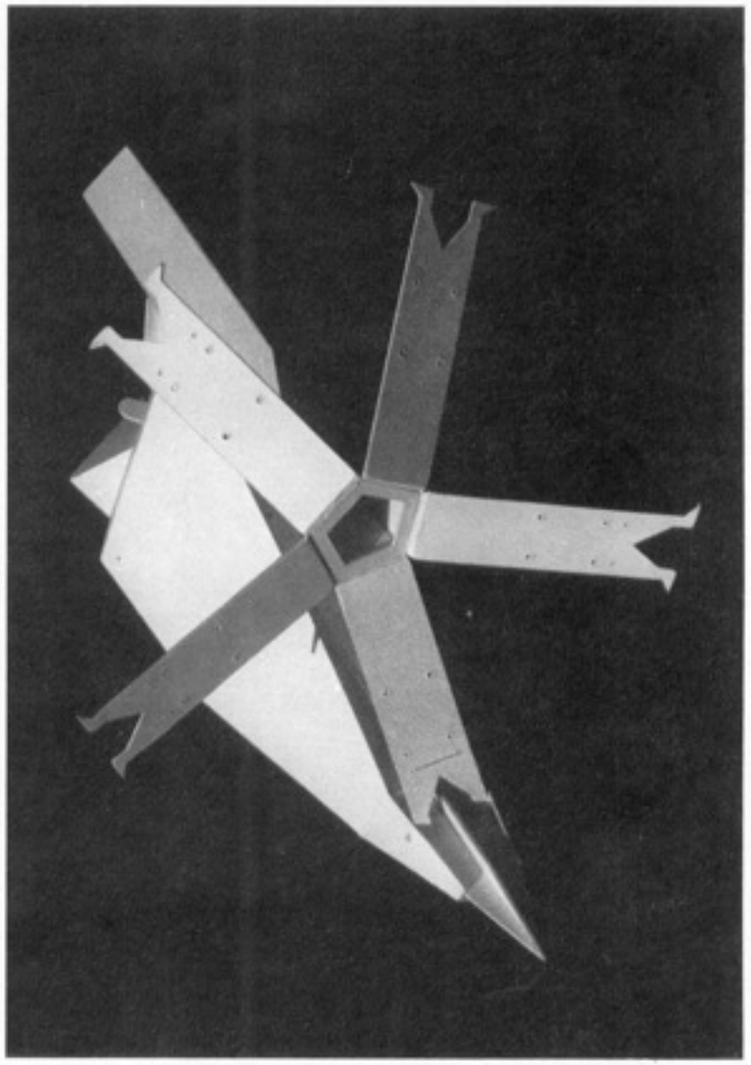


Model.

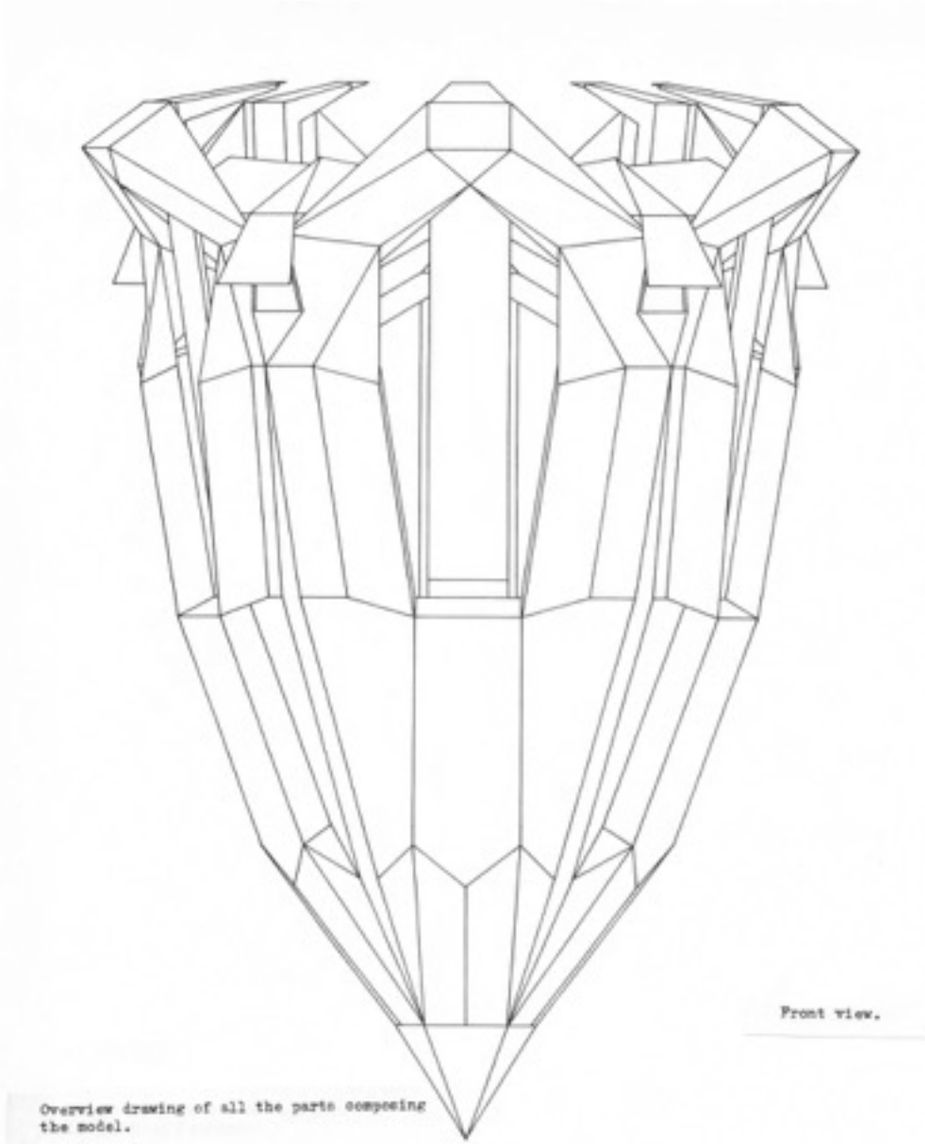
Scarpa, Giorgio, Modelli di bionica,1985.



Models of the pentagonal prism and the jaw, connected together.



Of course, in some cases, the inserting of these new forms will require changes in the previously designed forms.
An accurate check-up is made, in order to improve the coordination of the various pieces, towards an improvement in their functionality.
After these changes are made, we move on to the final assembling of the model.



Front view.

Overview drawing of all the parts composing the model.

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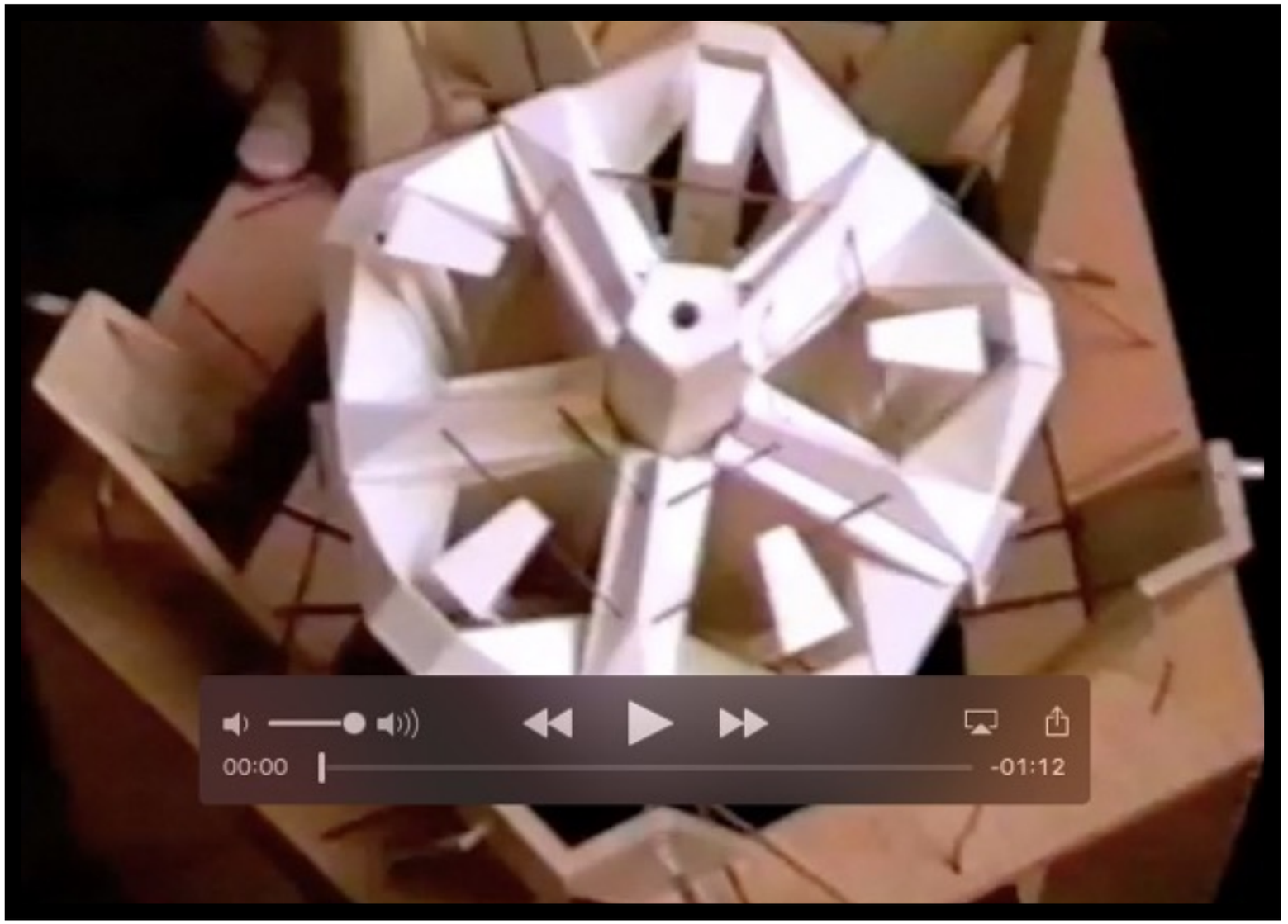
Scarpa, Giorgio, Modelli di bionica,1985.



[Bionic Model of Aristotle's Lantern by Giorgio Scarpa -- Youtube video]

Scarpa, Giorgio, Modelli di bionica,1985.

GIORGIO SCARPA'S MODEL OF A SEA URCHIN INSPIRES NEW INSTRUMENTATION

PDF: static.trogu.com/documents/scarpa/leon_a_01384.pdf

Trogu, 2016
Leonardo Just Accepted MS.
doi: 10.1162/LEON_a_01384

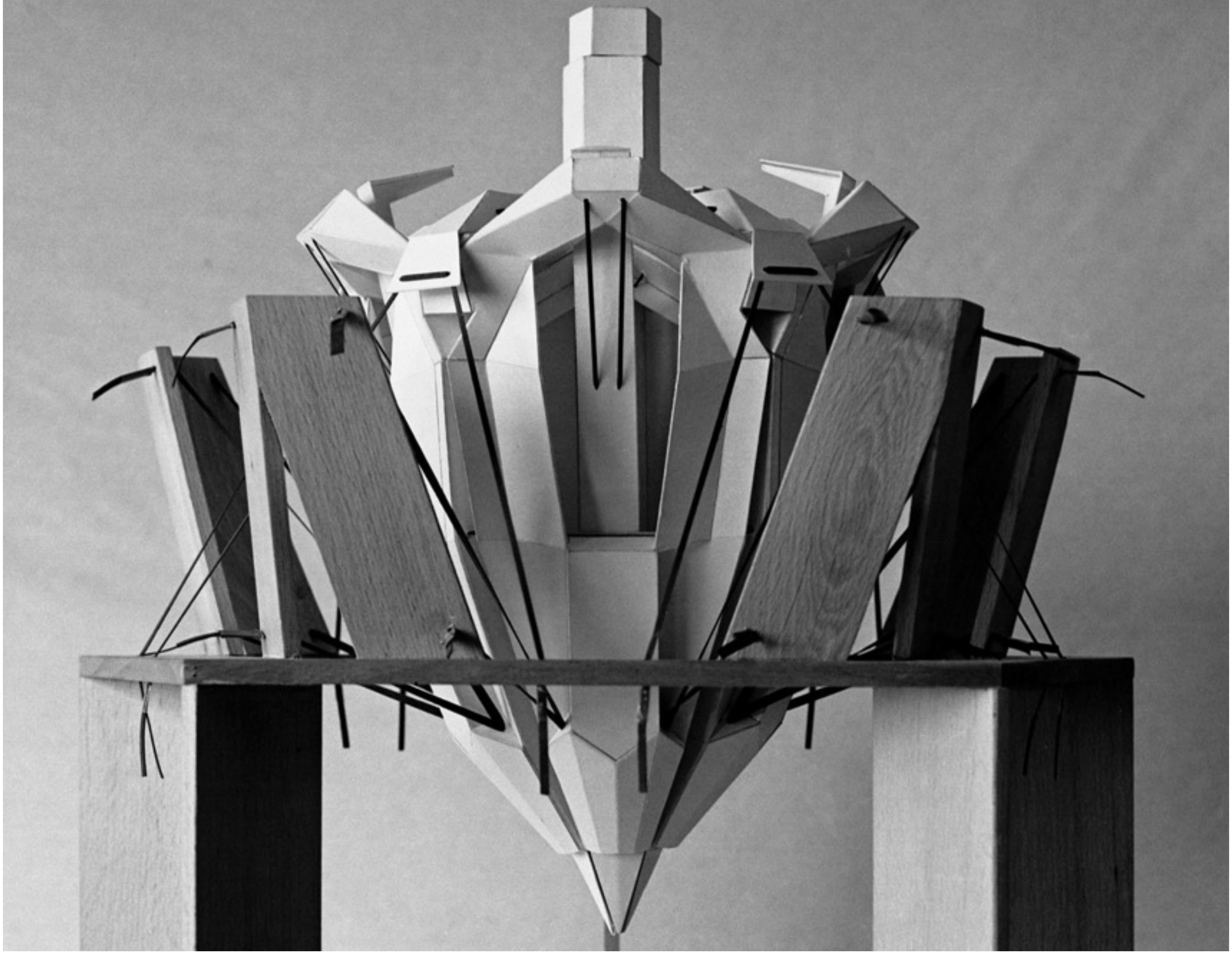


Photo: Giorgio Cireddu

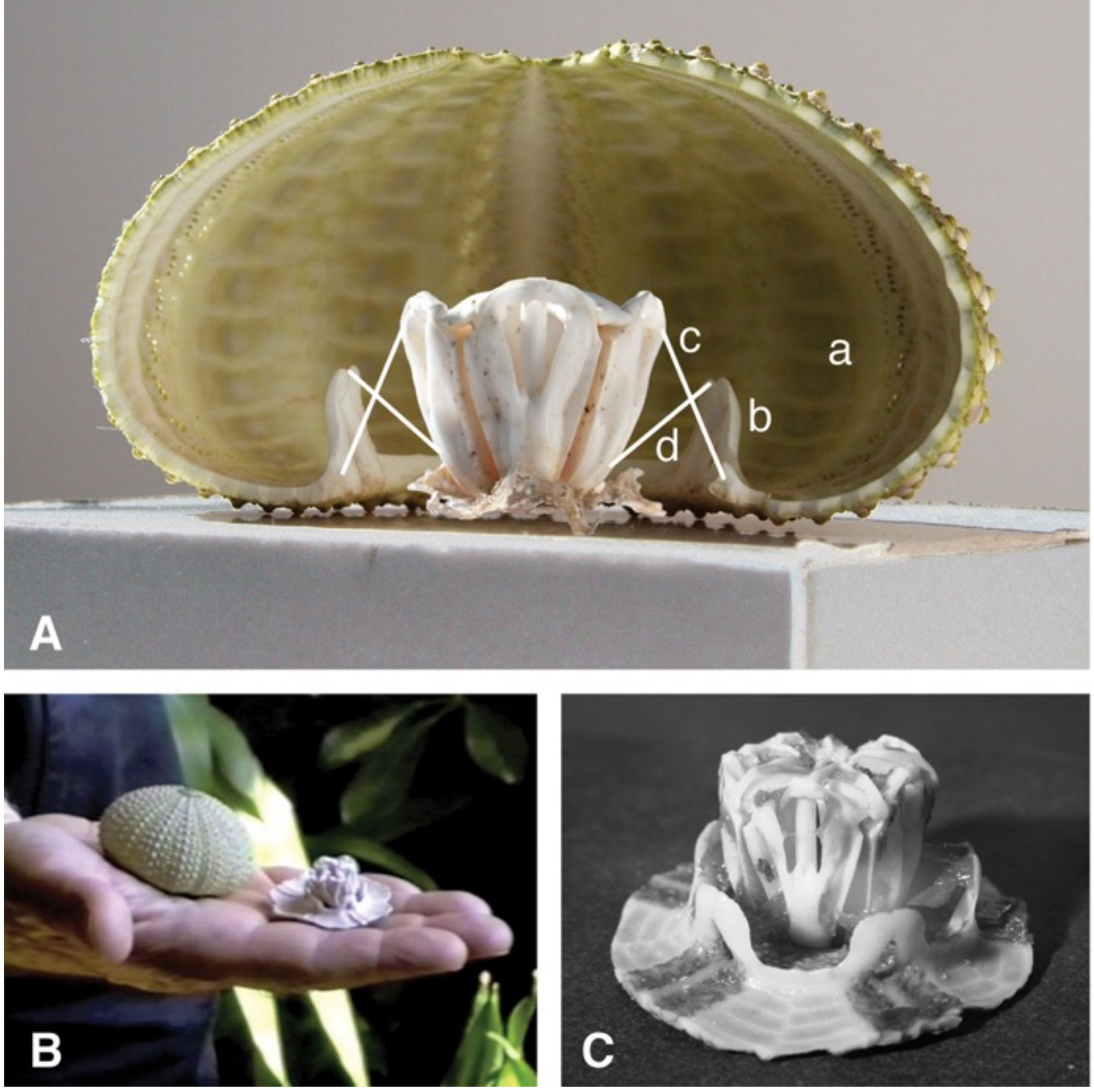
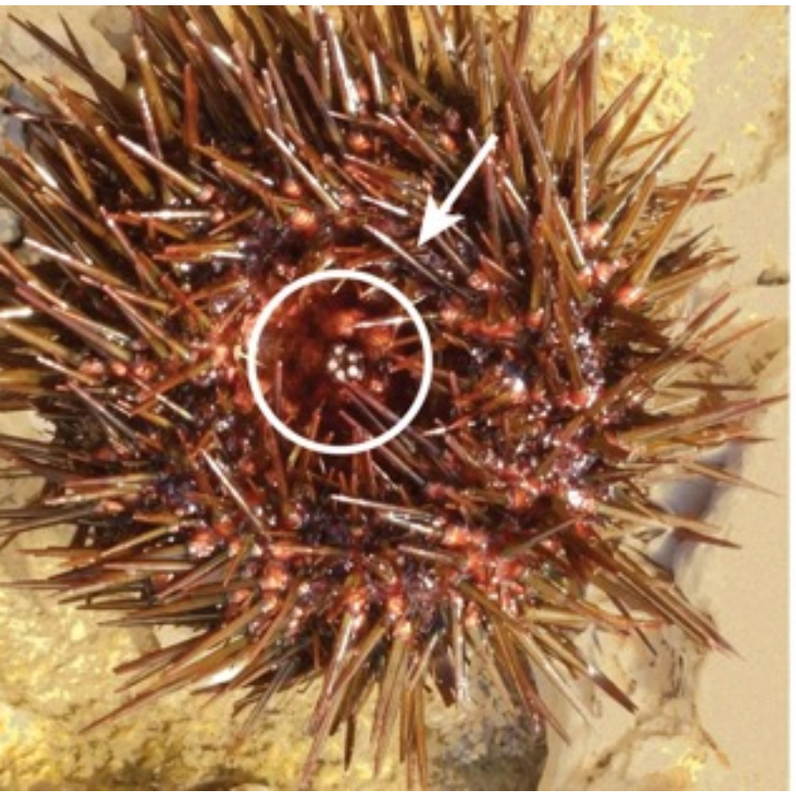
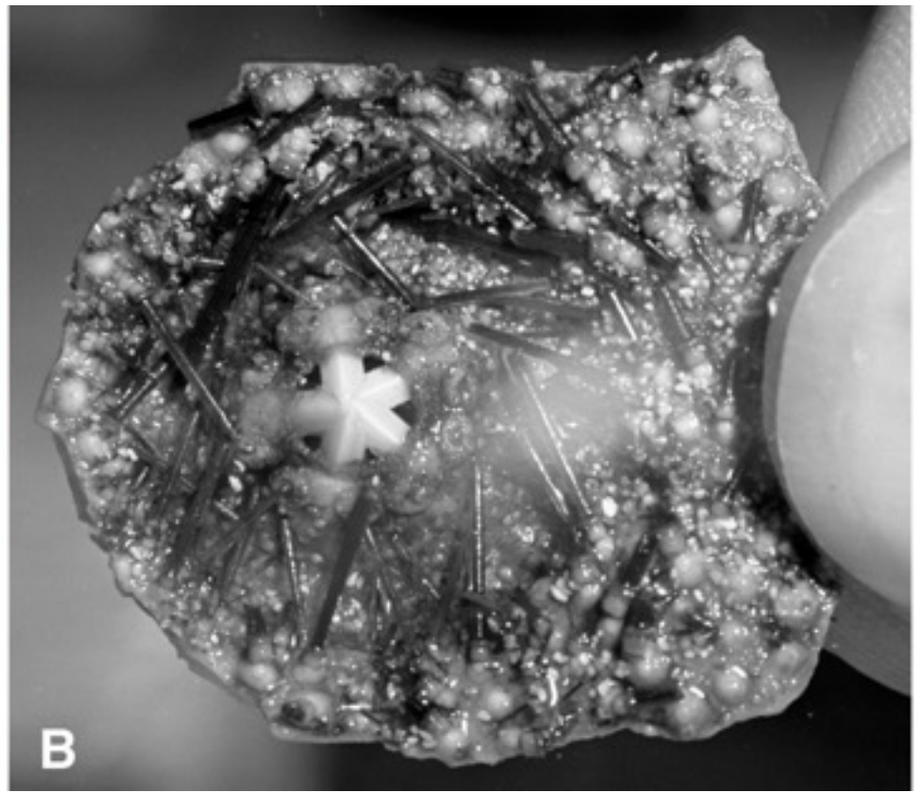


