

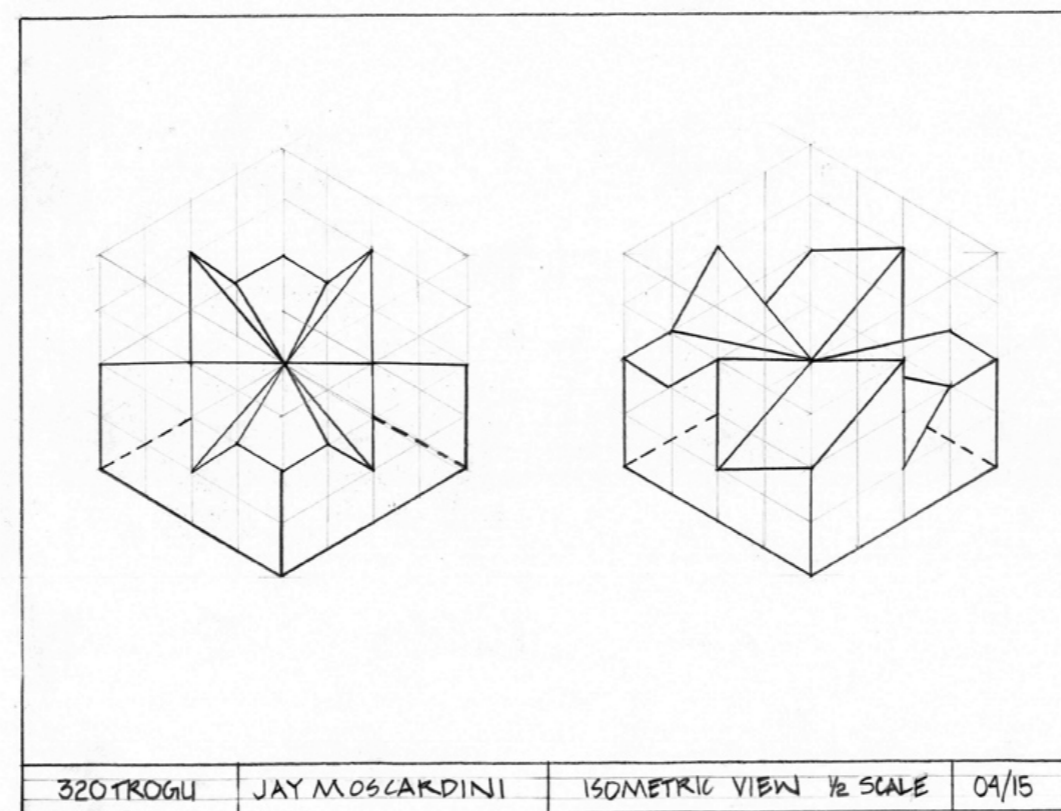
PINO TROGU – SAN FRANCISCO STATE UNIVERSITY

ROTATIONAL GEOMETRY AS A TEACHING TOOL : APPLYING THE WORK OF GIORGIO SCARPA

DRS // CUMULUS – OSLO, NORWAY

THE 2ND INTERNATIONAL CONFERENCE FOR DESIGN EDUCATION RESEARCHERS

15 MAY 2013



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Quaderni di design

La collana, dedicata in particolare a insegnanti e studenti di educazione tecnica, educazione artistica e design, è un prezioso e stimolante strumento di consultazione per chiunque si interessi alla formazione della cultura di oggi.

I singoli volumi, ampiamente illustrati, hanno per argomento i punti nodali della progettazione: la raccolta dei dati, la sperimentazione, l'aspetto fisico e psicologico del progetto, l'informazione culturale e tecnologica relativa a materie e strumenti, la metodologia progettuale, la costruzione di modelli, l'indagine su forme e fenomeni naturali, le regole di coerenza formale, il linguaggio tecnico e la comunicazione visiva.

Nella collana

- 1 Textures
a cura di Corrado Gavinelli
- 2 La scoperta del triangolo
a cura di Bruno Munari
- 3 Ricerca e progettazione di un simbolo
a cura di Pietro Gasperini
- 4 Xerografie originali
a cura di Bruno Munari
- 5 Modelli di geometria rotatoria
a cura di Giorgio Scarpa
- 6 La scoperta del quadrato
a cura di Bruno Munari

In preparazione

- 7 Colore: codice e norma
a cura di Narciso Silvestrini
- 8 La scoperta del pentagono
a cura di Aldo Montù

Sezionare una forma basilare, un quadrato o un triangolo, in due o più pezzi, ruotare questi pezzi sul piano fino a combinarli in altro modo: si ottengono nuove forme che, a loro volta si combinano con altre simili.

Da tutte queste combinazioni e rotazioni di elementi di forme nascono ancora altre forme che, a prima vista sembrano molto complesse, in realtà tutto diventa molto semplice, quando si conosce la regola.

Giorgio Scarpa mostra in questo libro tutti i procedimenti logici per ottenere nuove forme a due e a tre dimensioni. La conoscenza di questi processi aiuta la formazione di un pensiero progettuale più attivo e, inoltre, fa capire meglio certi aspetti di forme naturali nate dalla rotazione di elementi modulati. L'arancia è una sfera la cui forma nasce dalla rotazione dei moduli a forma di spicchio, attorno a un asse rettilineo.

33E0042 OD 05 Scarpa Modelli geom. rotatoria

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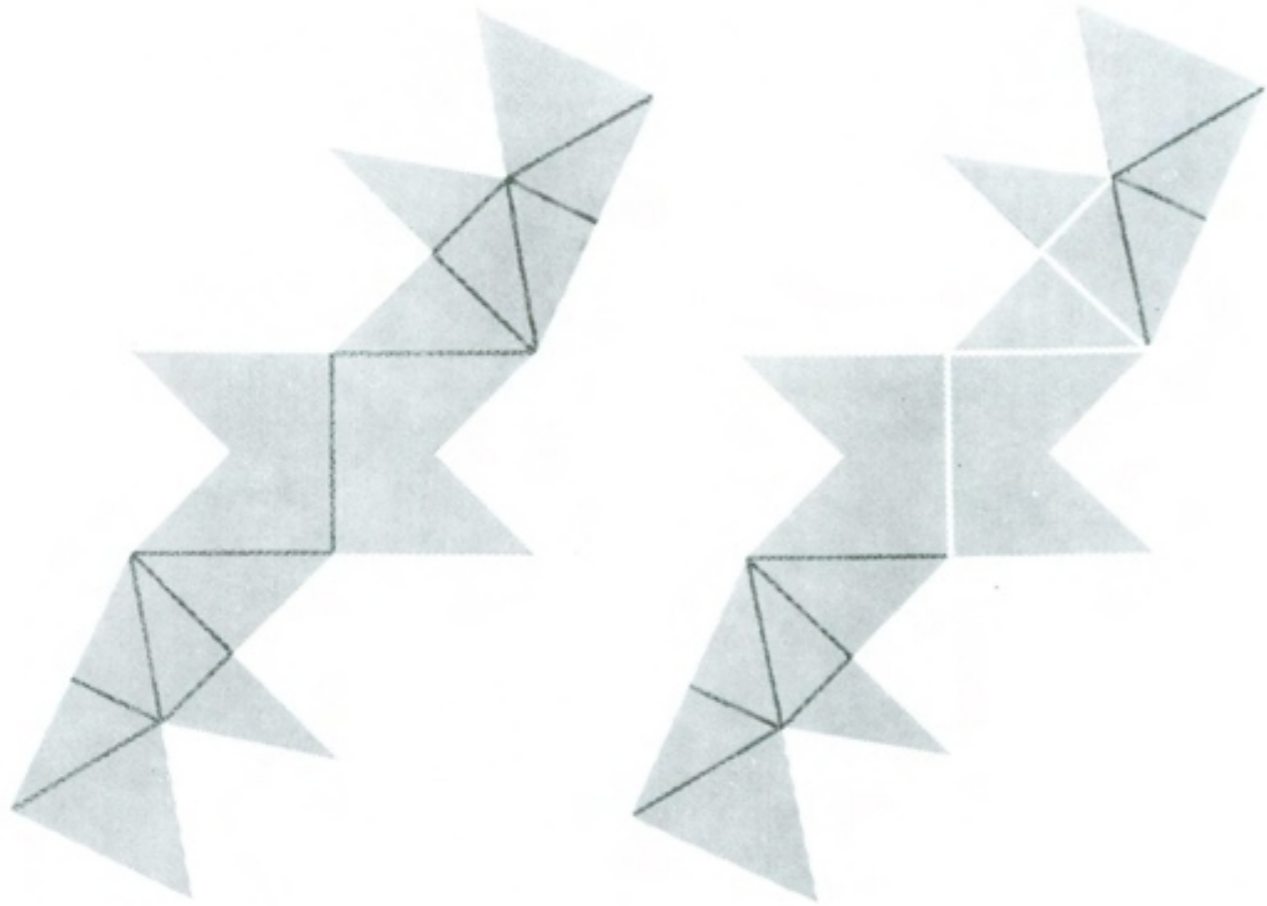
Collana diretta da Bruno Munari

Quaderni di design

MODELLI DI GEOMETRIA ROTATORIA

I moduli complementari
e le loro combinazioni

a cura di Giorgio Scarpa

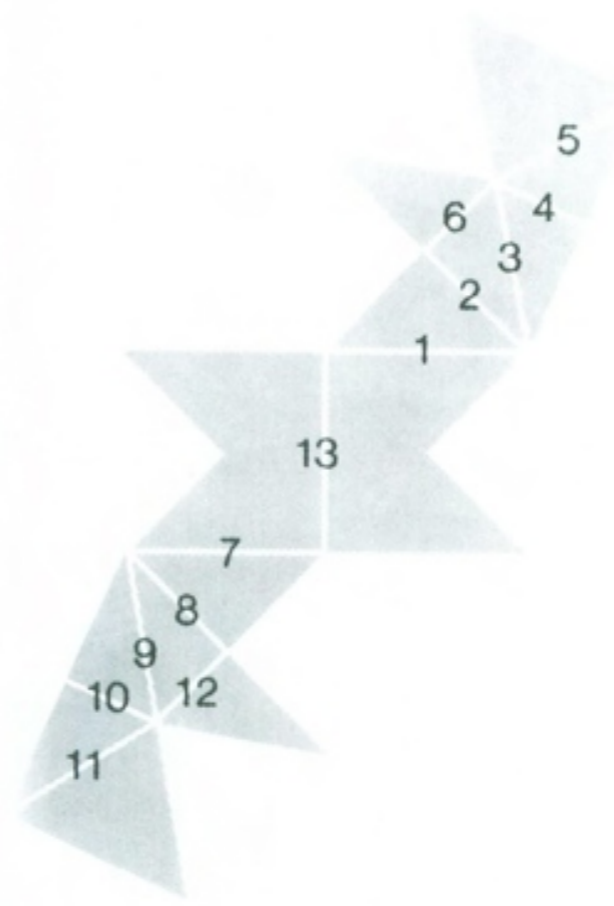


ROTAZIONE-PIEGATURA DEGLI SVILUPPI

I collegamenti degli sviluppi di superficie esterna coi piani interni dell'esaedro determinano, come abbiamo visto, nuove configurazioni, nuovi sviluppi, ripiegando i quali, e passando quindi dal piano allo spazio, si ottengono moduli tridimensionali. Il passaggio da due dimensioni a tre dipende:

1. dal far assumere la funzione di assi di rotazione a linee che dimensionano le superfici degli sviluppi;