Photo: Giorgio Cireddu





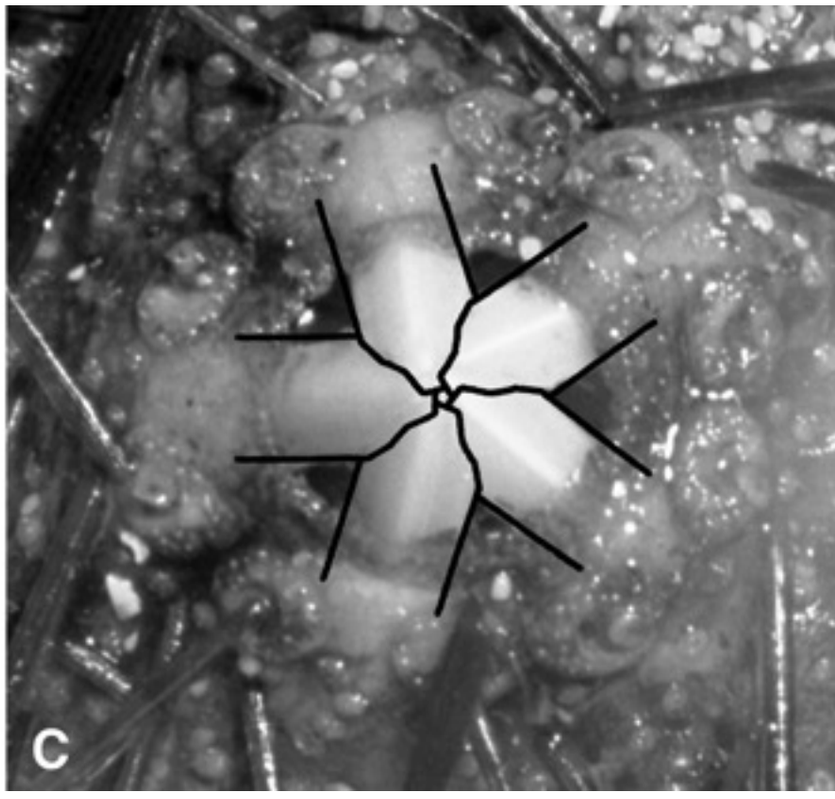


Photo: Giorgio Cireddu

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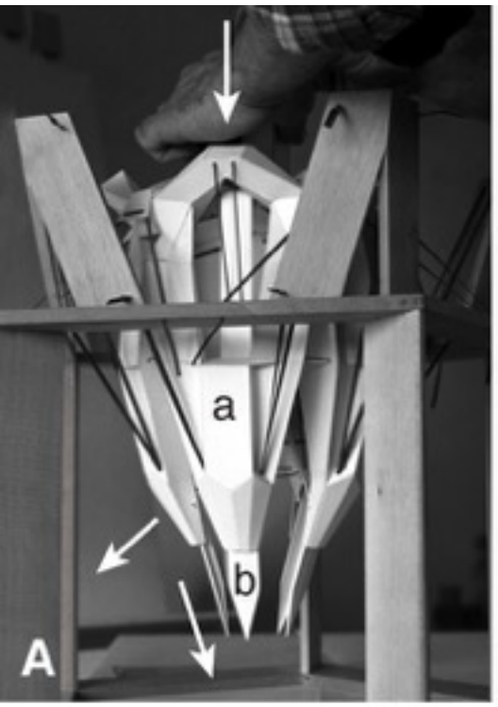

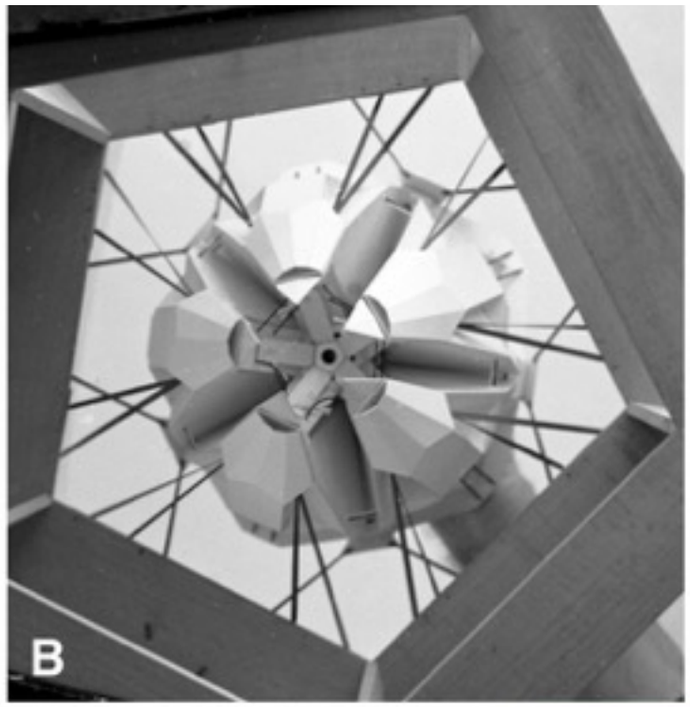

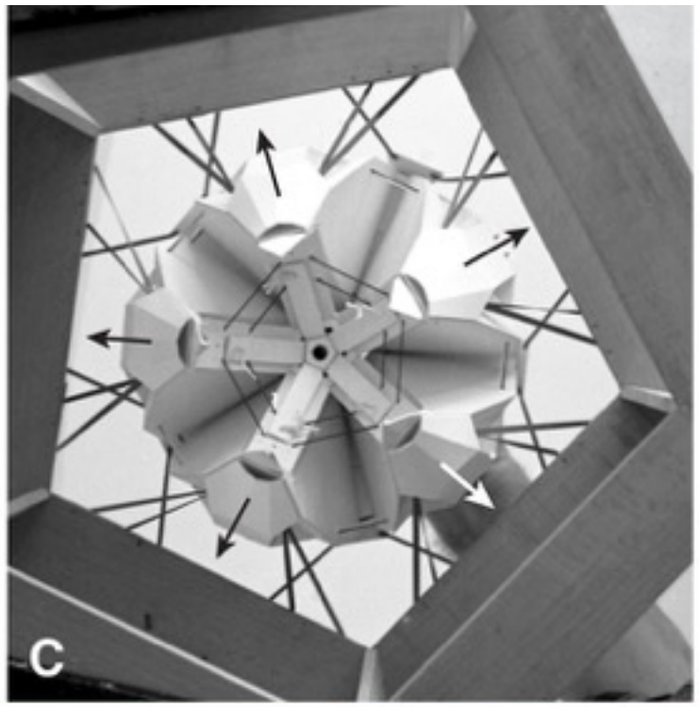

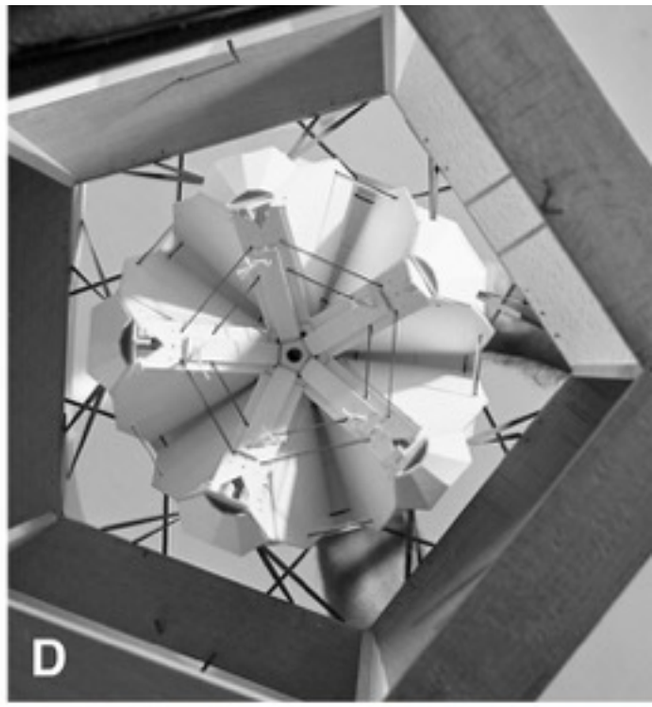

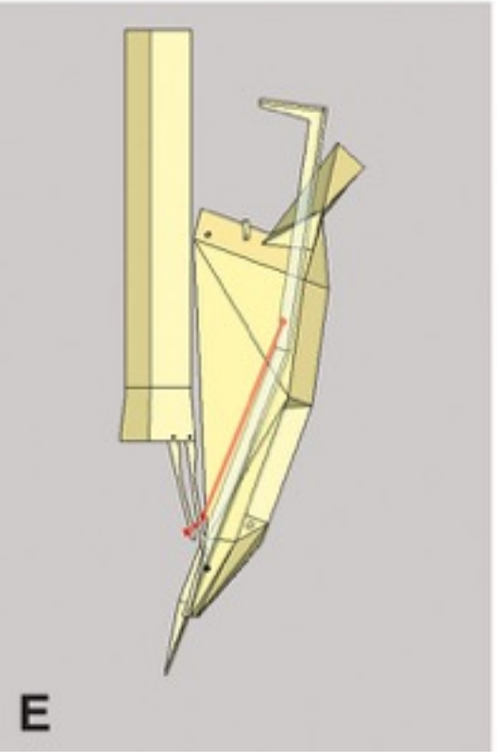

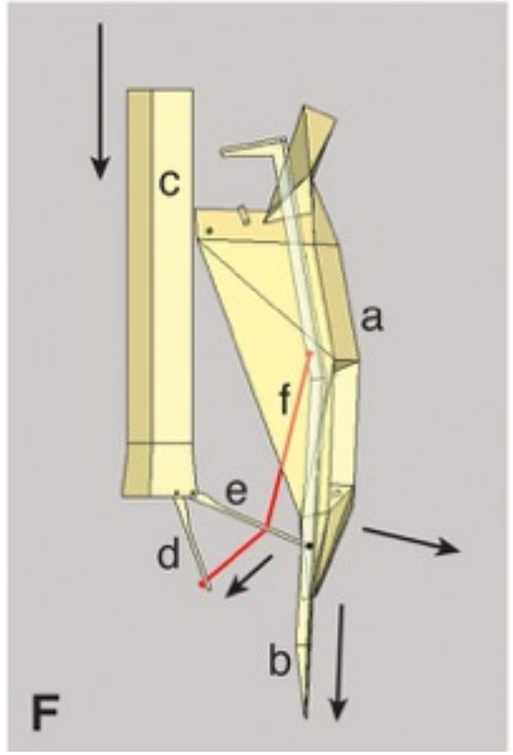

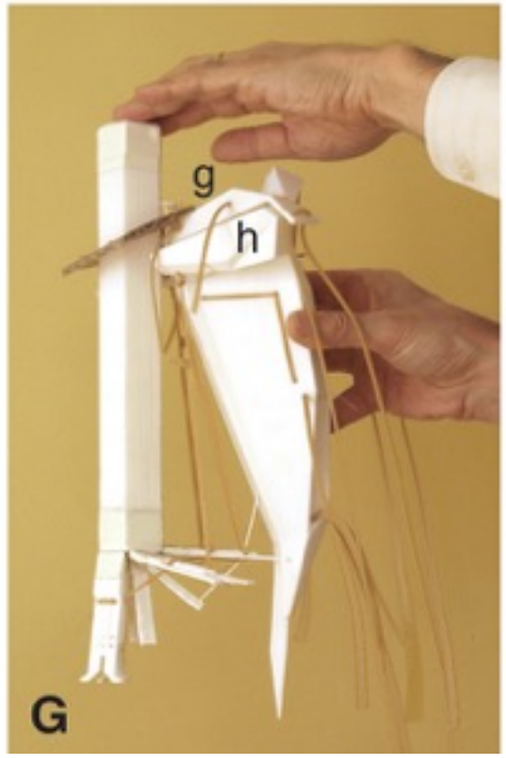

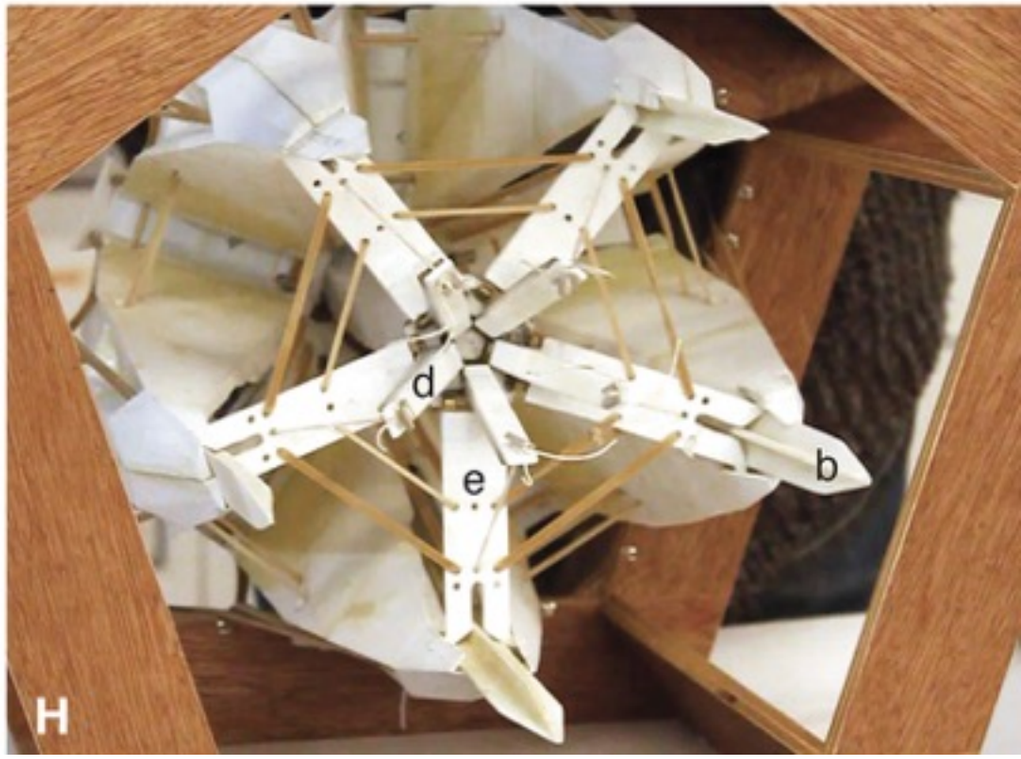

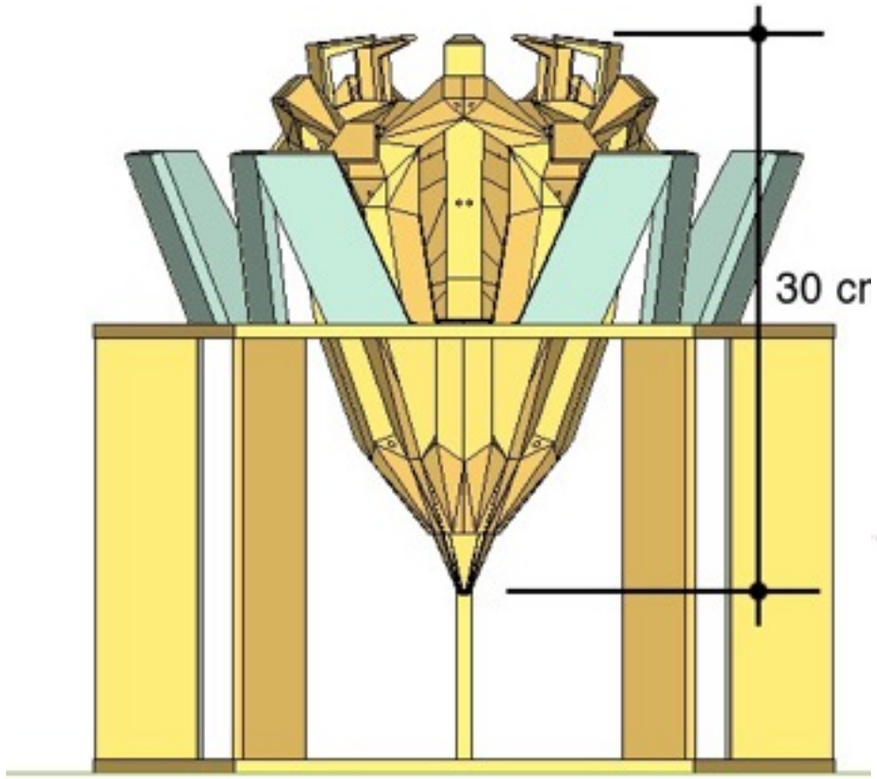
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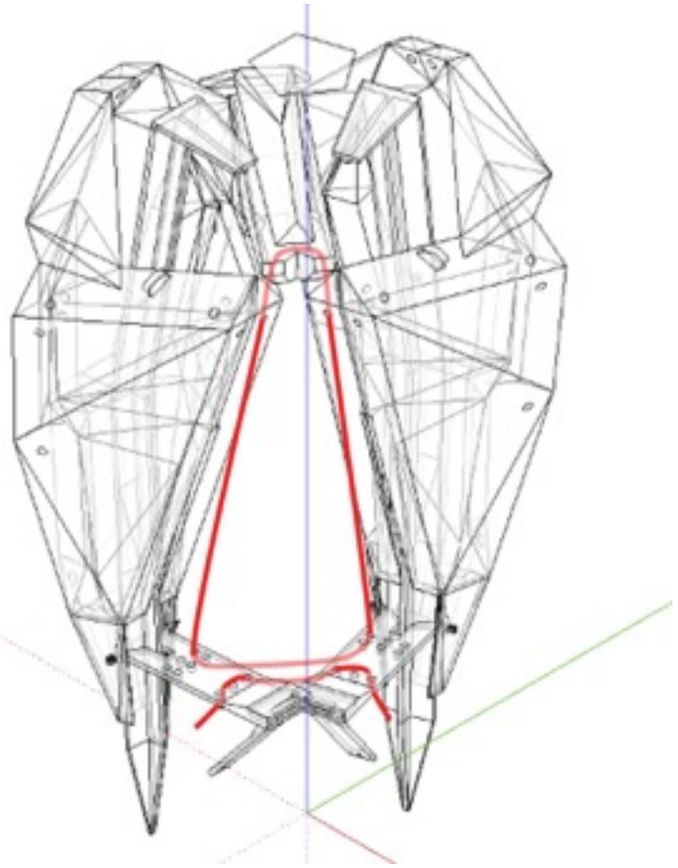