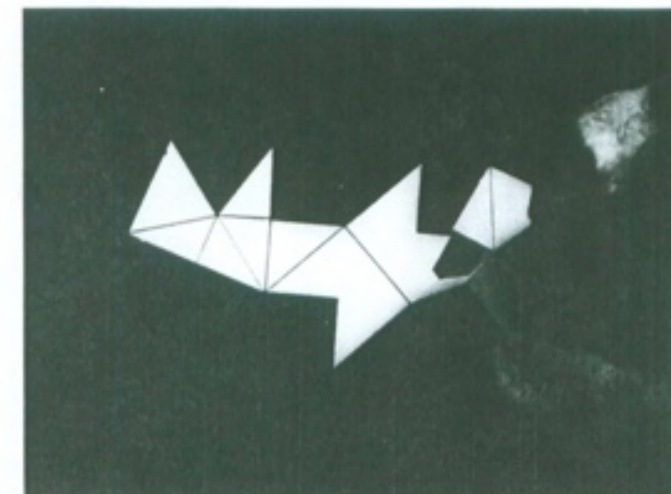
2. dall'individuare lungo queste configurazioni lineari, sequenze di piegatura costituenti determinati percorsi;
3. dalla scelta dei percorsi più logici ed economici;
4. dal ruotare (piegare) secondo determinati angoli, parti del modello intorno a queste linee (assi);
5. dal regolare numero e tipo di operazioni in riferimento a schemi di organizzazione formale.

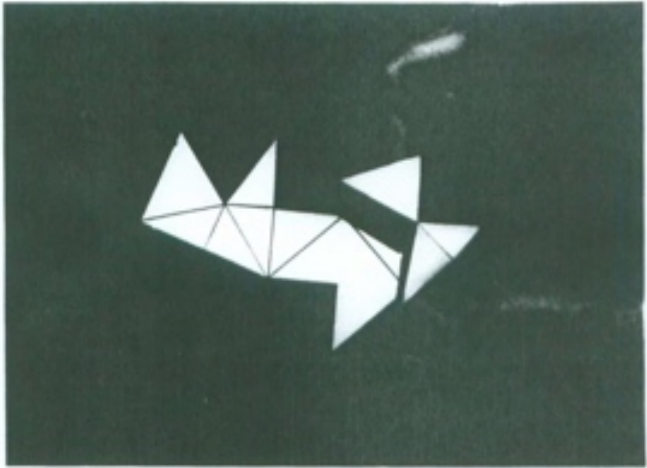


Esempi:
ordine di piegatura indicato sulle linee interne dai numeri 1-13, relativo alla definizione del modulo;

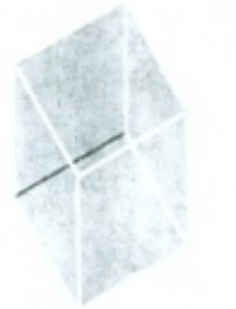


cella cubica a cui riferire le sequenze di piegatura del modello.





Il percorso lineare intorno al quale ruotare i piani del modello è il seguente:



1. spigolo del cubo



2. metà diagonale di una faccia



4. metà asse interno



5. metà diagonale interna



3. metà diagonale interna



6. metà asse interno



7. spigolo



8. metà diagonale di una faccia



9. metà diagonale interna



10. metà asse interno



11. metà diagonale interna

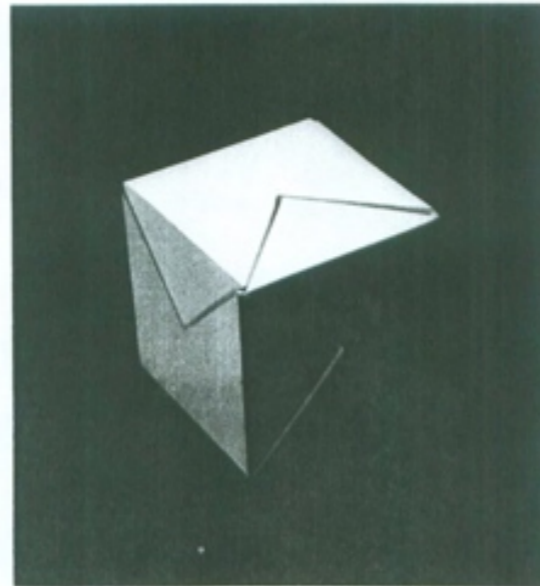




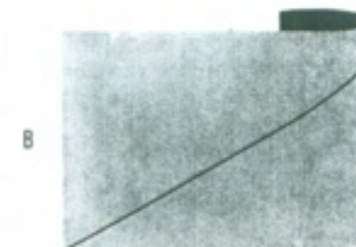
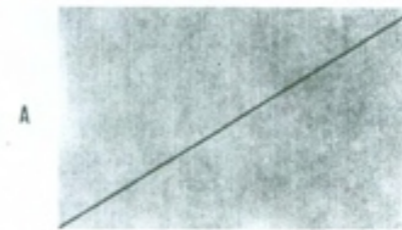
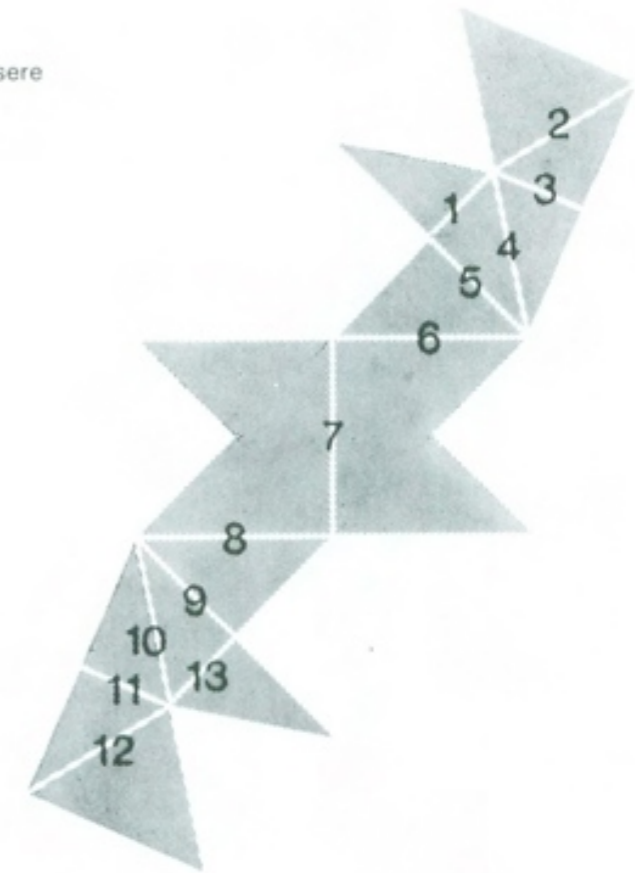
12. metà asse interno