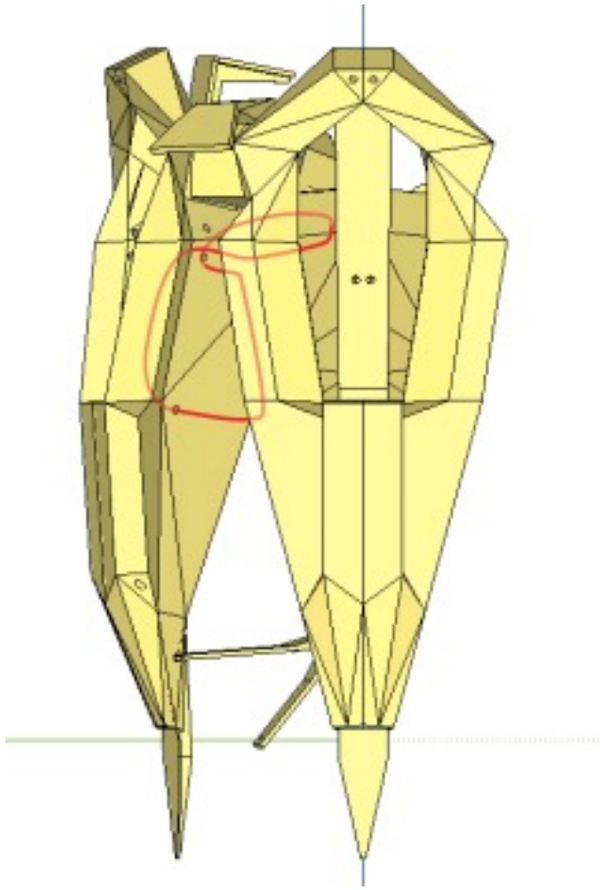


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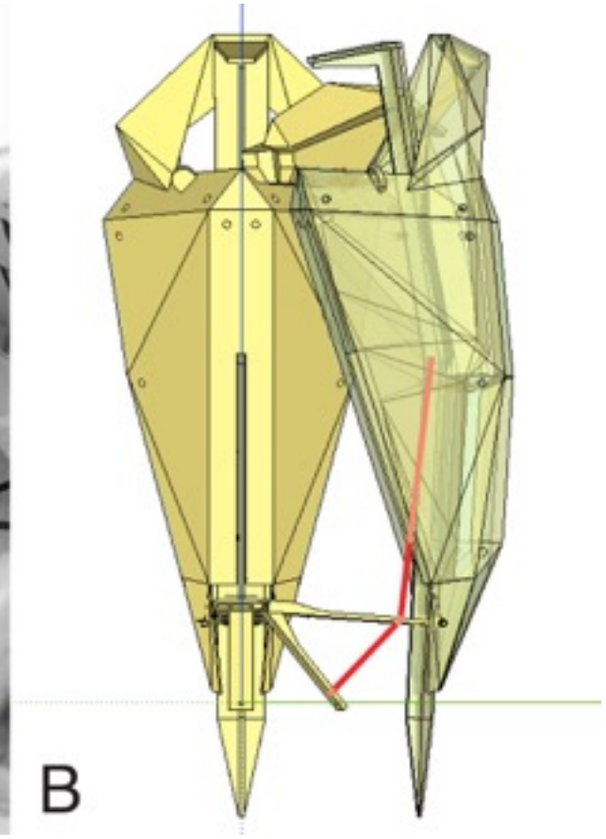
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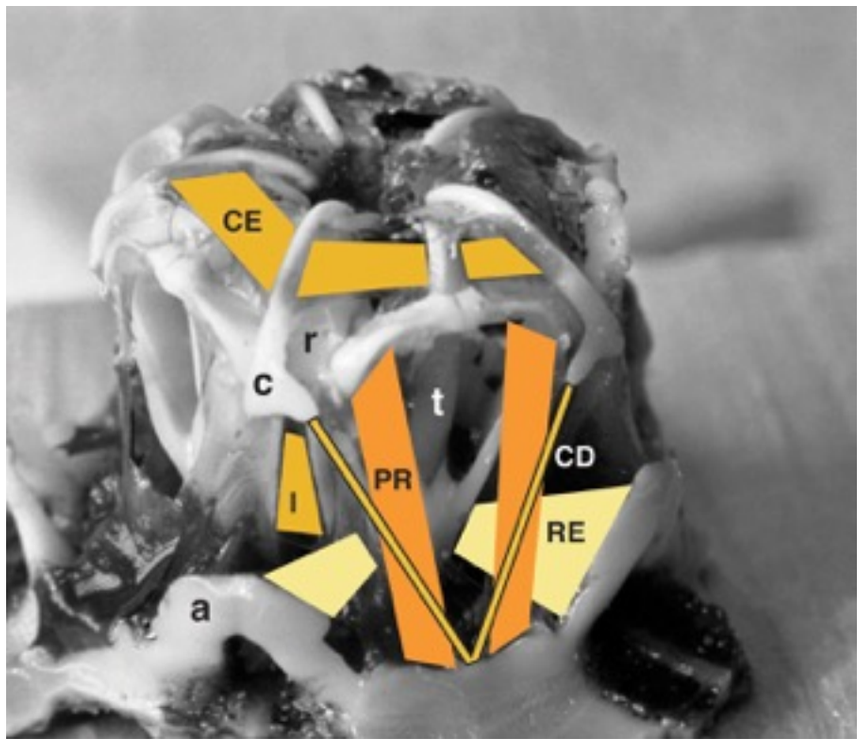
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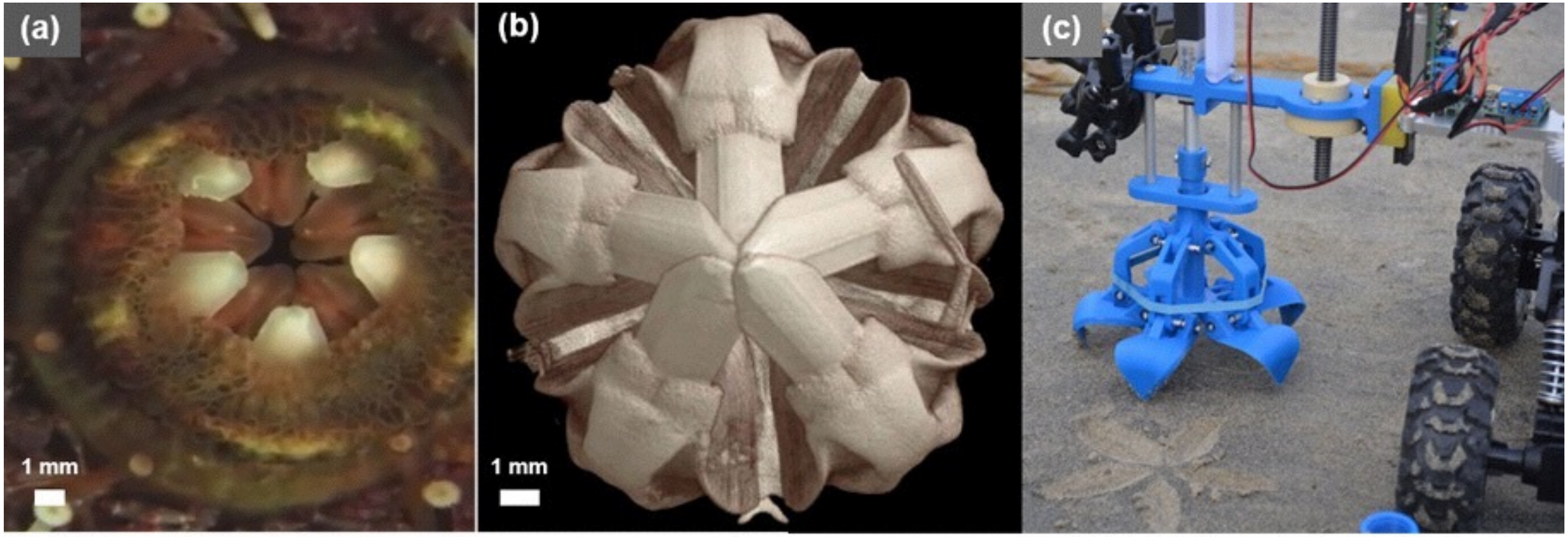
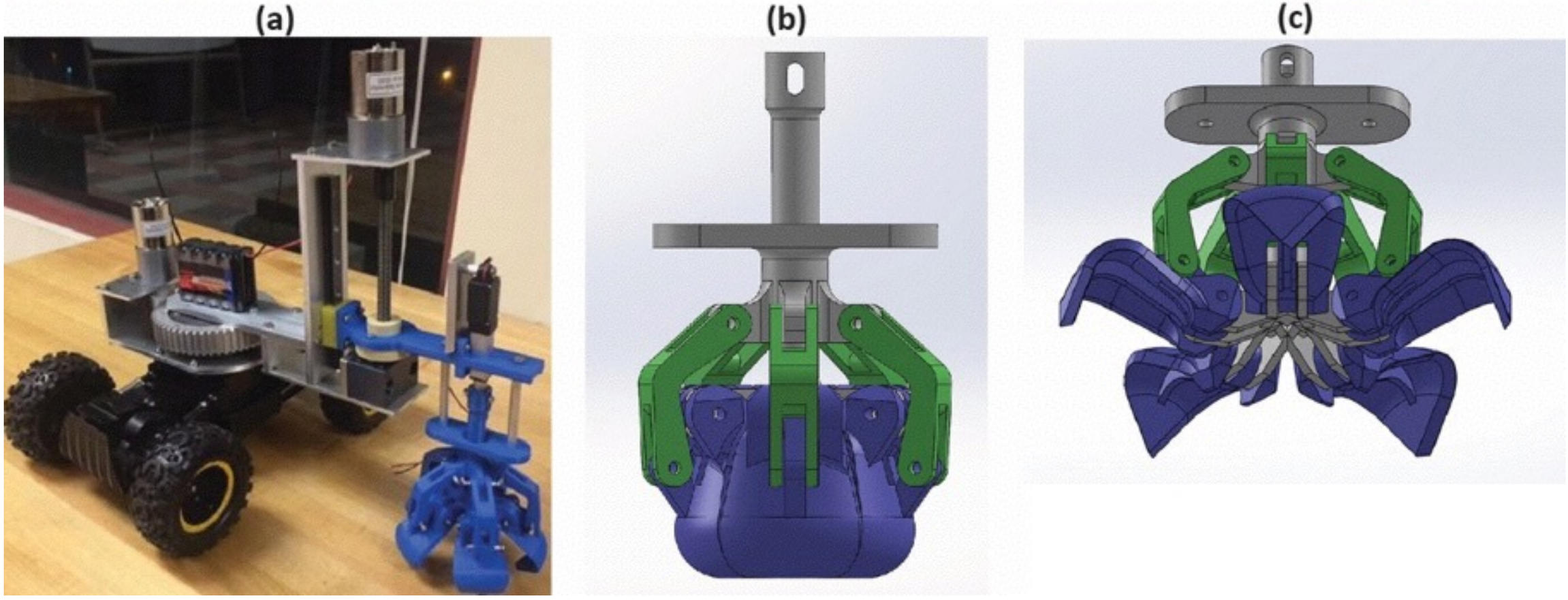
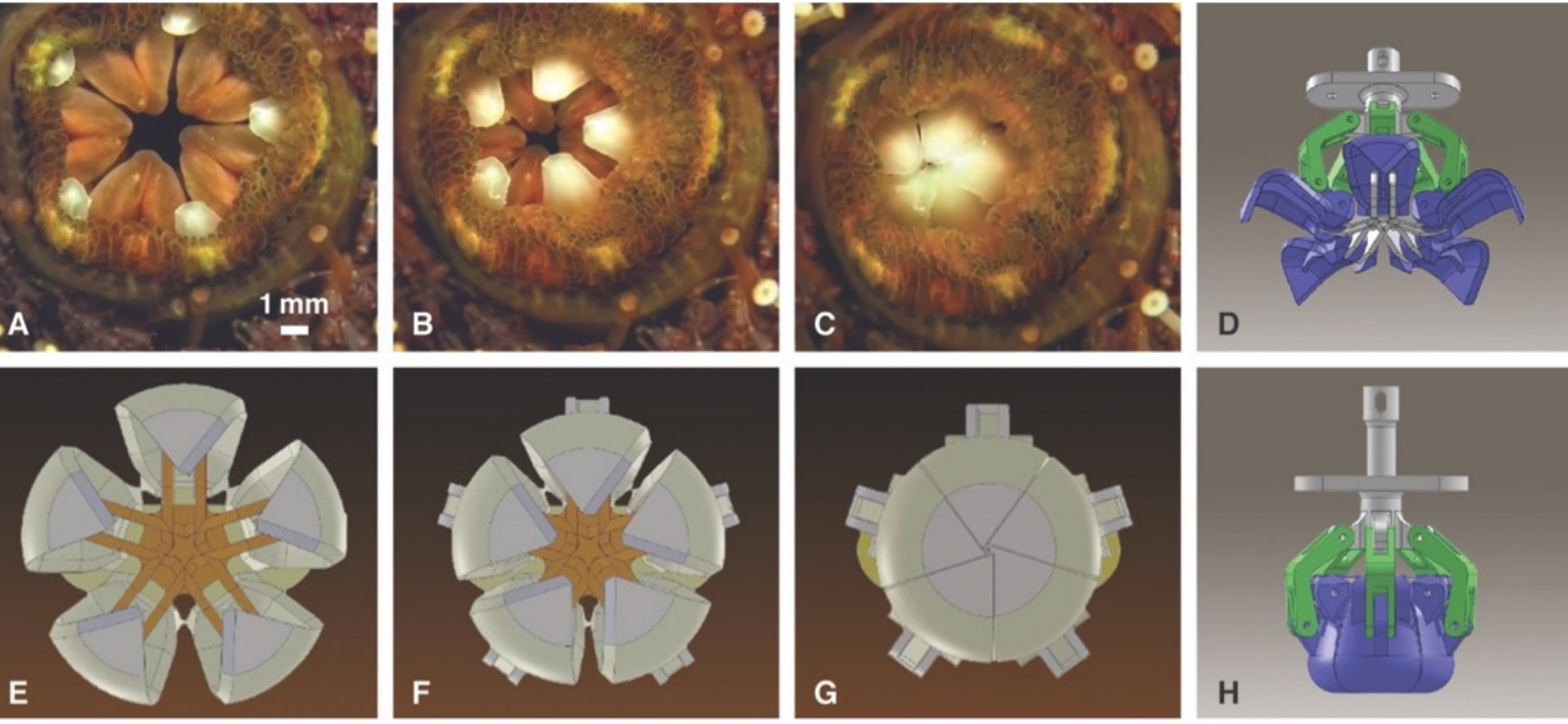
THE GROUND SAMPLER OF FRANK ET AL.

(Frank et al, UC San Diego, 2015)

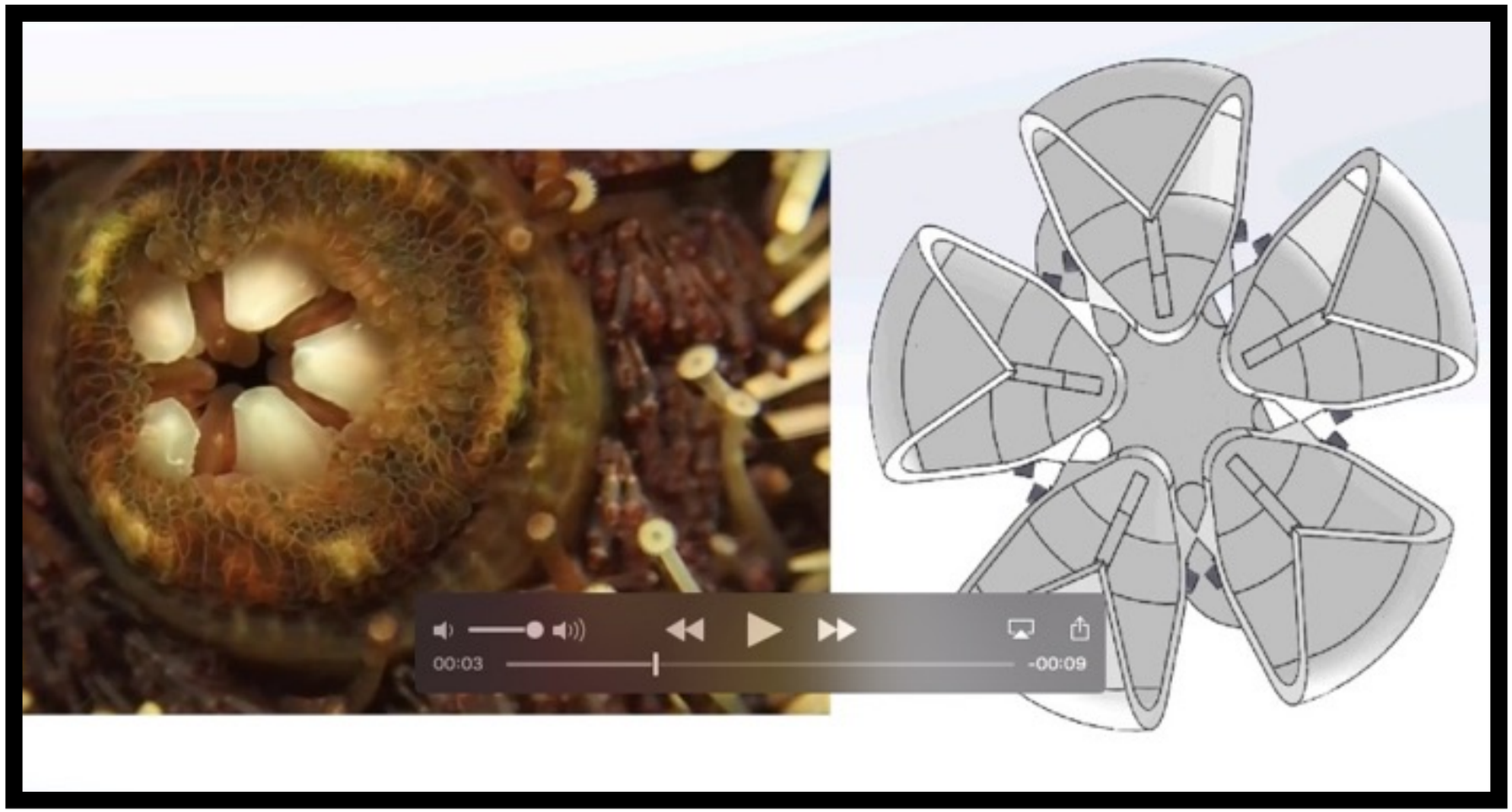




(Frank et al, UC San Diego, 2015)



(Frank et al, UC San Diego, 2015)



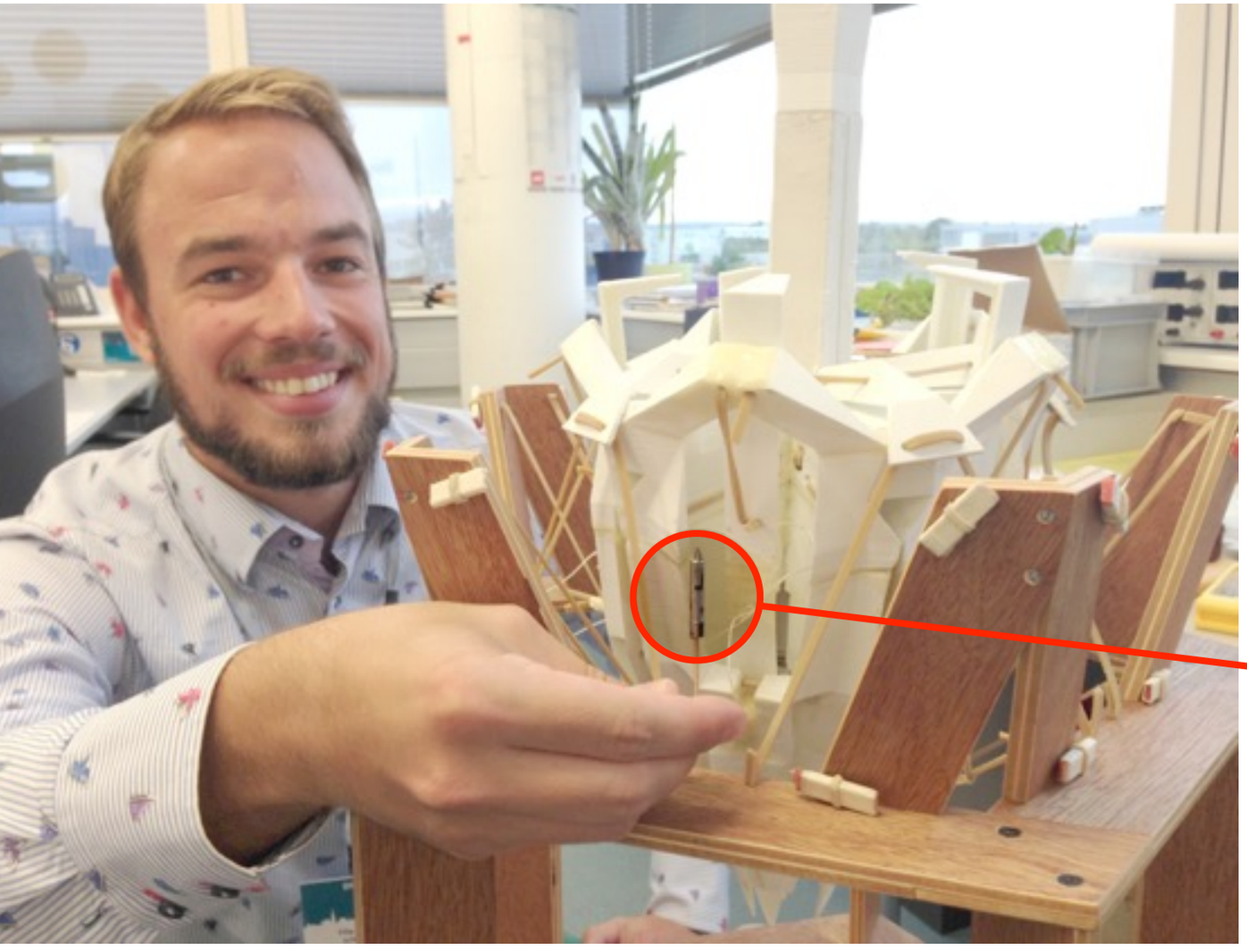
Frank et al., UCSD urchin side-by-side video

(Frank et al, UC San Diego, 2015)

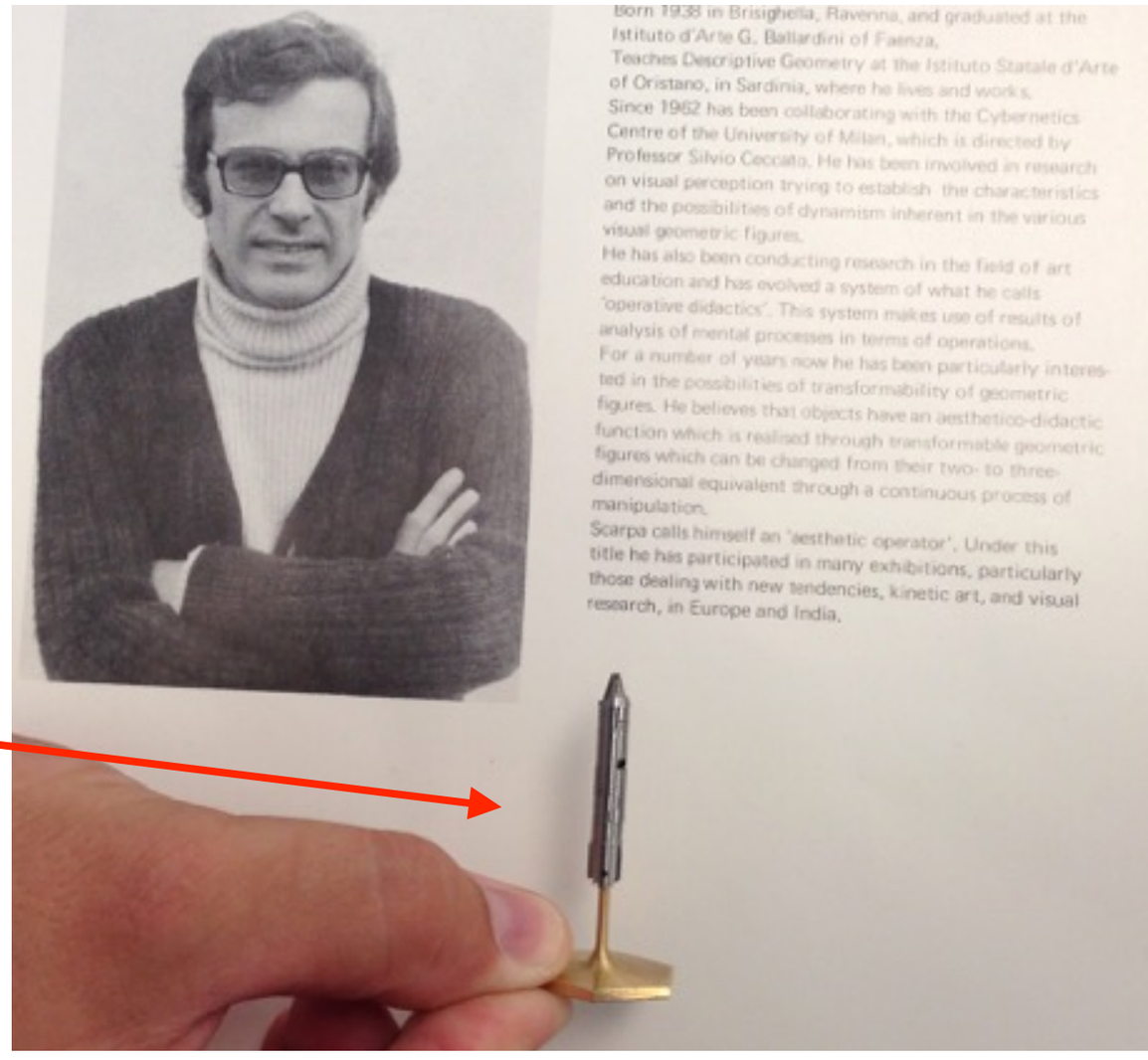
THE BIOPSY HARVESTER OF JELÍNEK ET AL.

(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)

Filip Jelínek

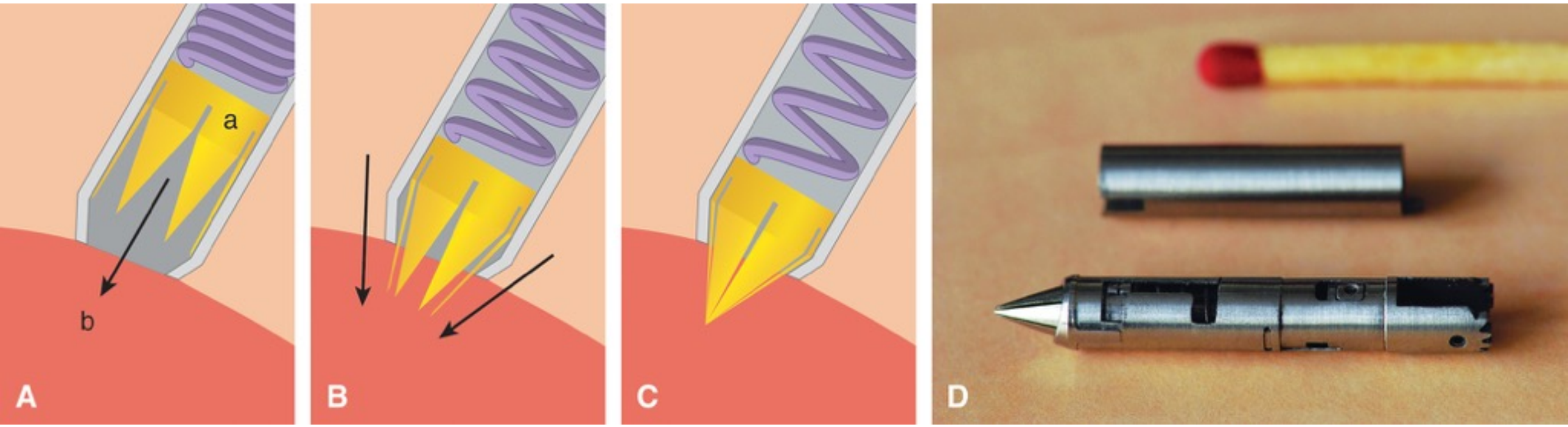


Giorgio Scarpa



(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)

(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)



(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)

Figure 9.4 *Final manufactured steerable opto-mechanical biopsy harvester prototype.*

(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)

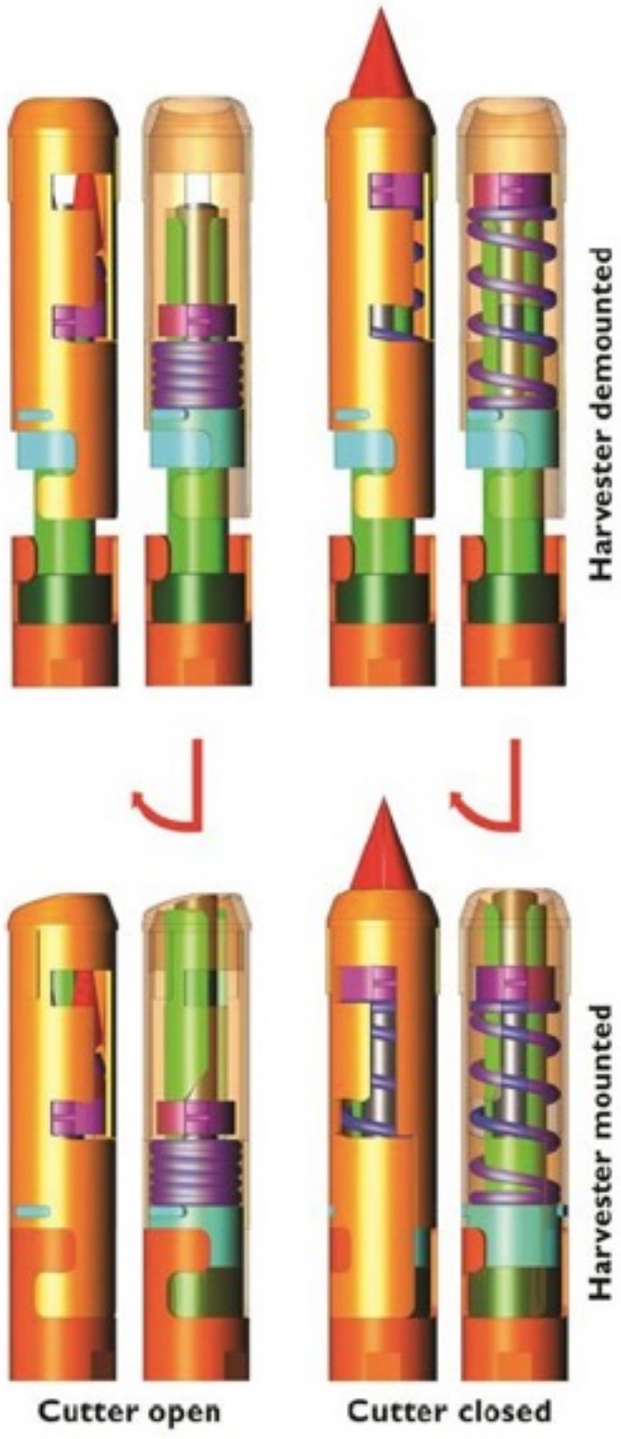


Figure 9.2 *Method of mounting the disposable part of the biopsy harvester to the permanent part by means of a bayonet connector (transparency and hidden features for the clarity of component alignment).*

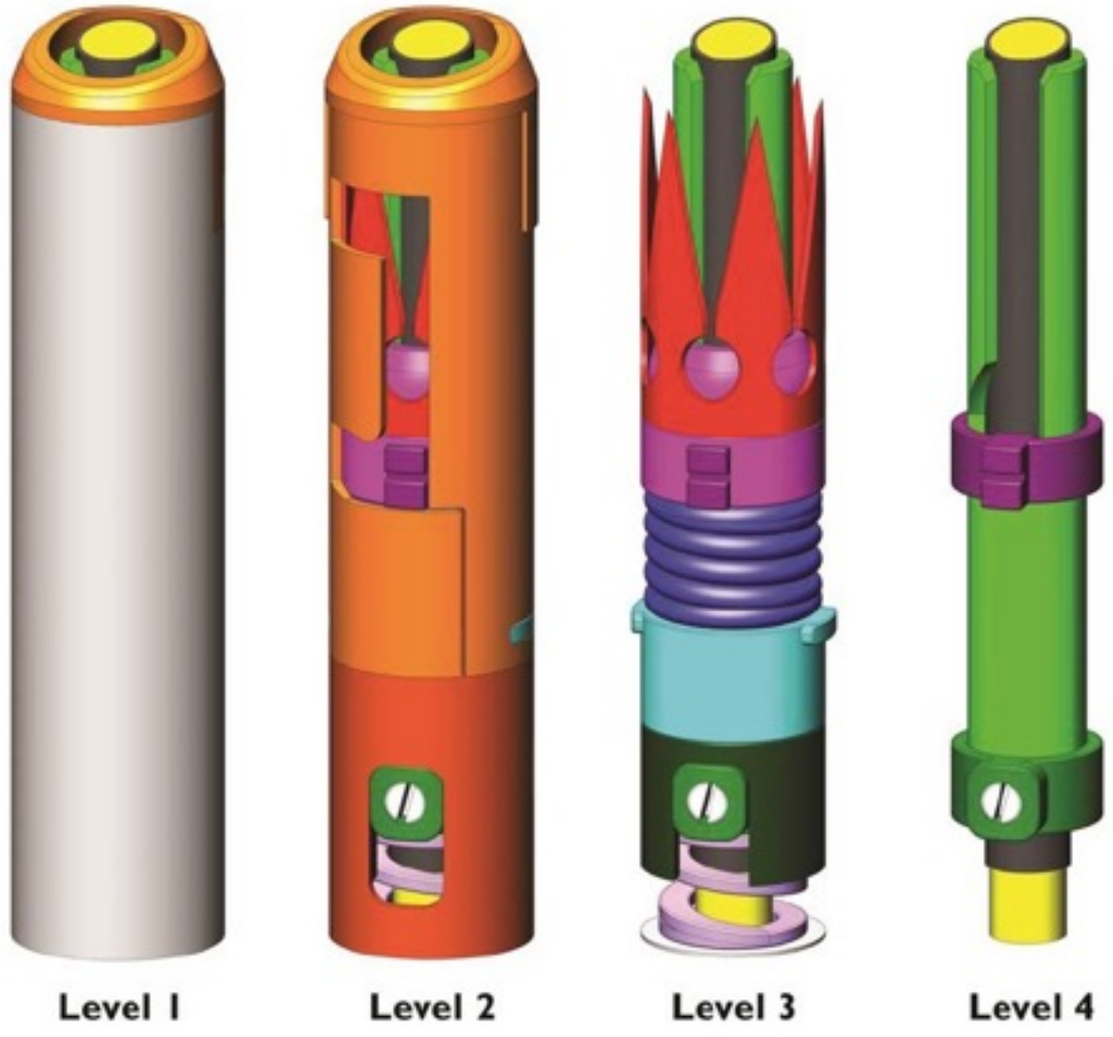
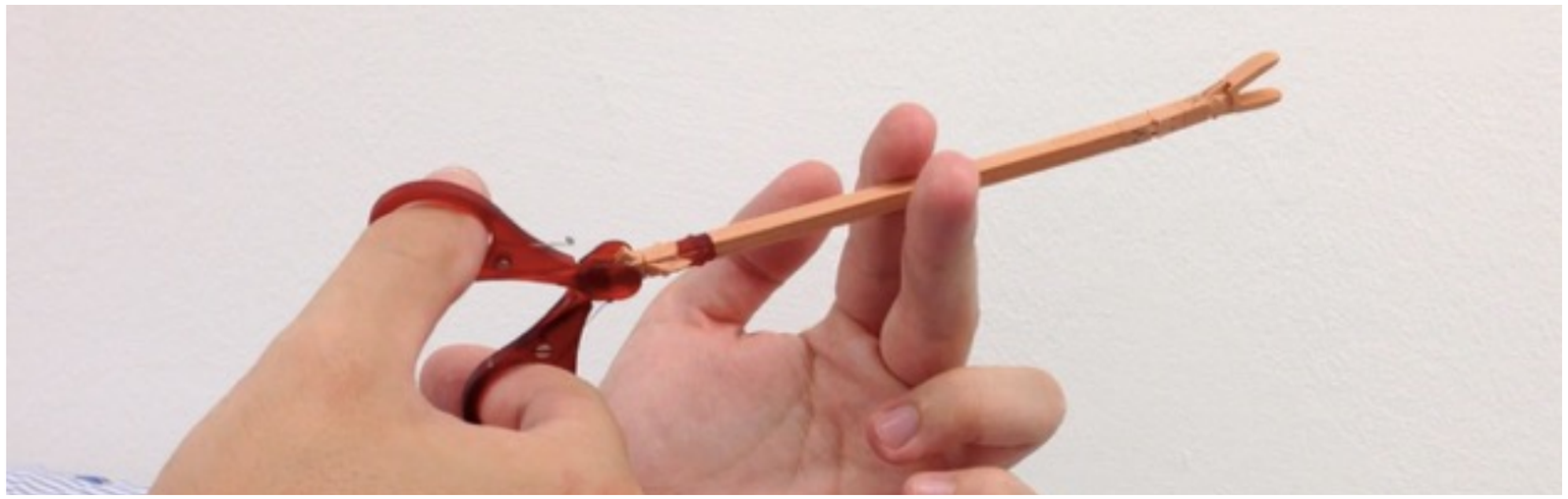


Figure 9.1 *Decomposition of the final envisioned biopsy harvester design in four levels.*

(Jelínek, Smit, Breedveld, TU Delft; ACMIT, Austria, 2014)



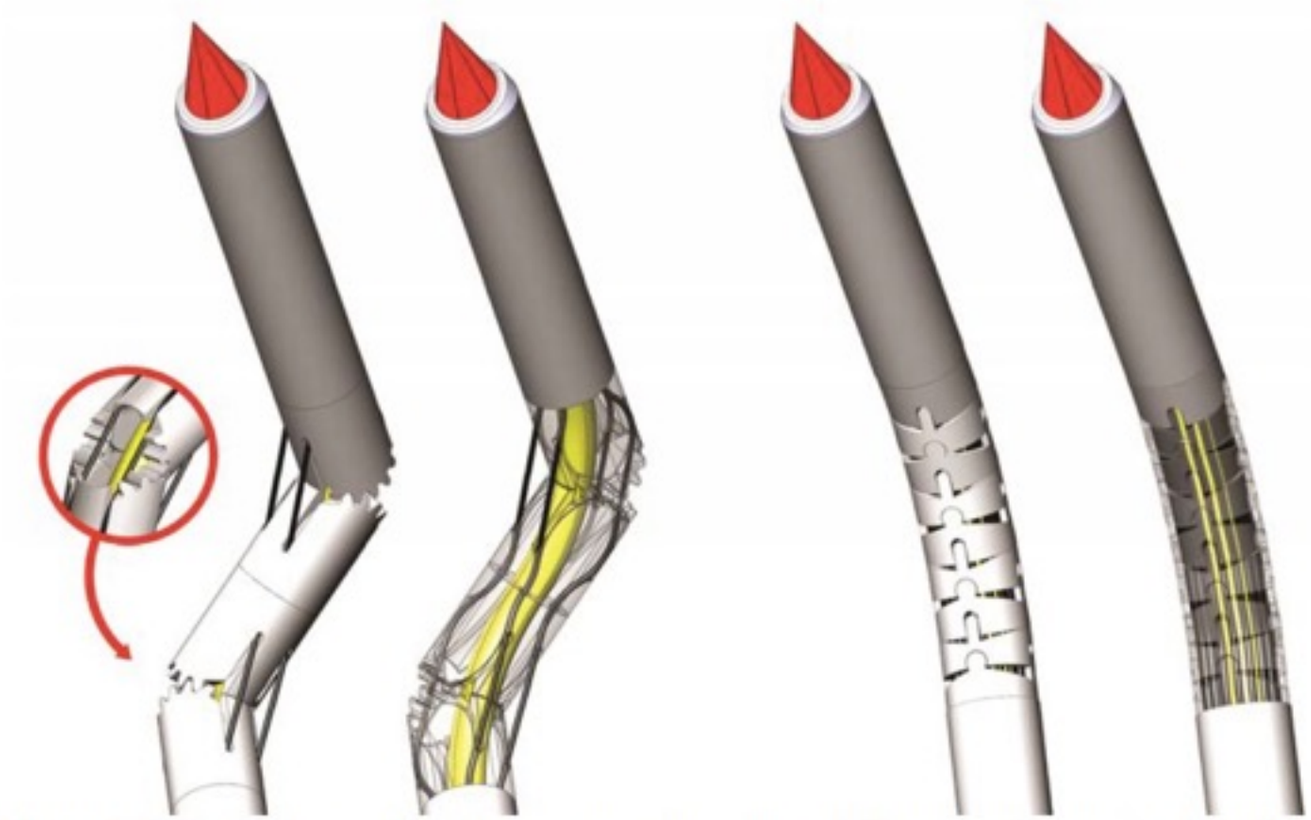


Figure 9.3 *Feasible steerable joint constructions: the additive manufactured rolling joint construction and the laser cut joint construction. Joints are actuated by steering cables (black).*

Jelínek, Filip, Steering and Harvesting Technology for Minimally Invasive Biopsy

PhD dissertation
doi:10.4233/uuid:18bc7cc6-153b-4ffe-8da1-474f08a212fc
Delft University of Technology, 2015

[Jelínek, Filip, Steering and Harvesting Technology for Minimally Invasive Biopsy]