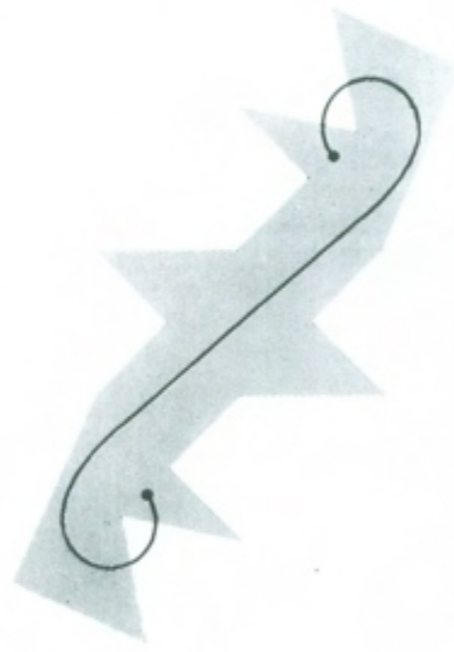
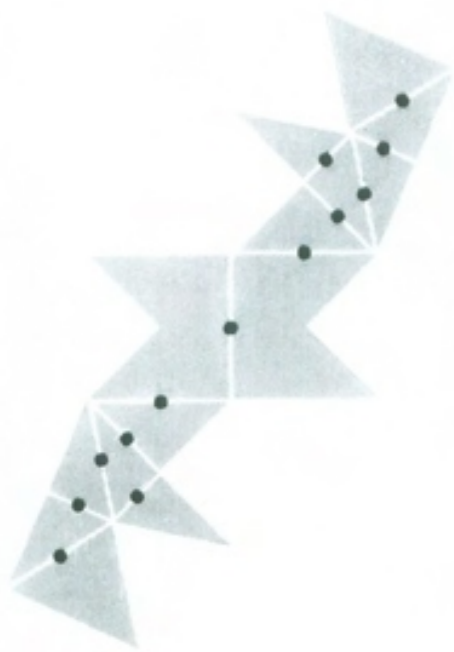
13. spigolo
Le rotazioni sono di 90°.



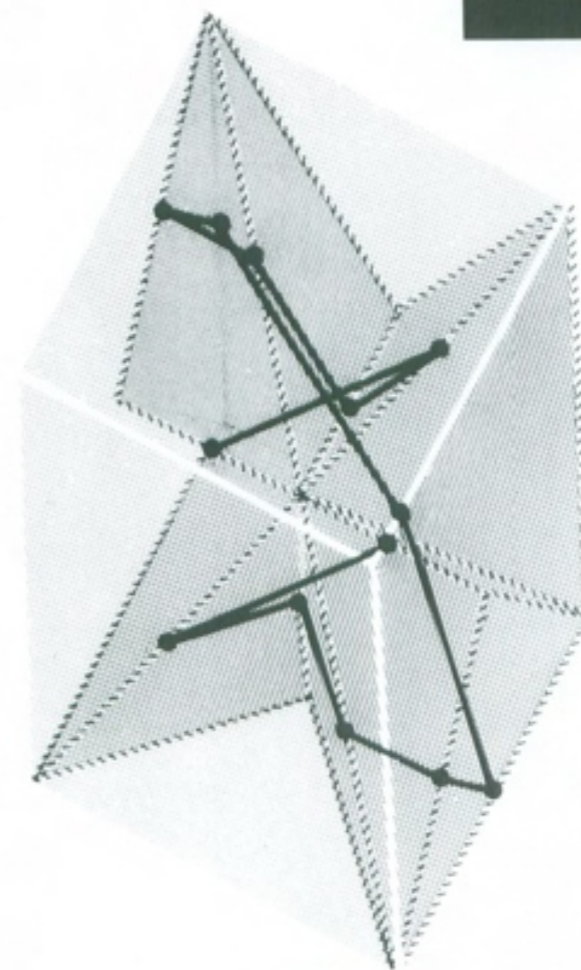
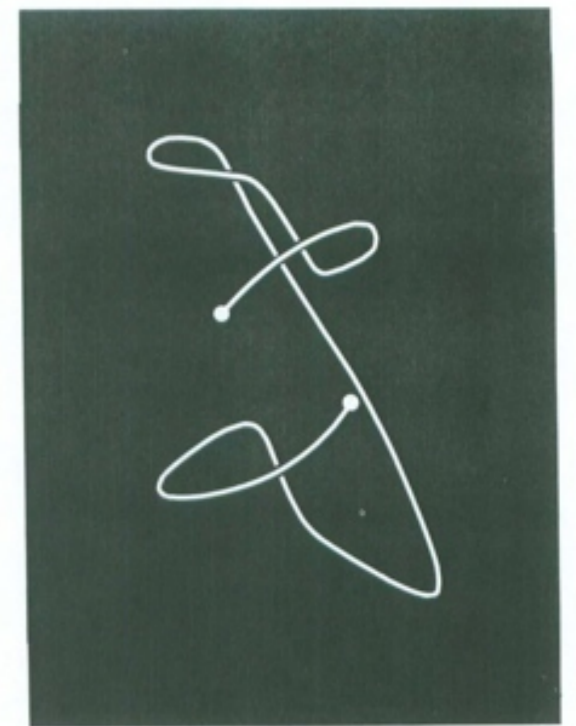
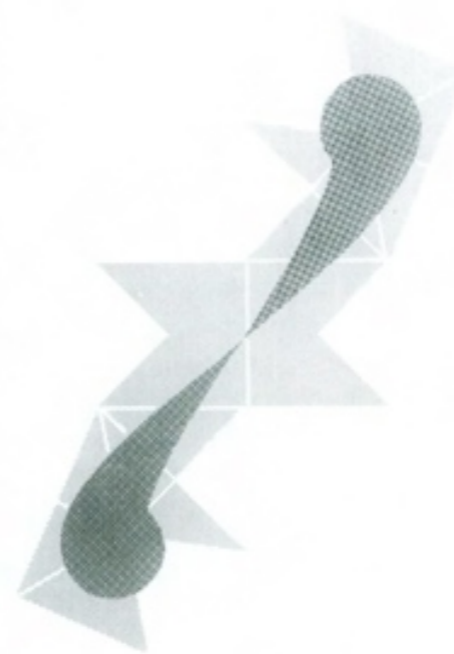
Uno stesso sviluppo può essere variamente ripiegato.