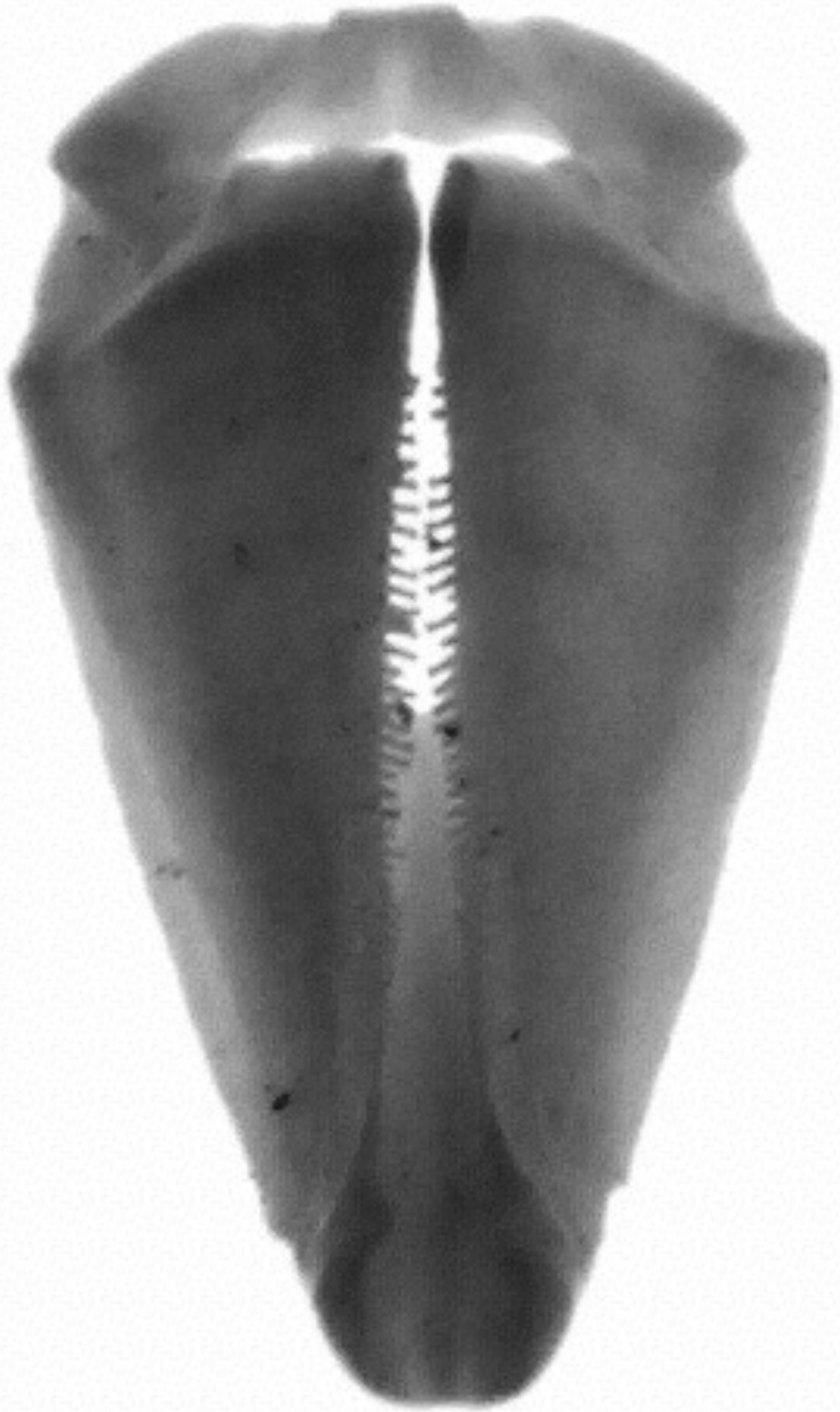
BIONICS: EXPLORATION BETWEEN PLAY AND RESEARCH

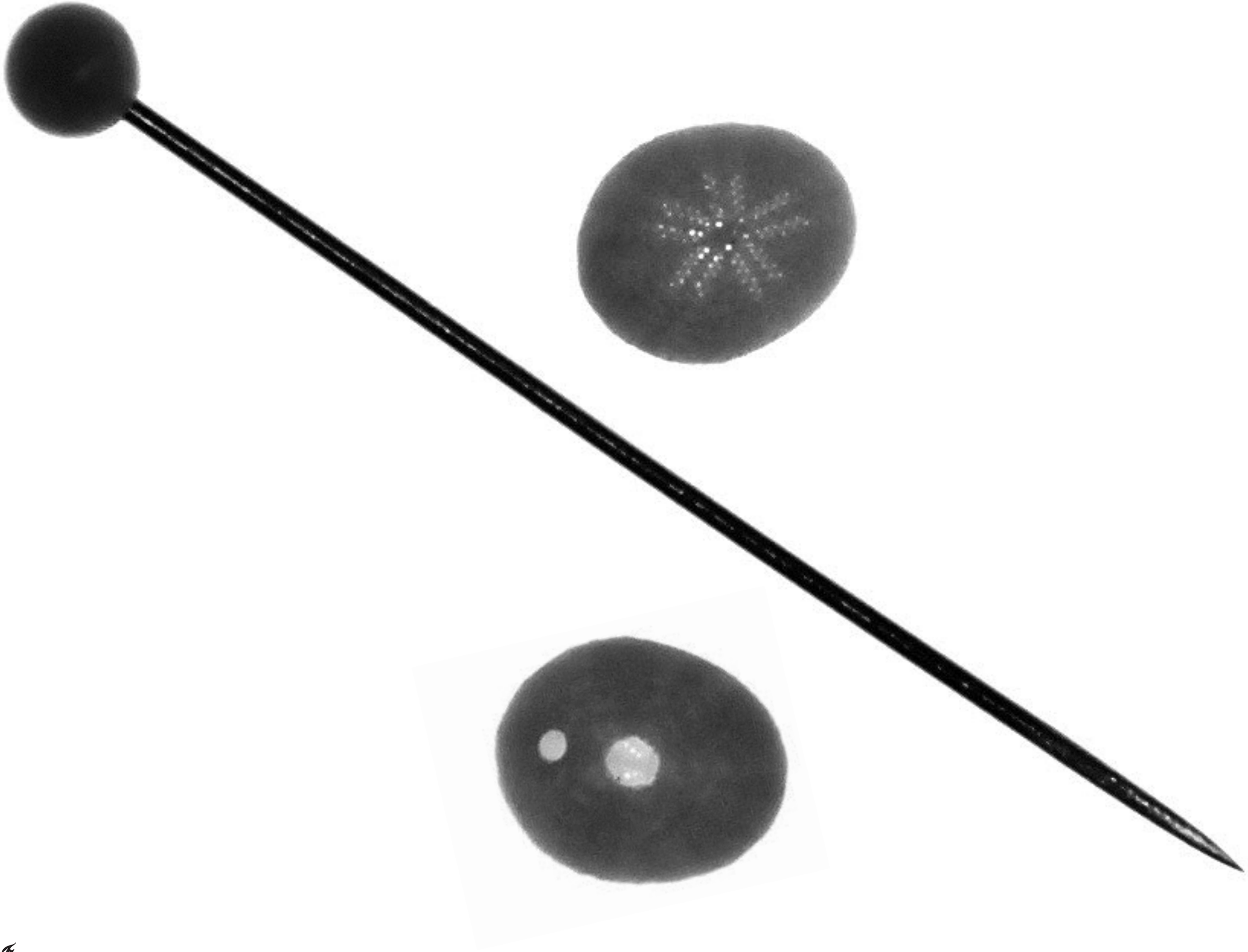
To play (to explore) is something that costs nothing and brings the mind closer to its desires by asking about the goals and function of every choice, so that every project, before it even becomes an application in its diversified specificity, every project should mean freedom and spontaneity in making, a non-paralyzing immersion, a contrast to what surrounds us, in a seamless process. […]

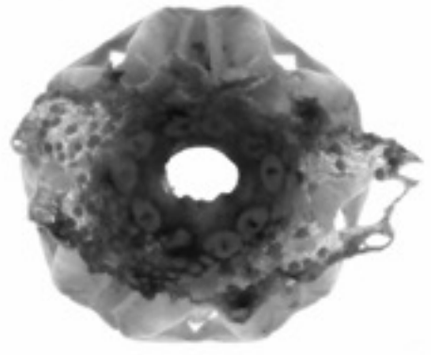
The image of destroyed sea urchins, their scattered fragments in the sand, and of the live sea urchins observed in their marine habitat, are the source of this study. […]

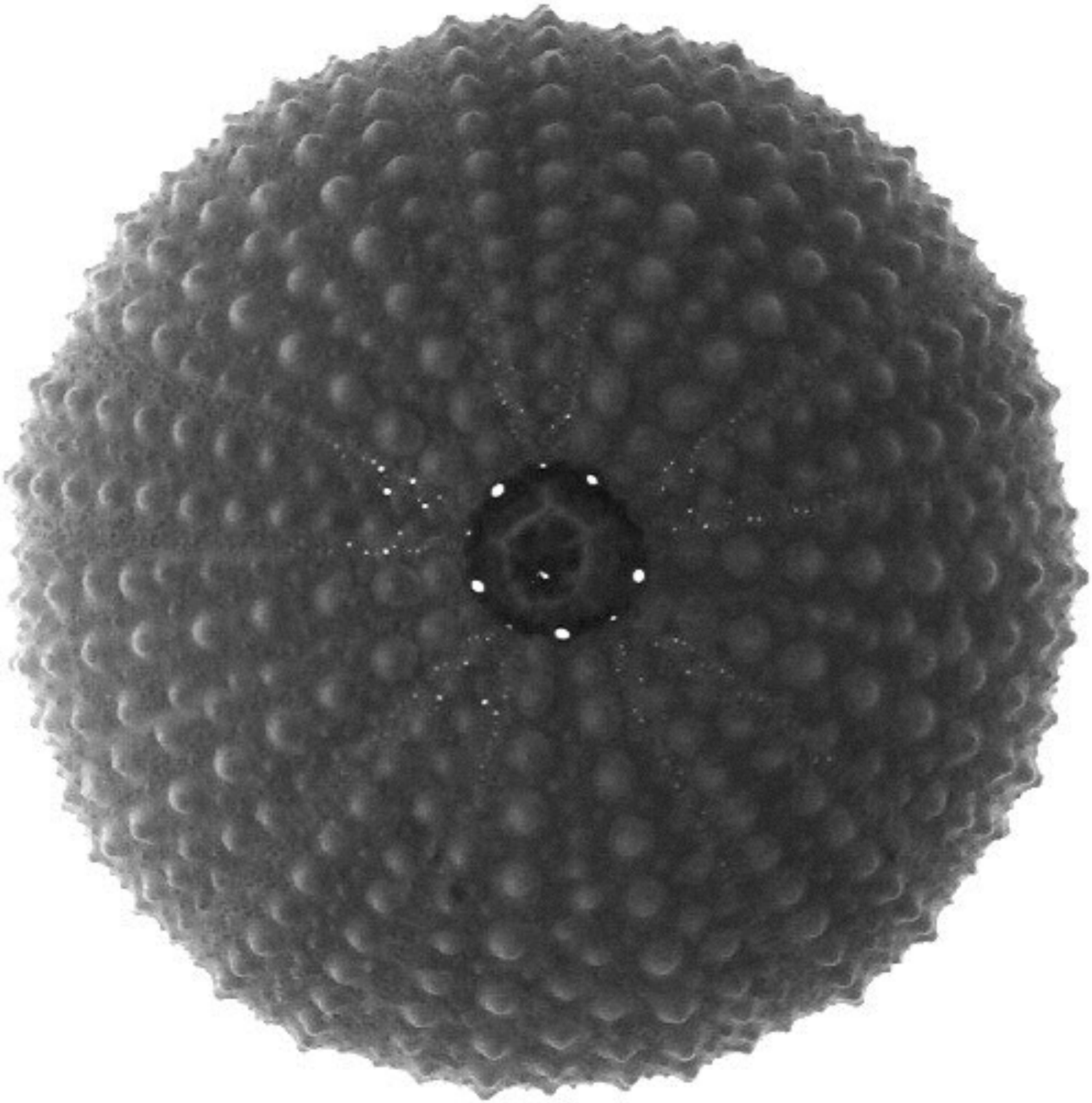
Not a single sea urchin was sacrificed in order to study it.

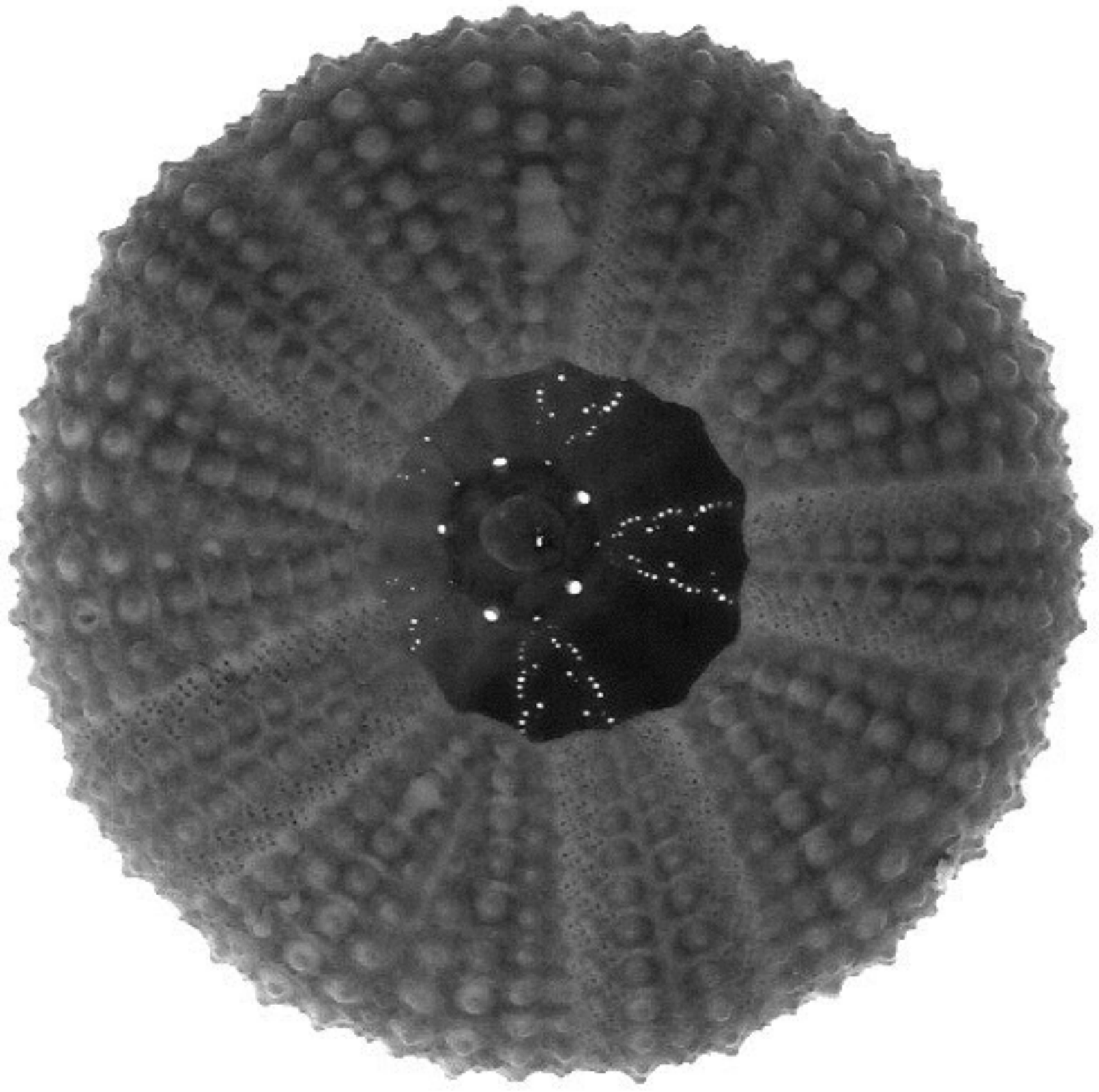
Giorgio Scarpa, c. 1970











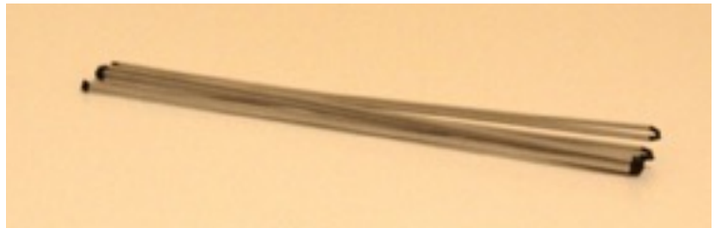
“If you are going to do research in bionics, don’t forget to study seeds, for the knowledge that nature displays in their creation, and for the originality and unpredictability of some of their self-dispersal mechanisms.”

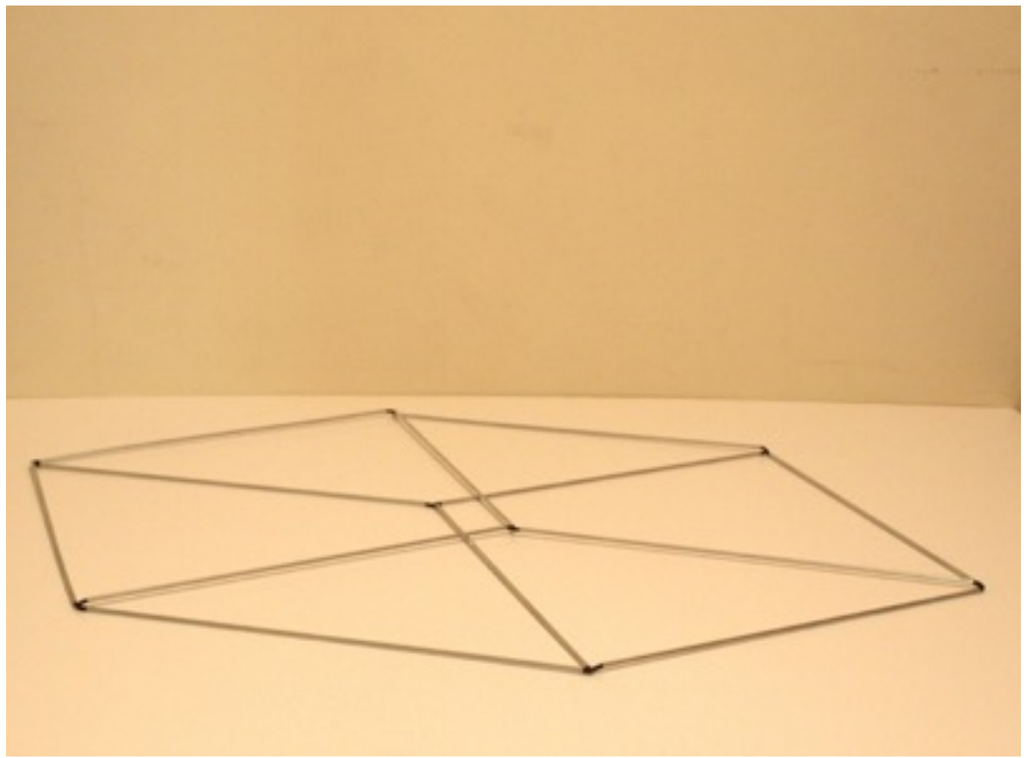
Giorgio Scarpa, 1988

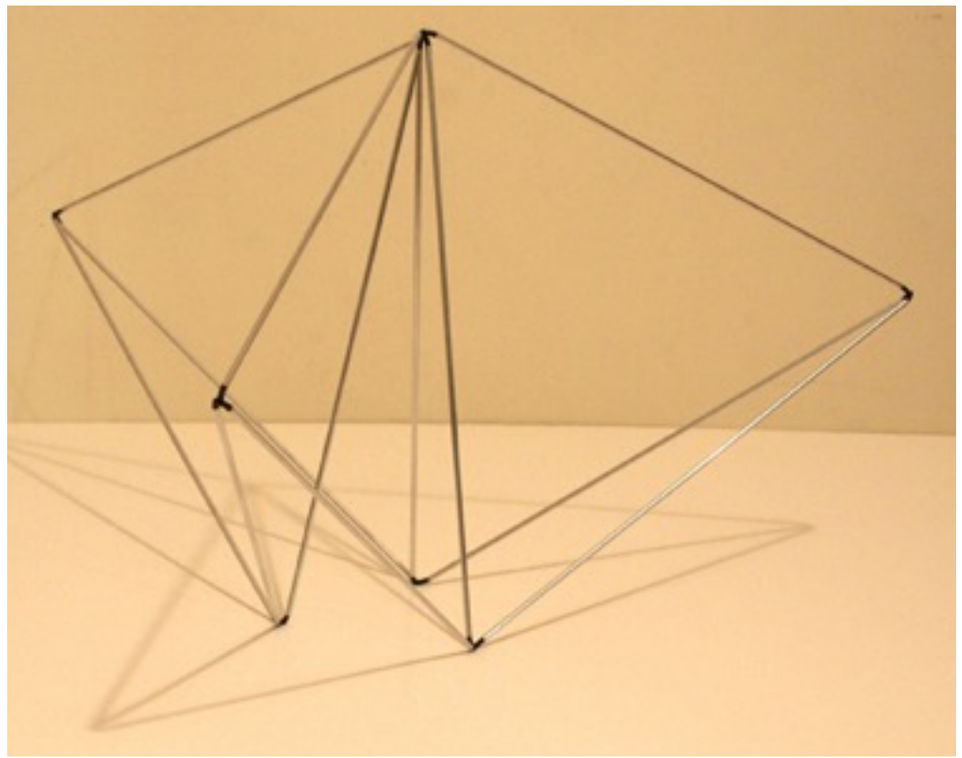
Giorgio Scarpa's collection of seeds on his workshop's desk in Castel Bolognese, Italy, 2002. (© Pino Trogu)

…AND MORE???