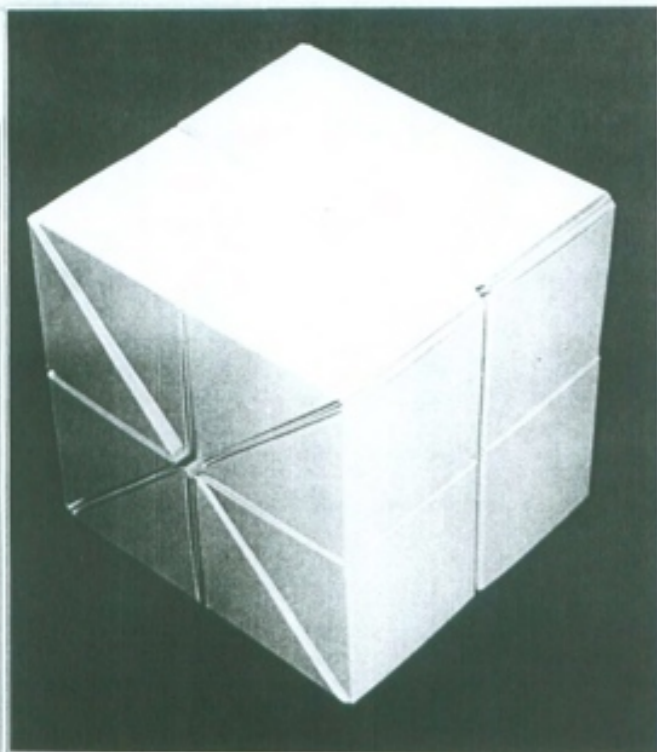


Che cos'è un'elica? è la curva spontanea disegnata nell'aria dai semi del tiglio quando si staccano dalla pianta; o dalla terra, che ruotando nello spazio intorno al Sole si sposta sull'asse di avanzamento del Sole verso la stella Vega; è per il pittore Paul Klee "...la più pura forma di movimento pensabile". In geometria, è nella sua forma più semplice, lo sviluppo cilindrico della diagonale di un rettangolo.