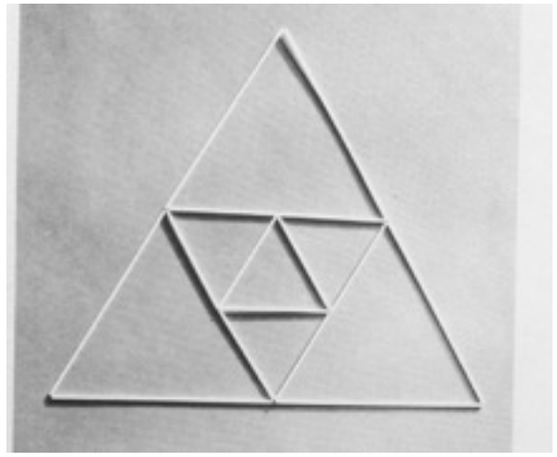
BIOINSPIRED GEOMETRIC FOLDING MODELS (ORIGAMI)

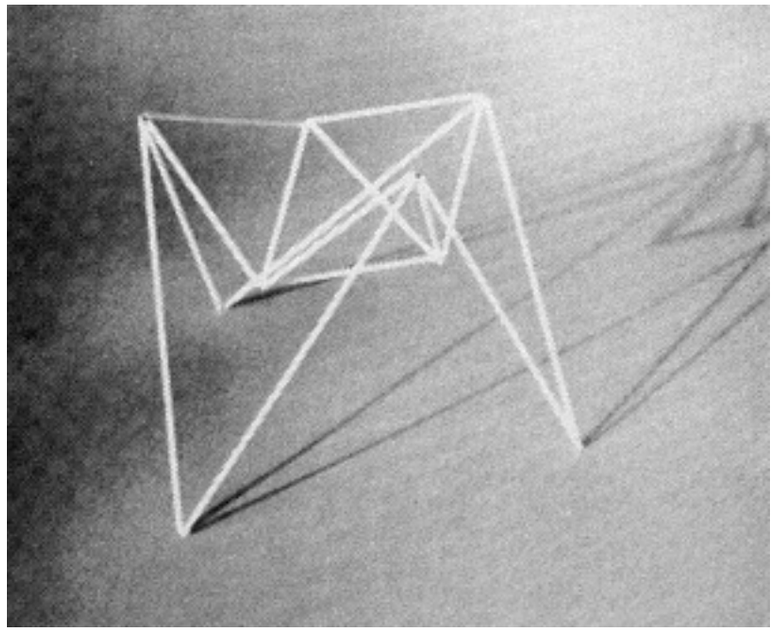


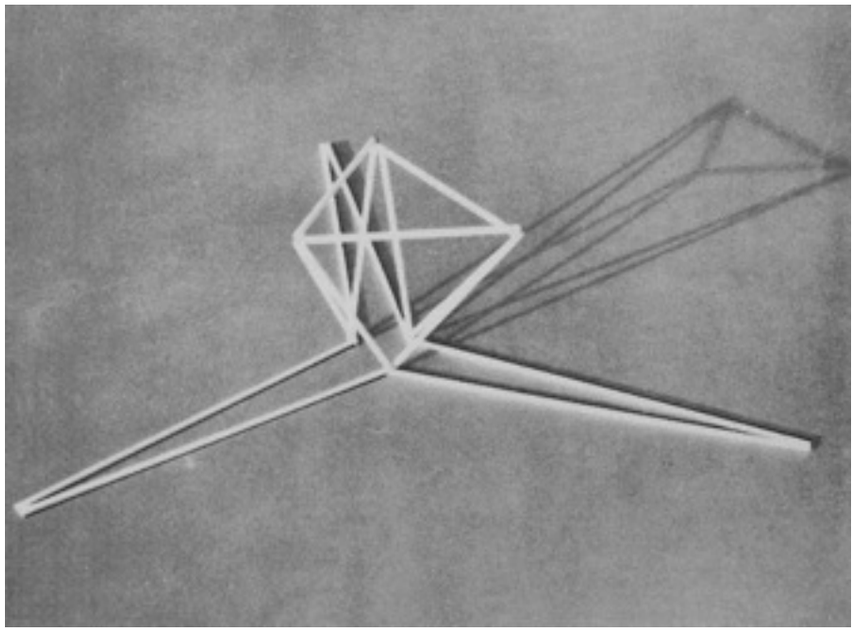


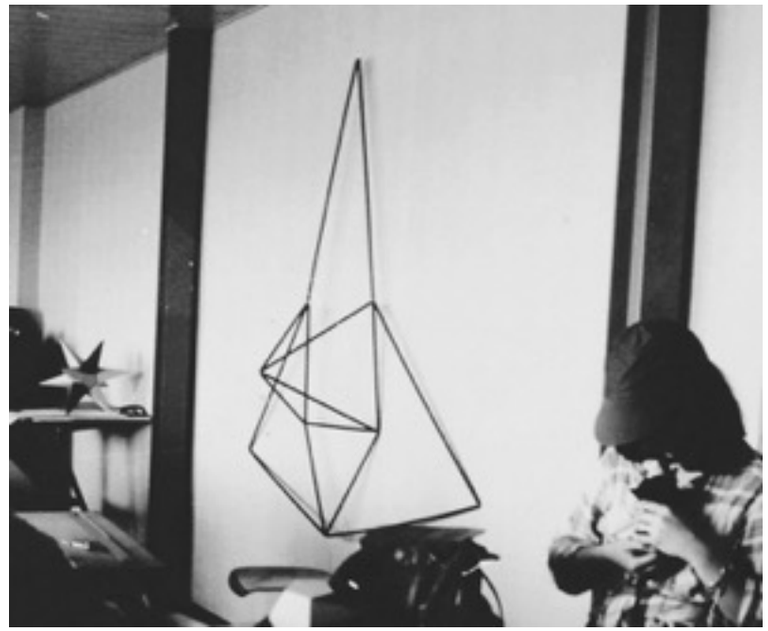


Scarpa, *Transformable cube*, 1965.

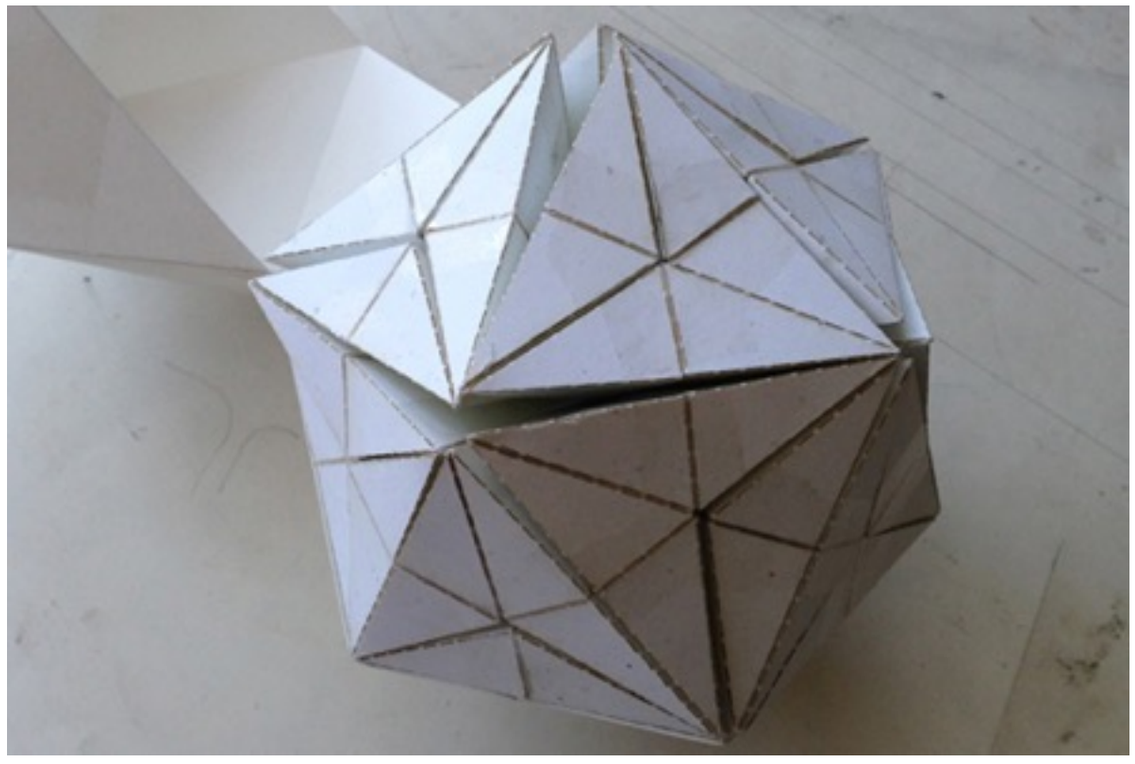


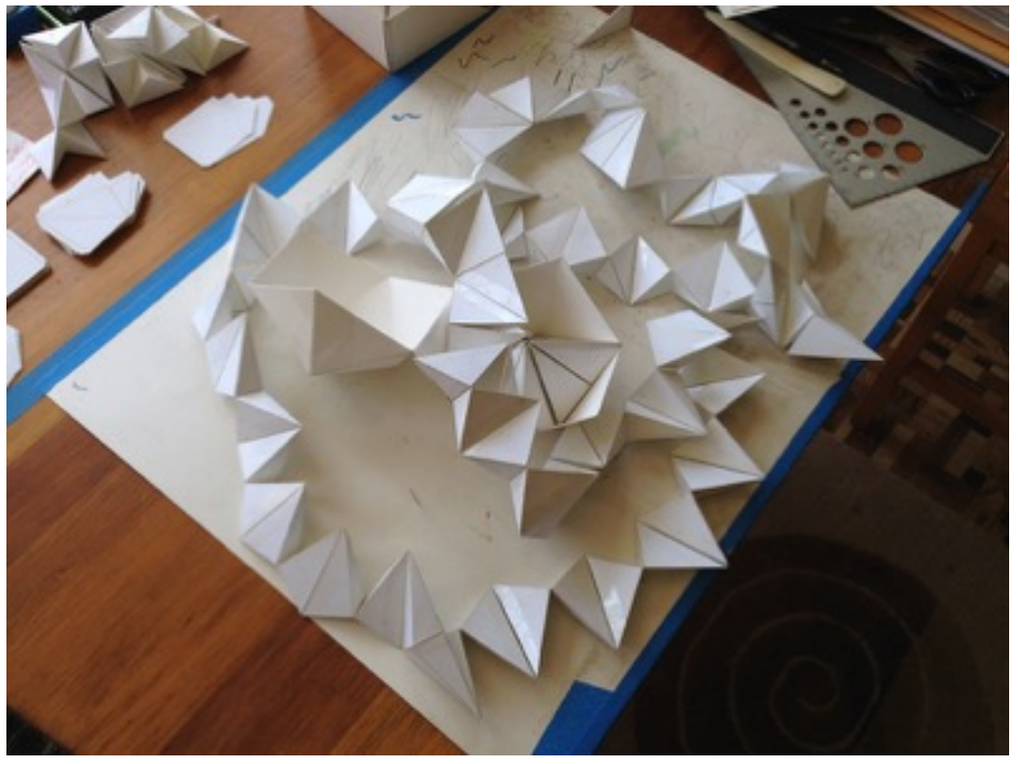






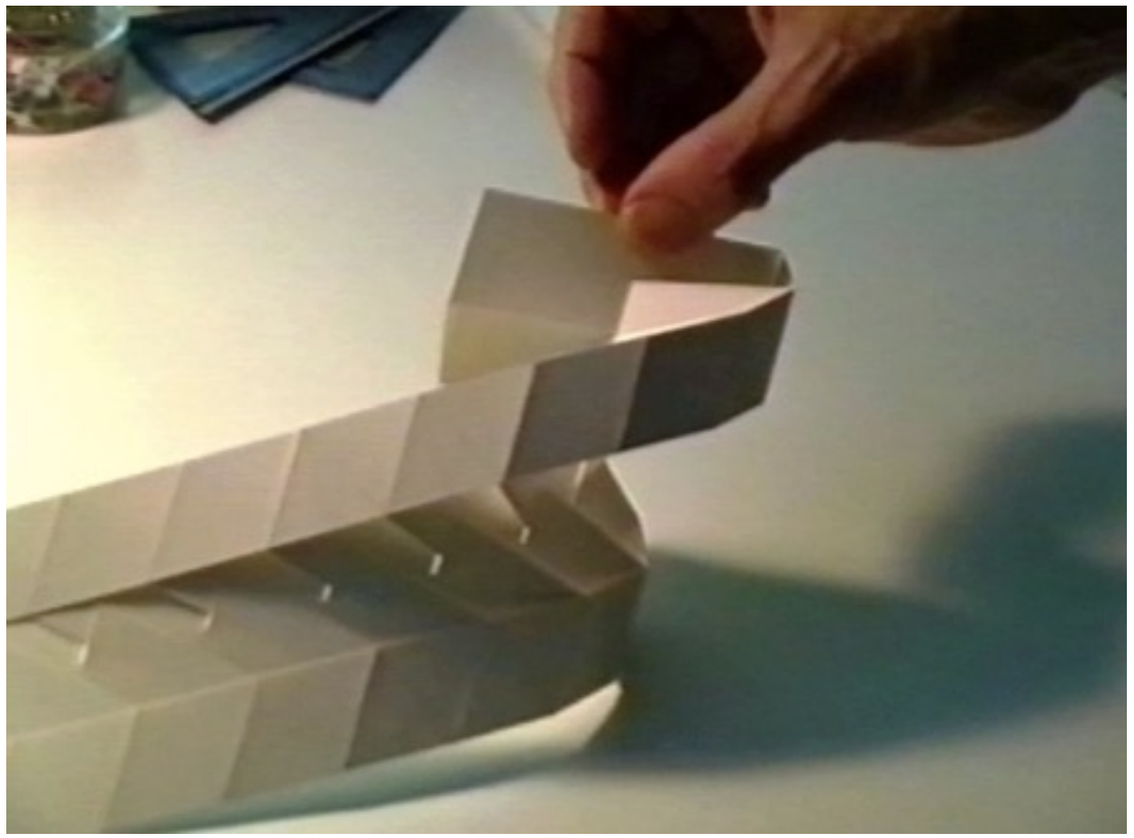
Scarpa, *Transformable triangle*, 1965.

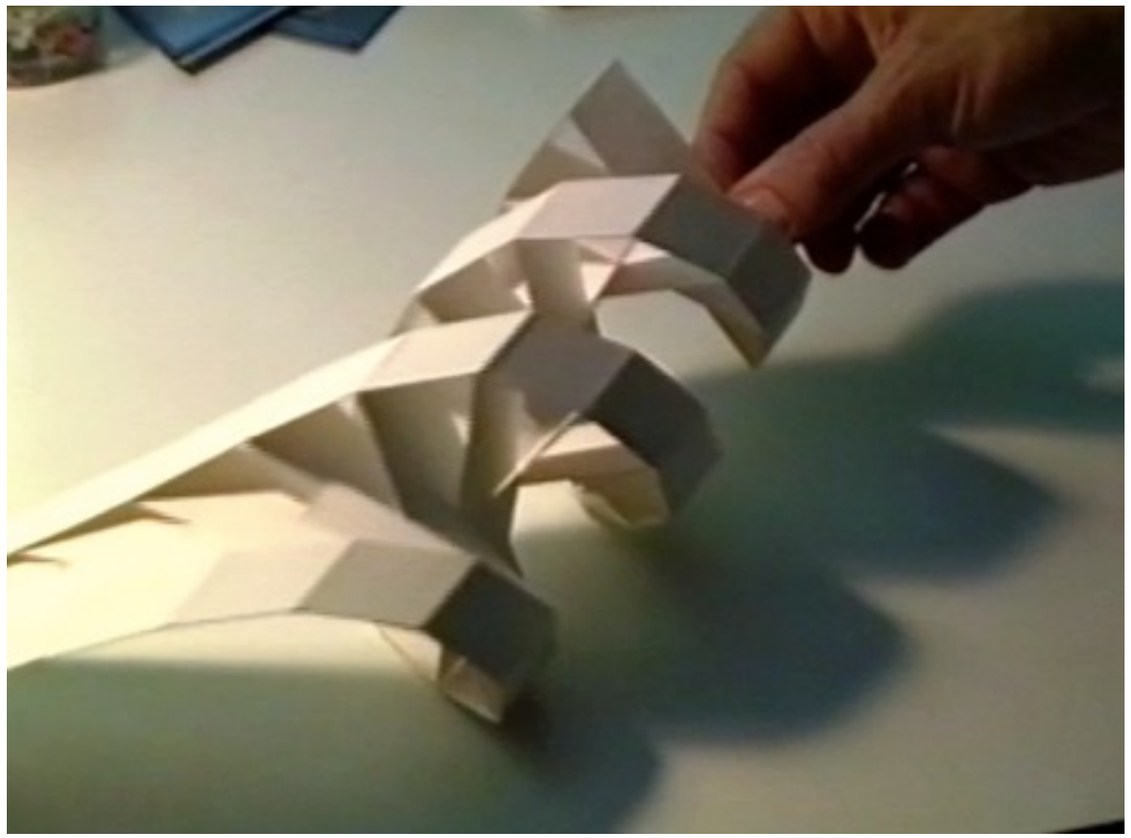




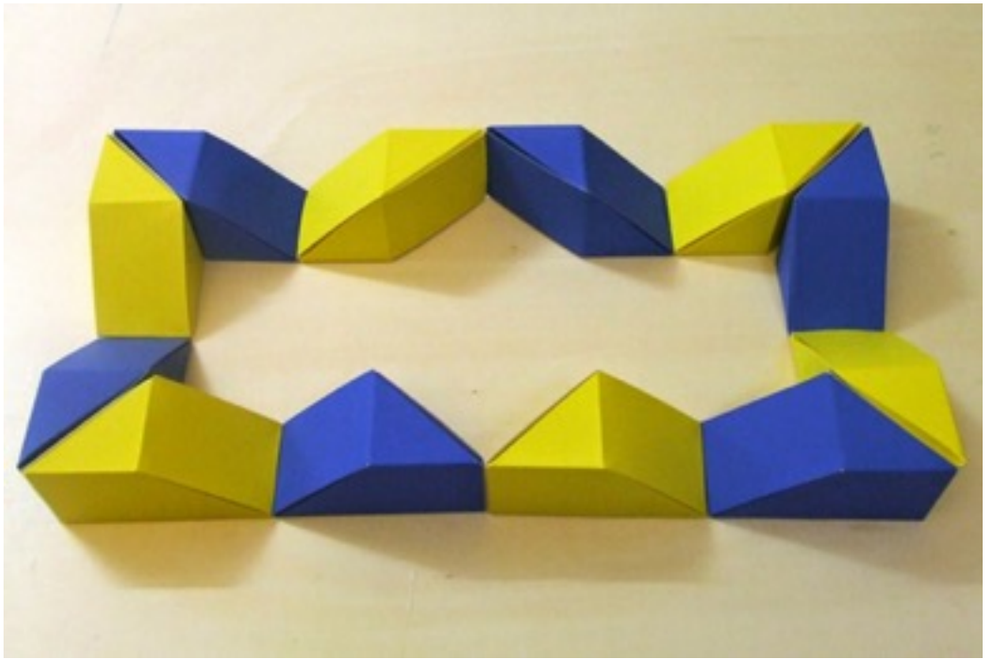
(Trogu & Nies, model based on Scarpa, 2015)

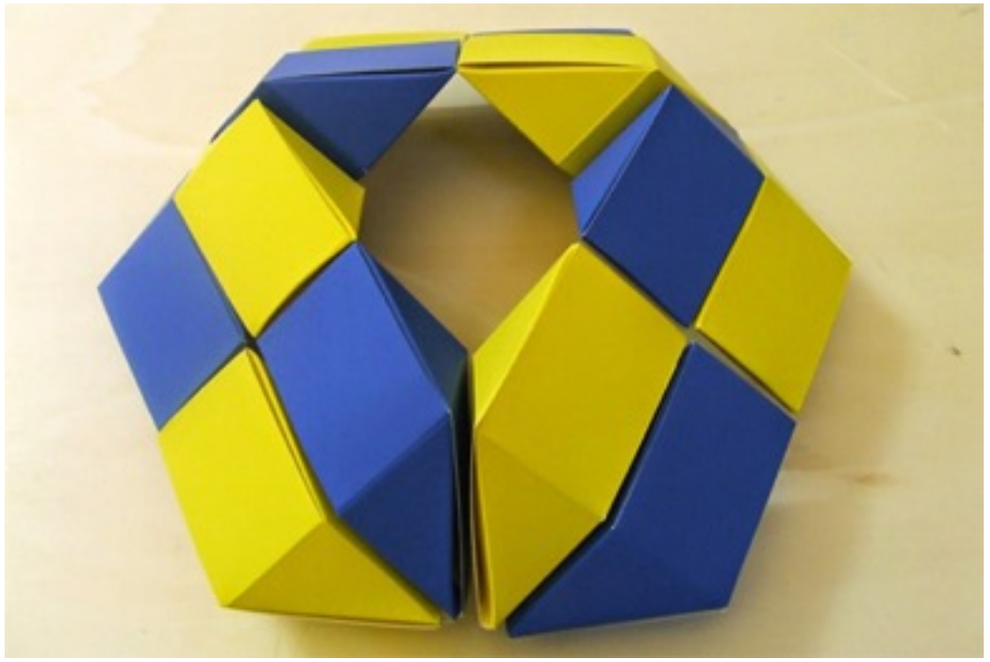
Scarpa, *Models of Rotational Geometry*, p. 112, & cover.

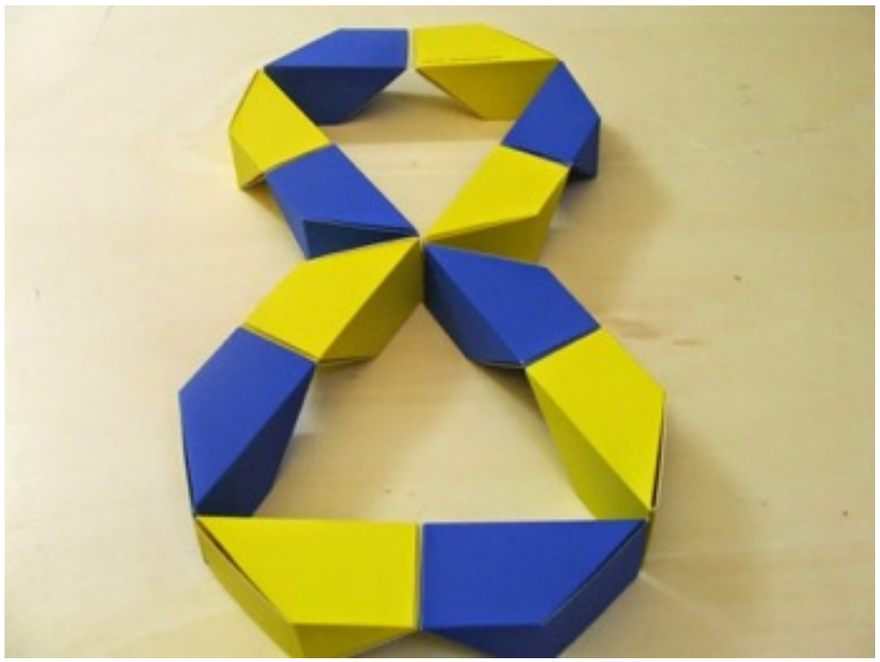


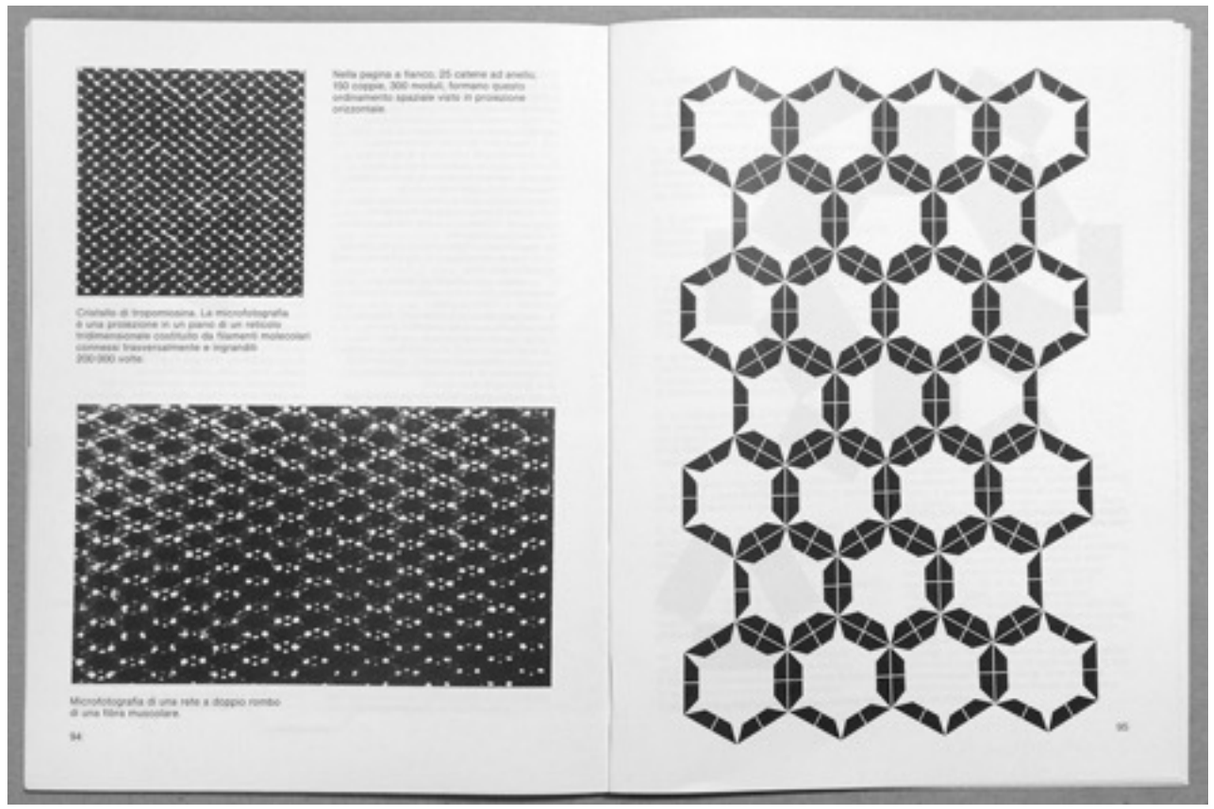


Scarpa, *DNA model*, circa 1980.

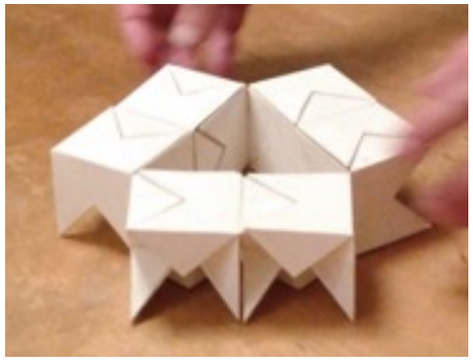


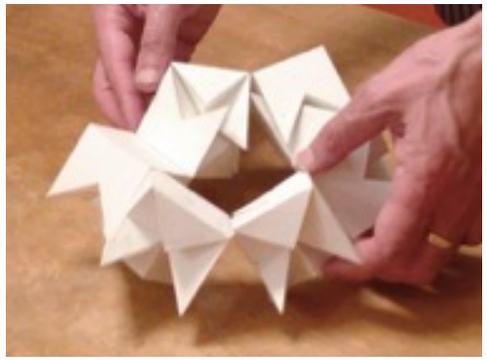


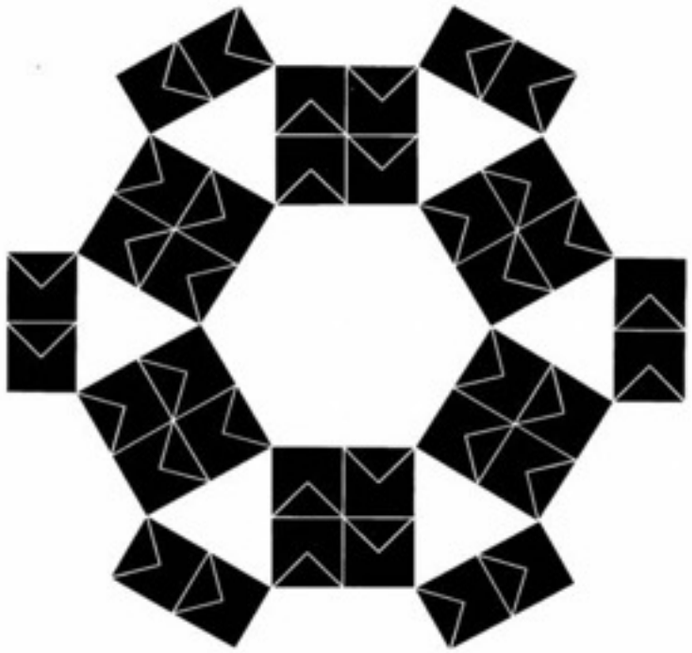


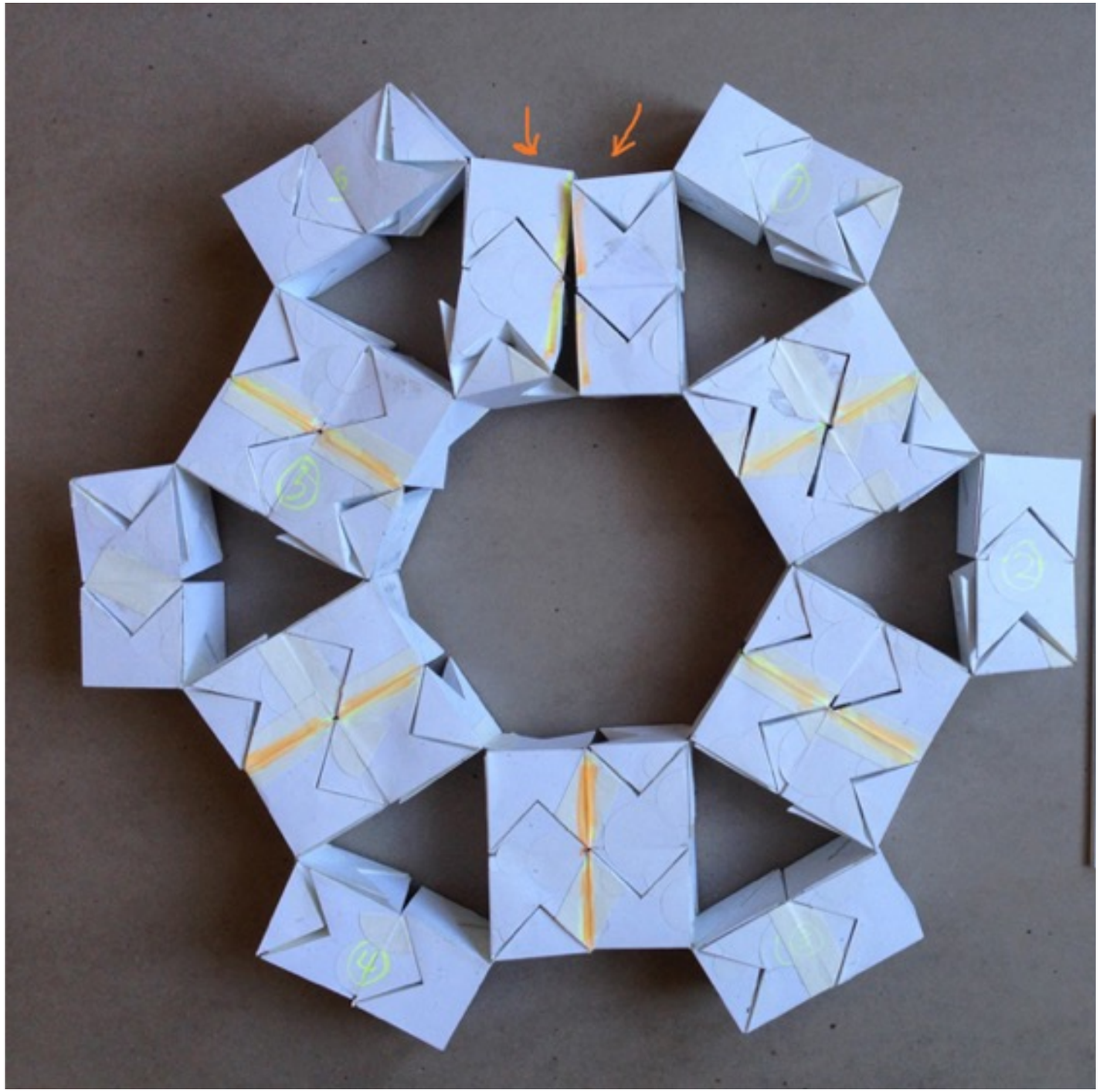


Scarpa, *Models of Rotational Geometry*, pp. 73, 95, & cover.



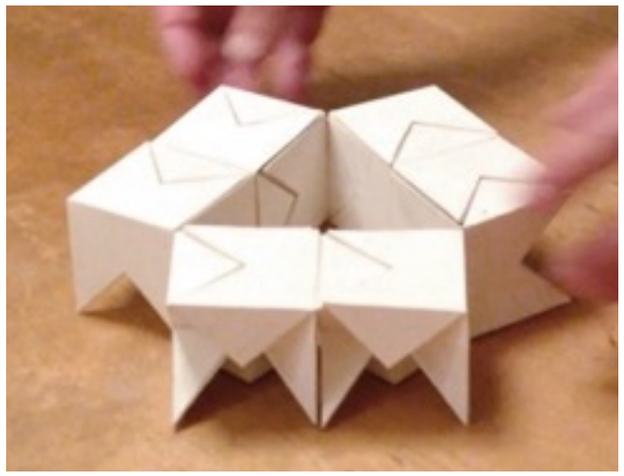


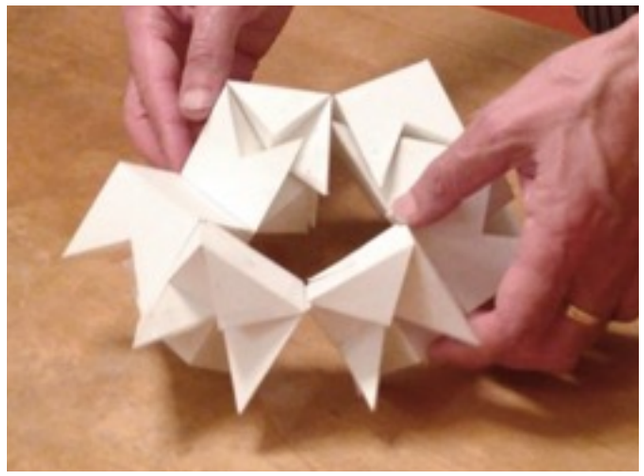


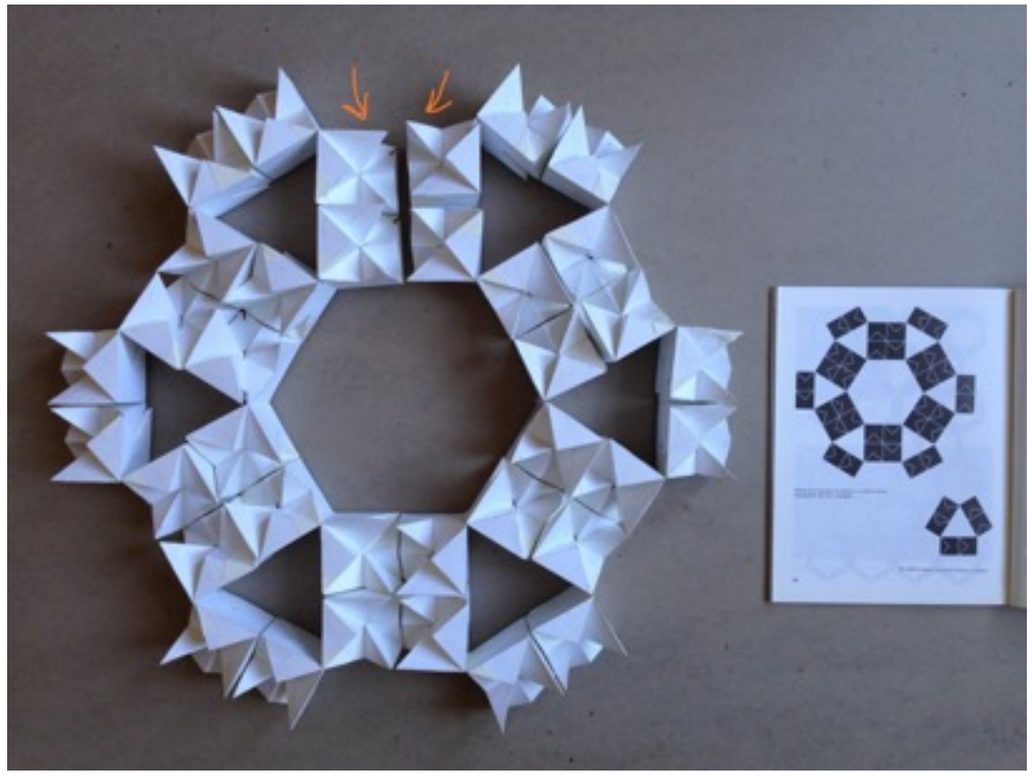


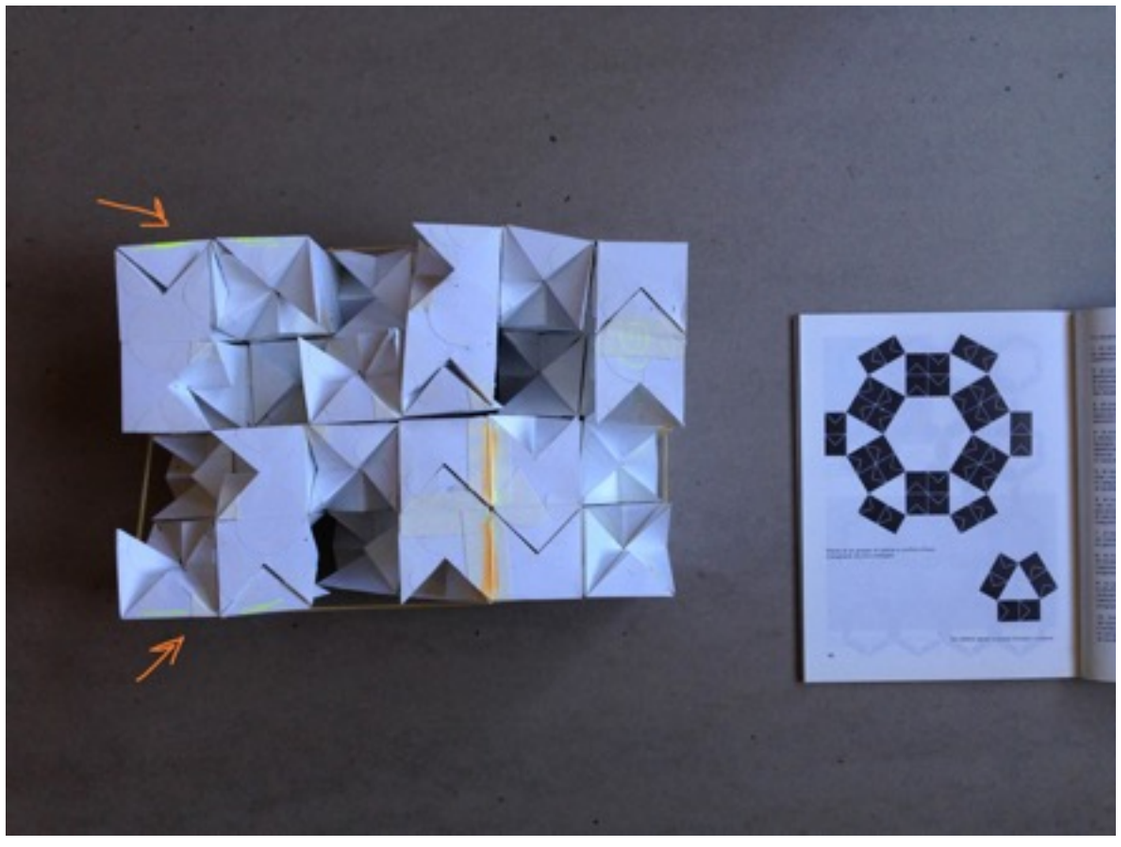
Scarpa, *Models of Rotational Geometry*, pp. 66-68, 96

(Trogu & Nies, prototype, 2015)