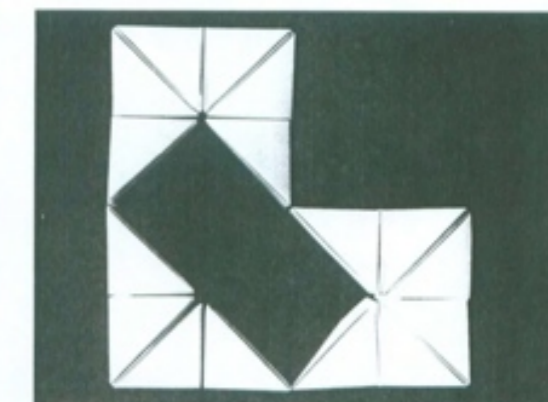
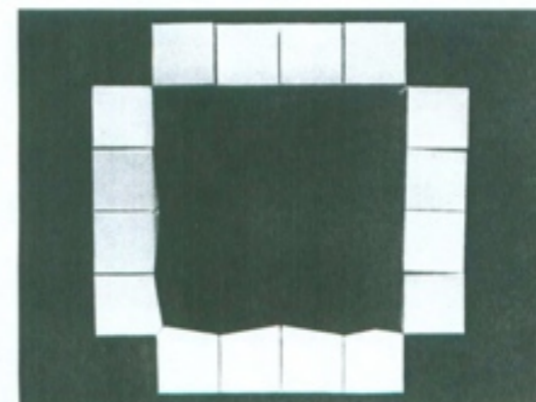
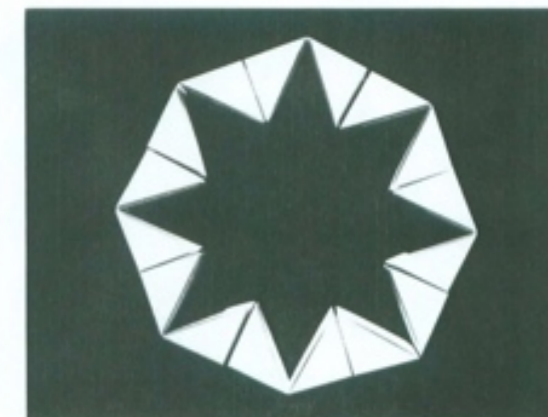
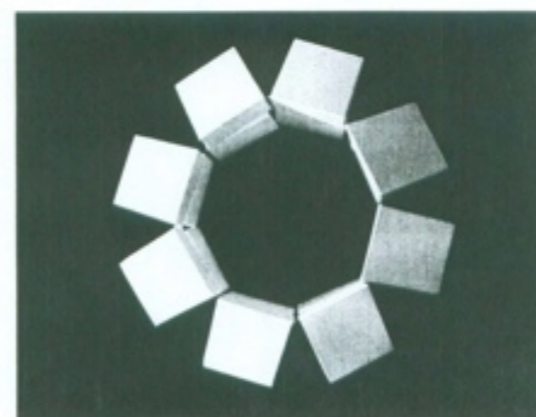
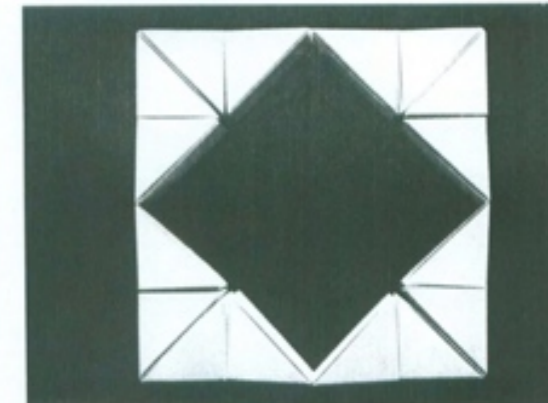
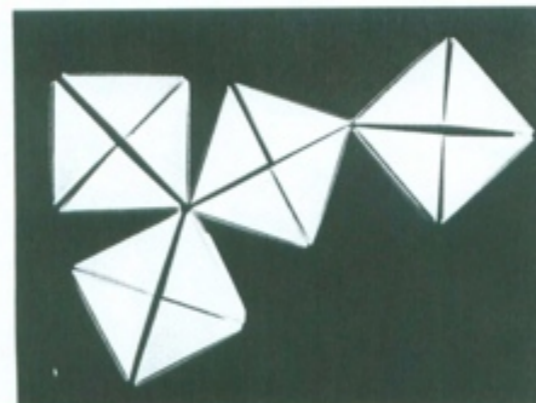
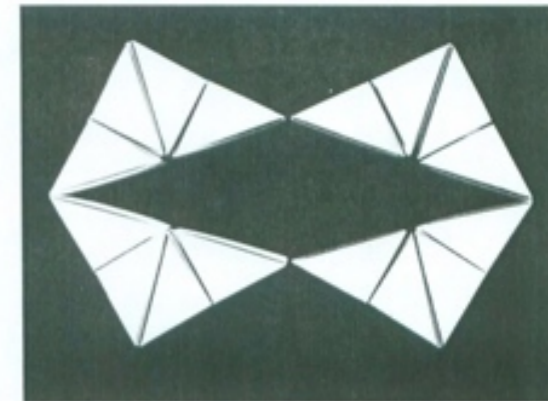
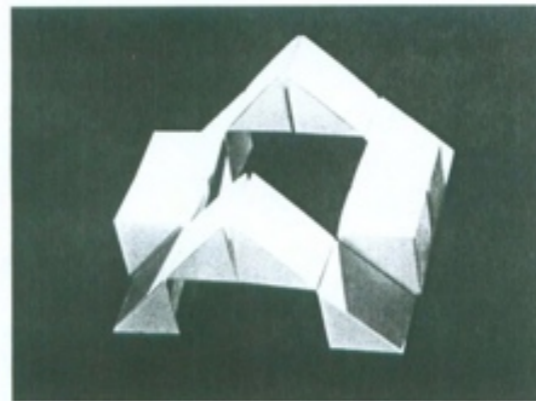
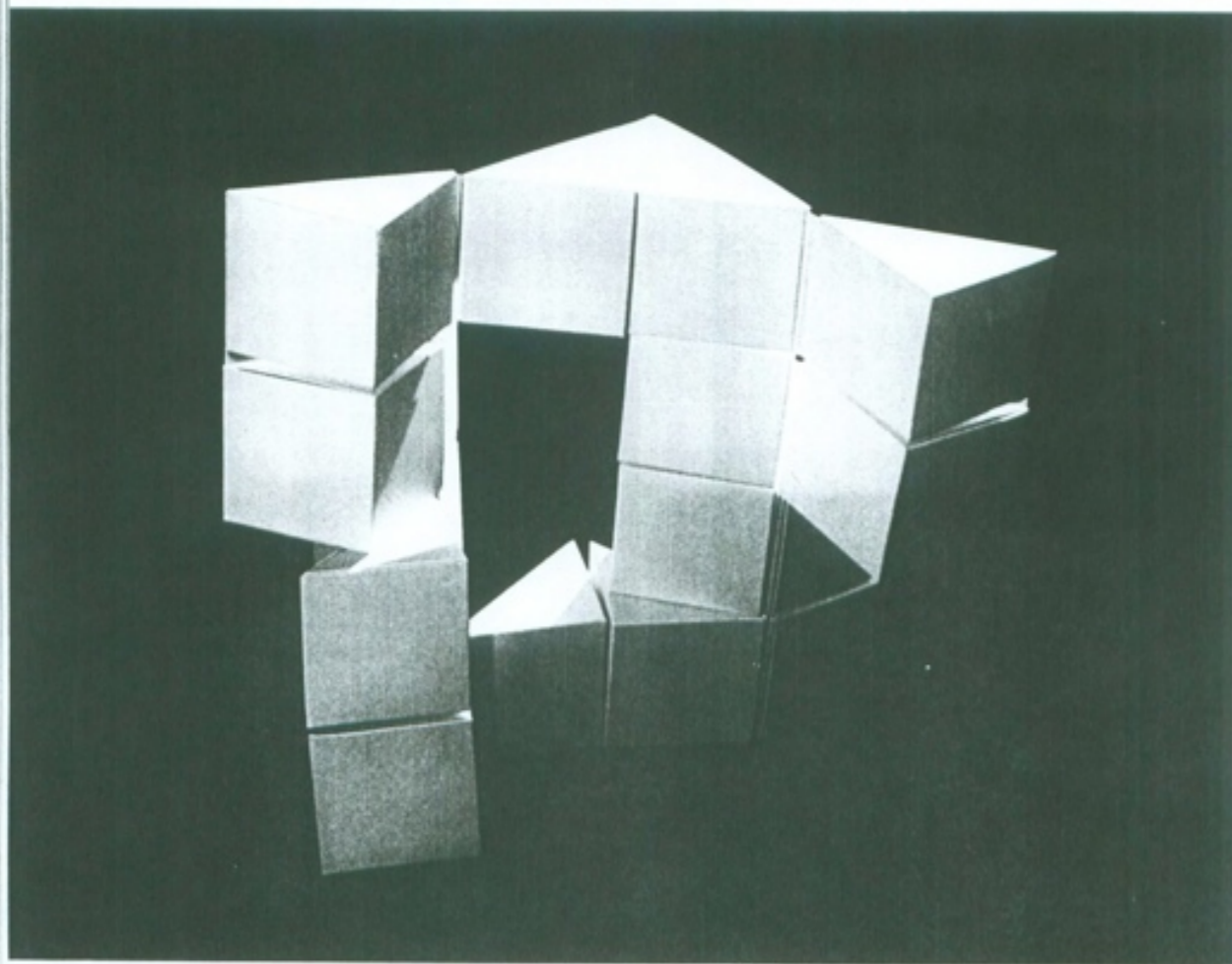