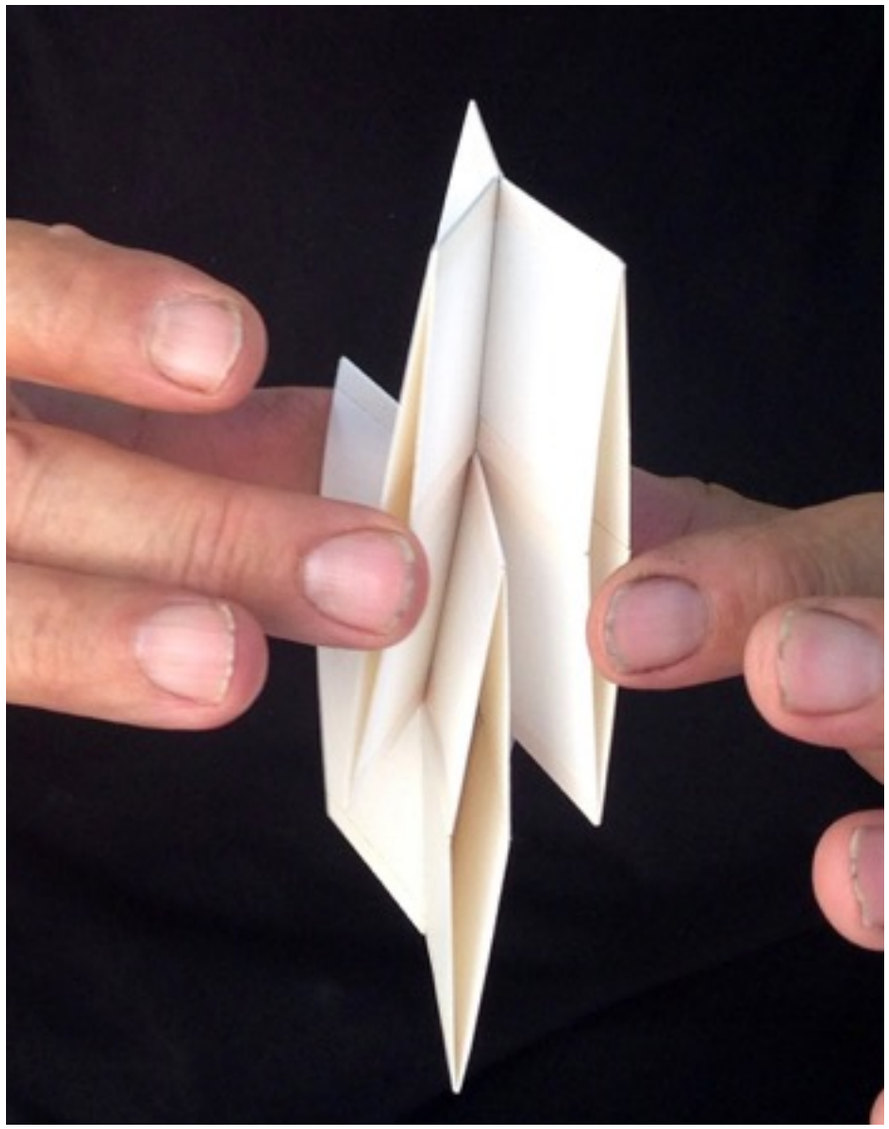




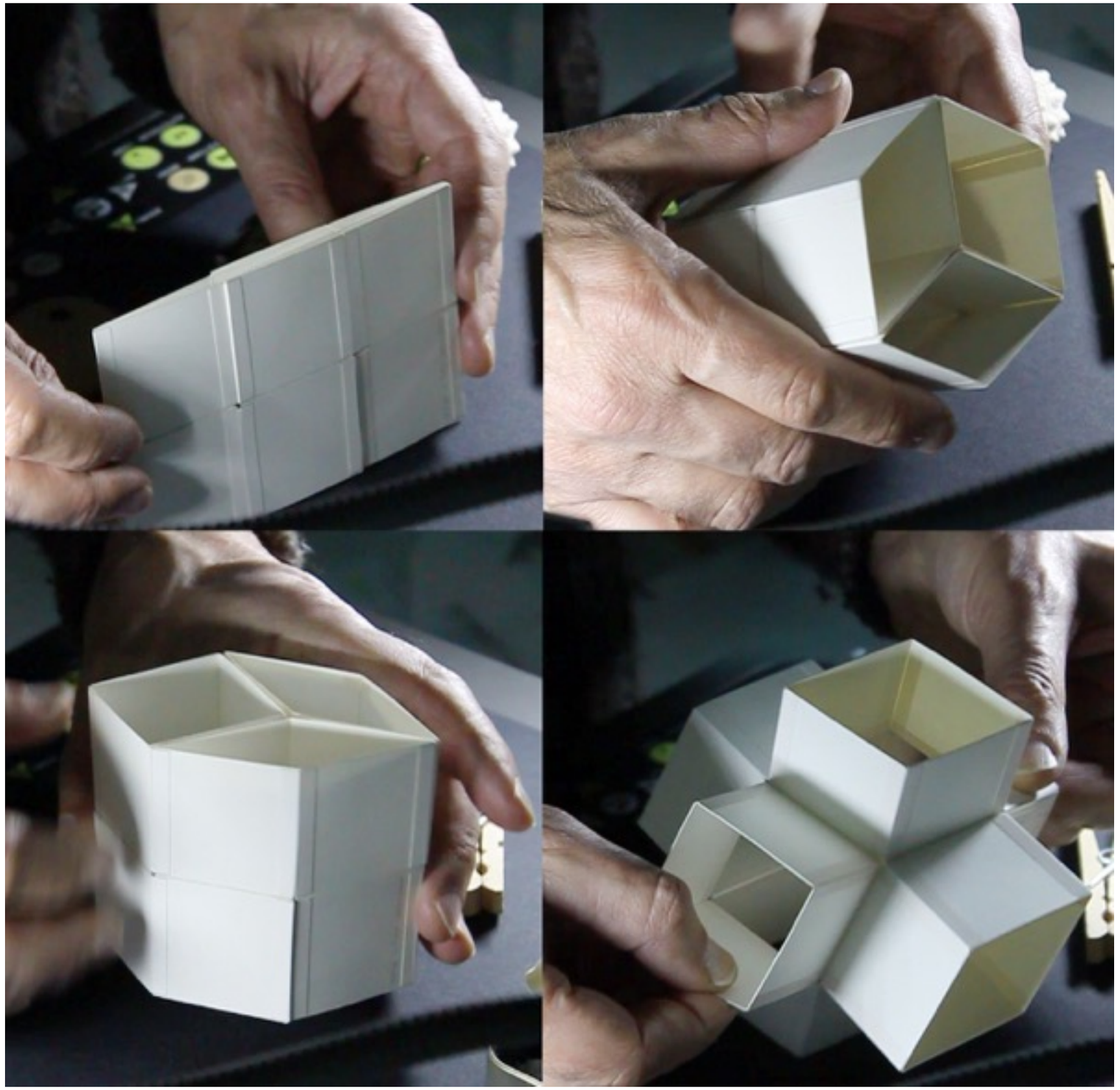


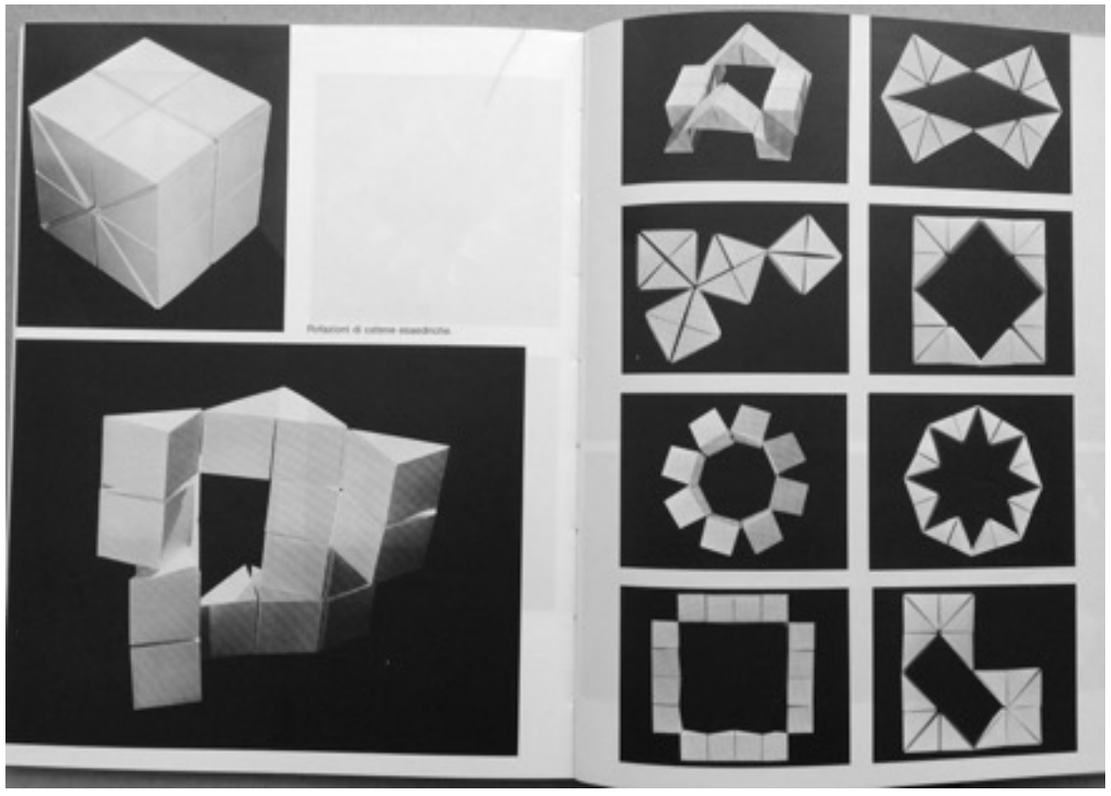
Scarpa, *Models of Rotational Geometry*, pp. 66-68, 96

(Trogu & Nies, prototype, 2015)

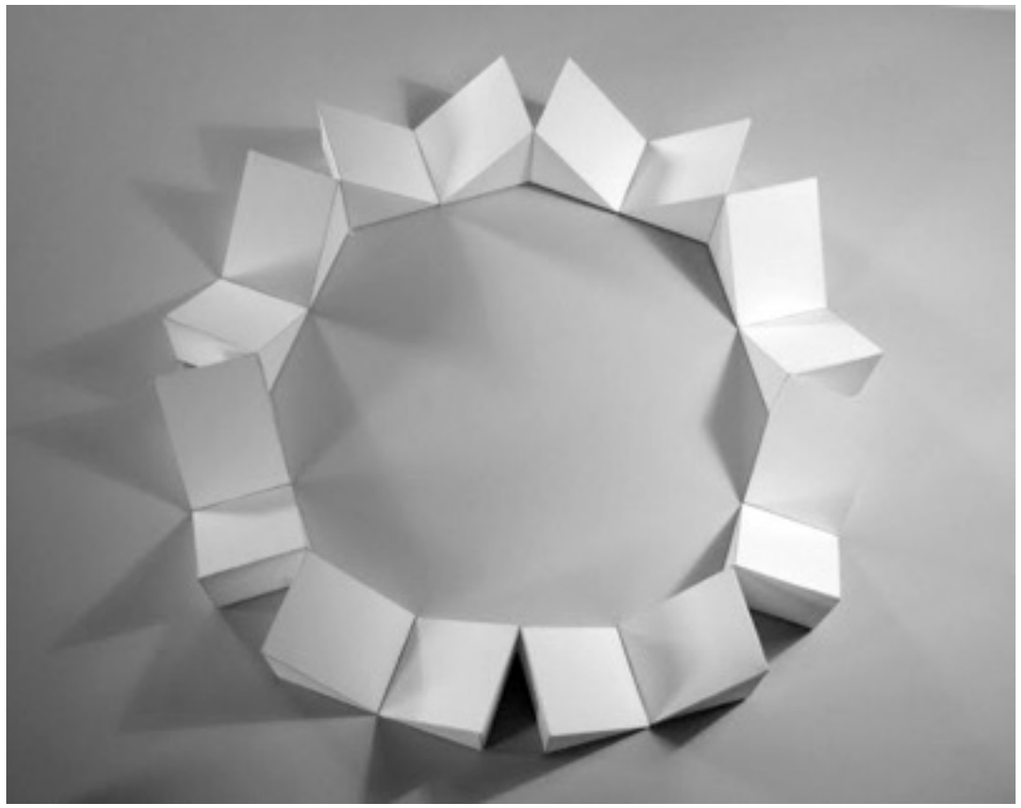


Scarpa, *Untitled, 1996*

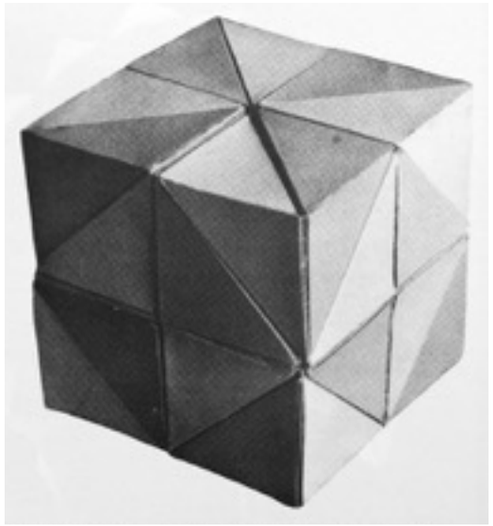


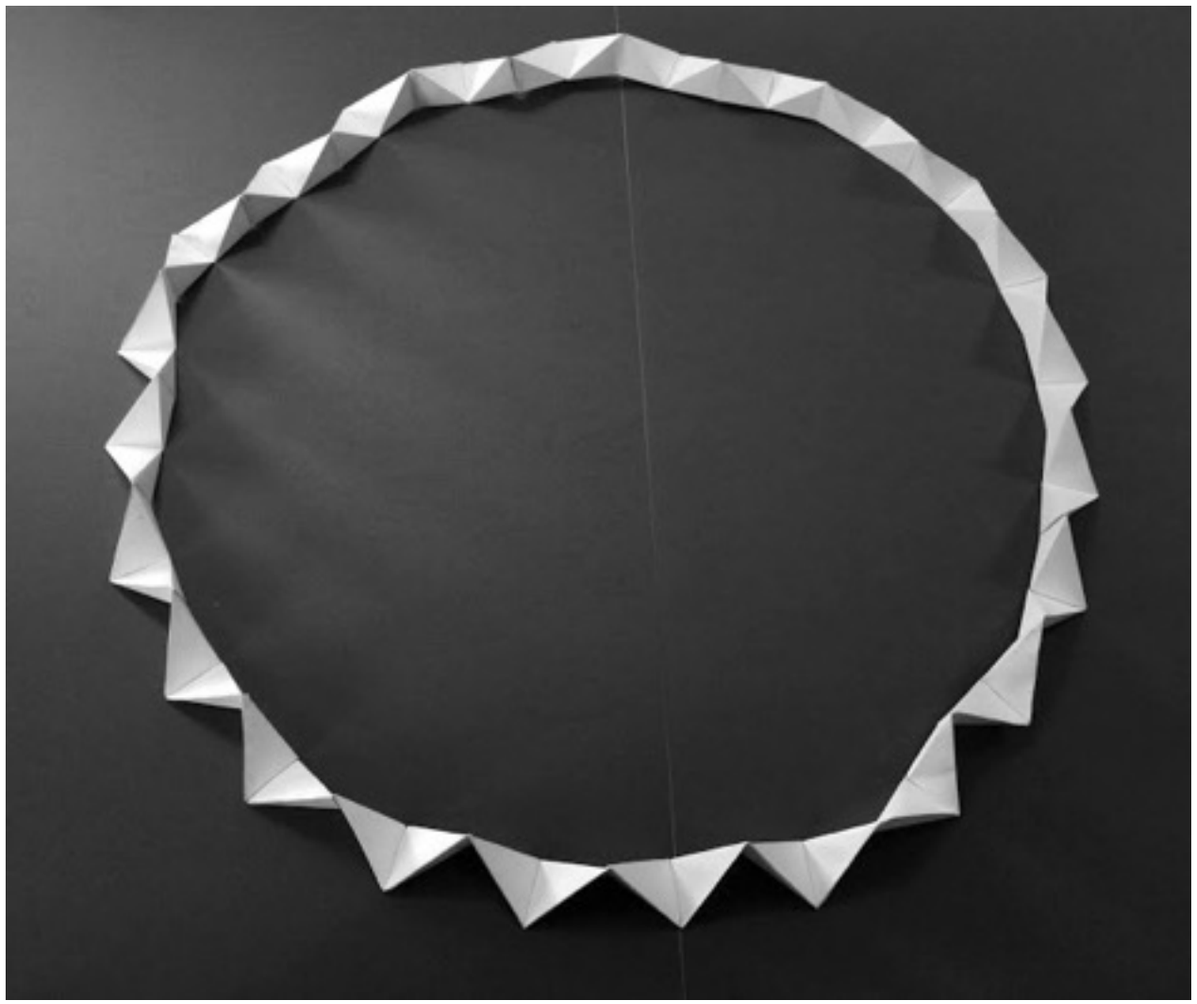


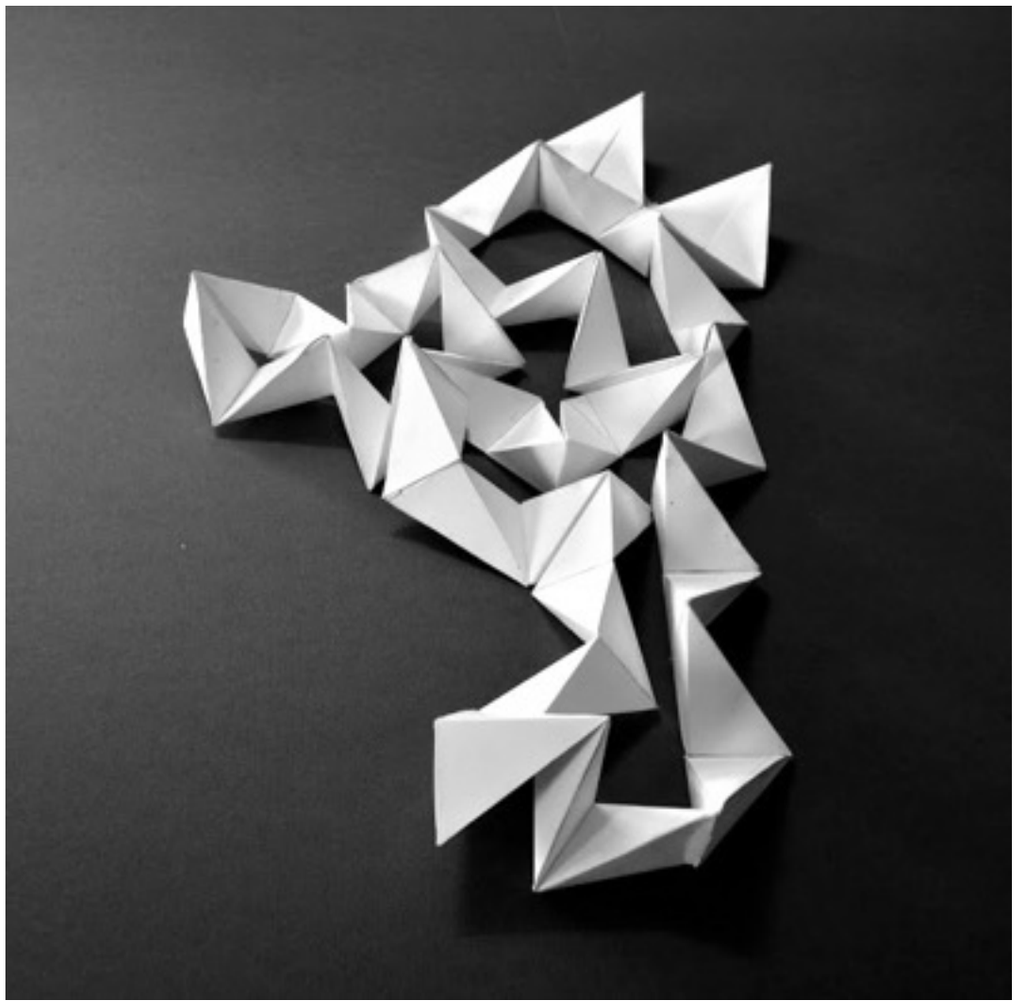
Scarpa, *Models of Rotational Geometry*
pp. 76–77



(L. Bocca, model replica, 2014)

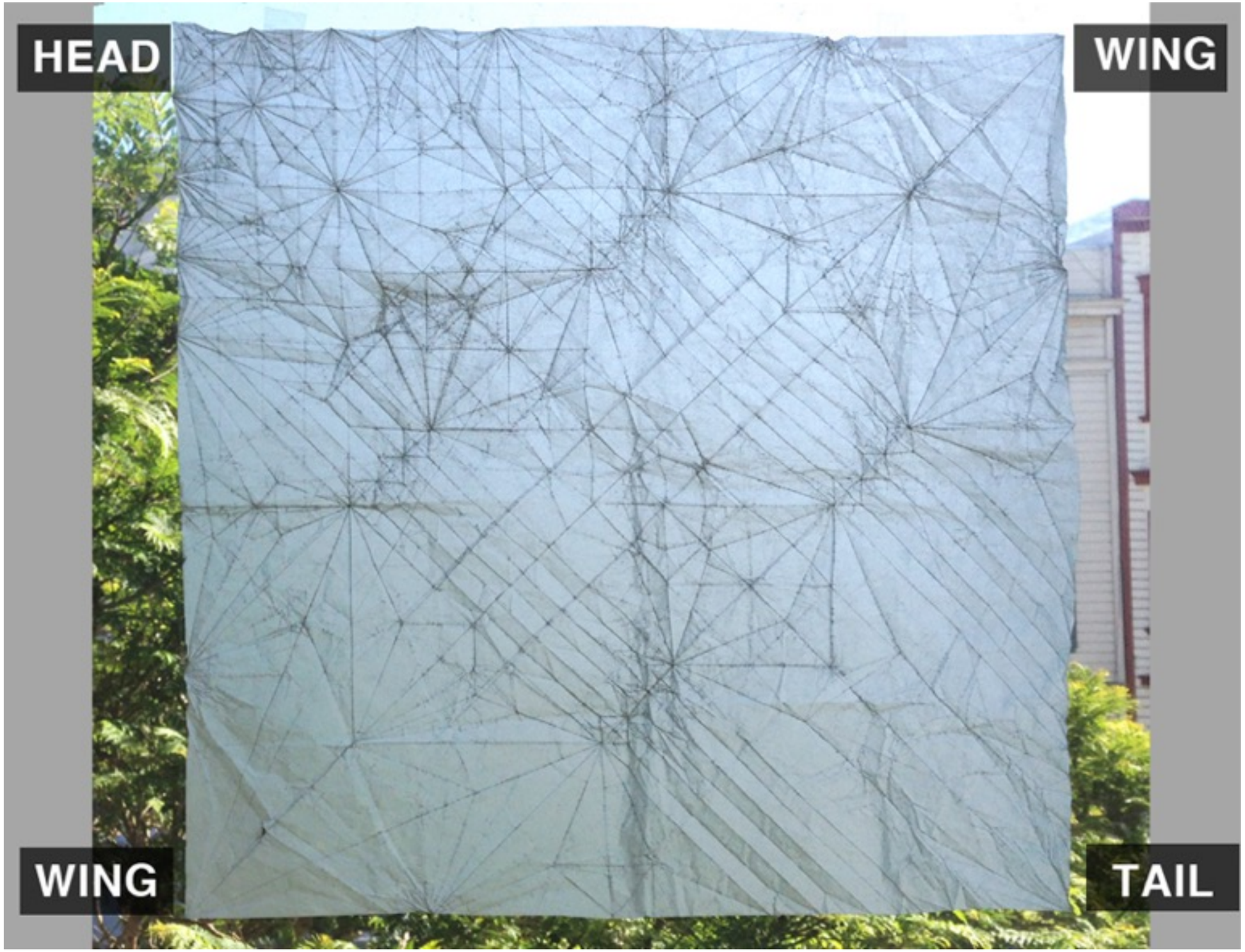






Scarpa, *Models of Rotational Geometry*, pp. 87–92

(L. Bocca, model replica, 2014)



What animal does the origami crease pattern above yield?
It's one of the models found here:
Francesco Trogu — Origami models: http://trogu.blogspot.nl/search/label/Origami%20Models

THANK YOU!

PINO TROGU

BIOCLAMPING: ARISTOTLE'S LANTERN

GIORGIO SCARPA'S MODEL OF THE MASTICATORY APPARATUS
OF THE SEA URCHIN… AND MORE.

Giorgio Scarpa, Pino Trogu, 1988

Filip Jelínek, 2015

More videos...

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trogu@sfsu.edu g.m.trogu@tudelft.nl

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