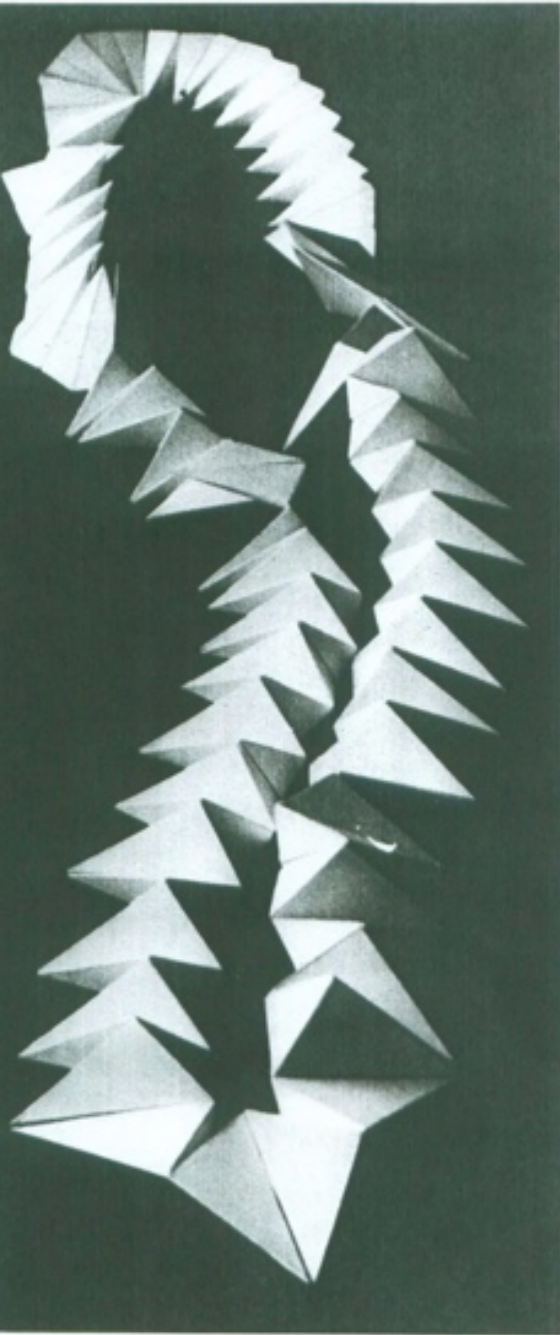
Consideriamo i piani articolati in due raggruppamenti (1-7 e 7-13, v. pagine precedenti) intorno al centro di rotazione 7; la loro forma complessiva è simile ad una esse che risulta più visibile se con una linea curva raccordiamo tra loro i punti da 1 a 13, o disegniamo due regioni che delimitano il tracciato puntiforme, accentuando l'andamento ciclico a due bracci dello sviluppo. La composizione dei movimenti di piegatura con cui portiamo nello spazio i piani, ruotandoli intorno agli assi 1-13, dà come risultante una traiettoria a forma di elica. Con questa mappa spaziale che unifica la successione dei movimenti, definiamo lo sviluppo in terza dimensione. La rappresentazione di mappe dei movimenti di ripiegamento deve avere come fine il controllo dell'intero processo, in vista della sua semplificazione.



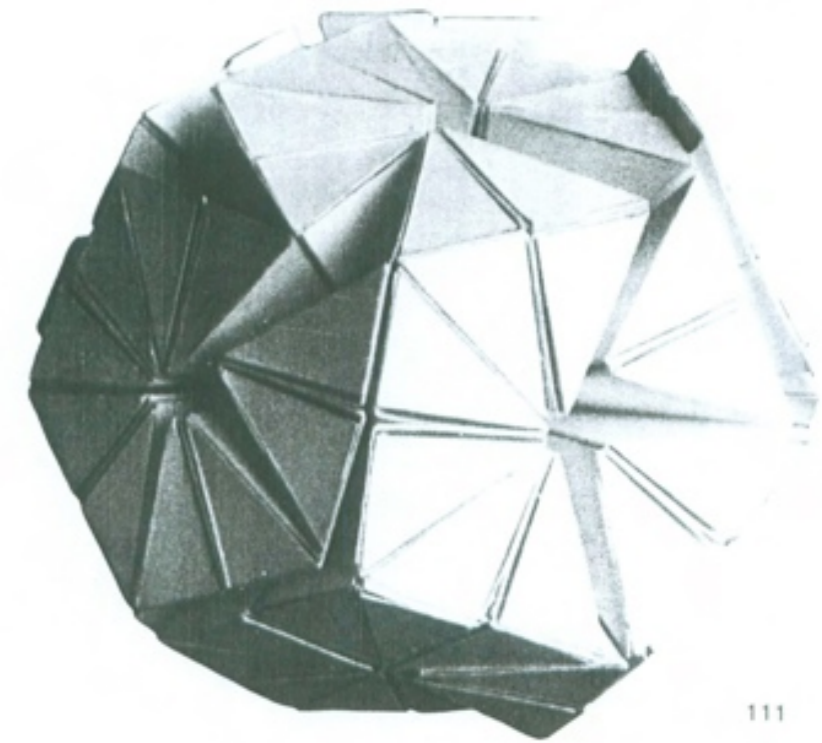
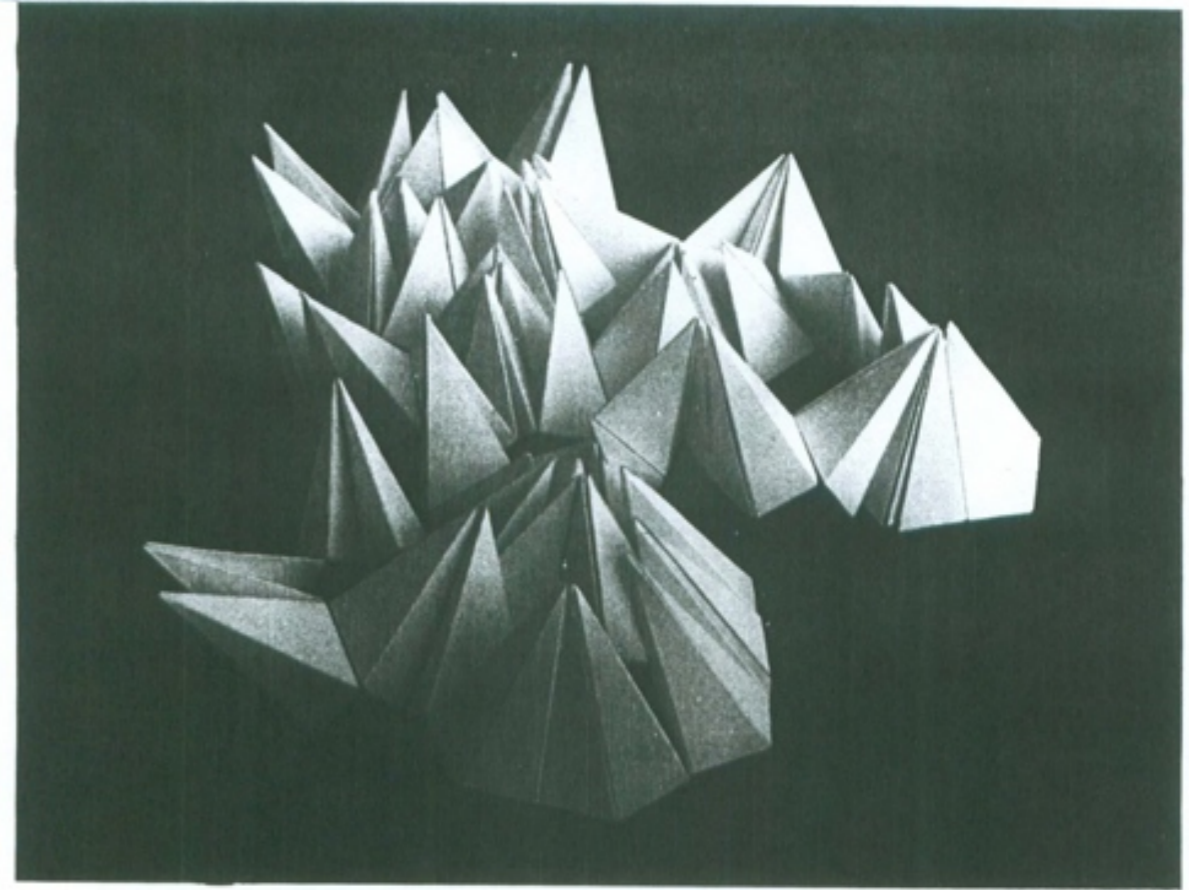


Rotazioni di catene esaedriche.





110



111







TWIN SECTION

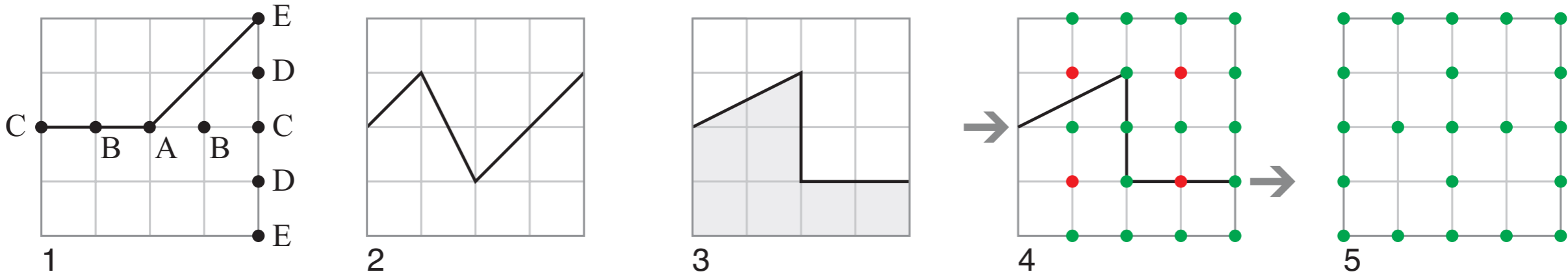


Fig. 1

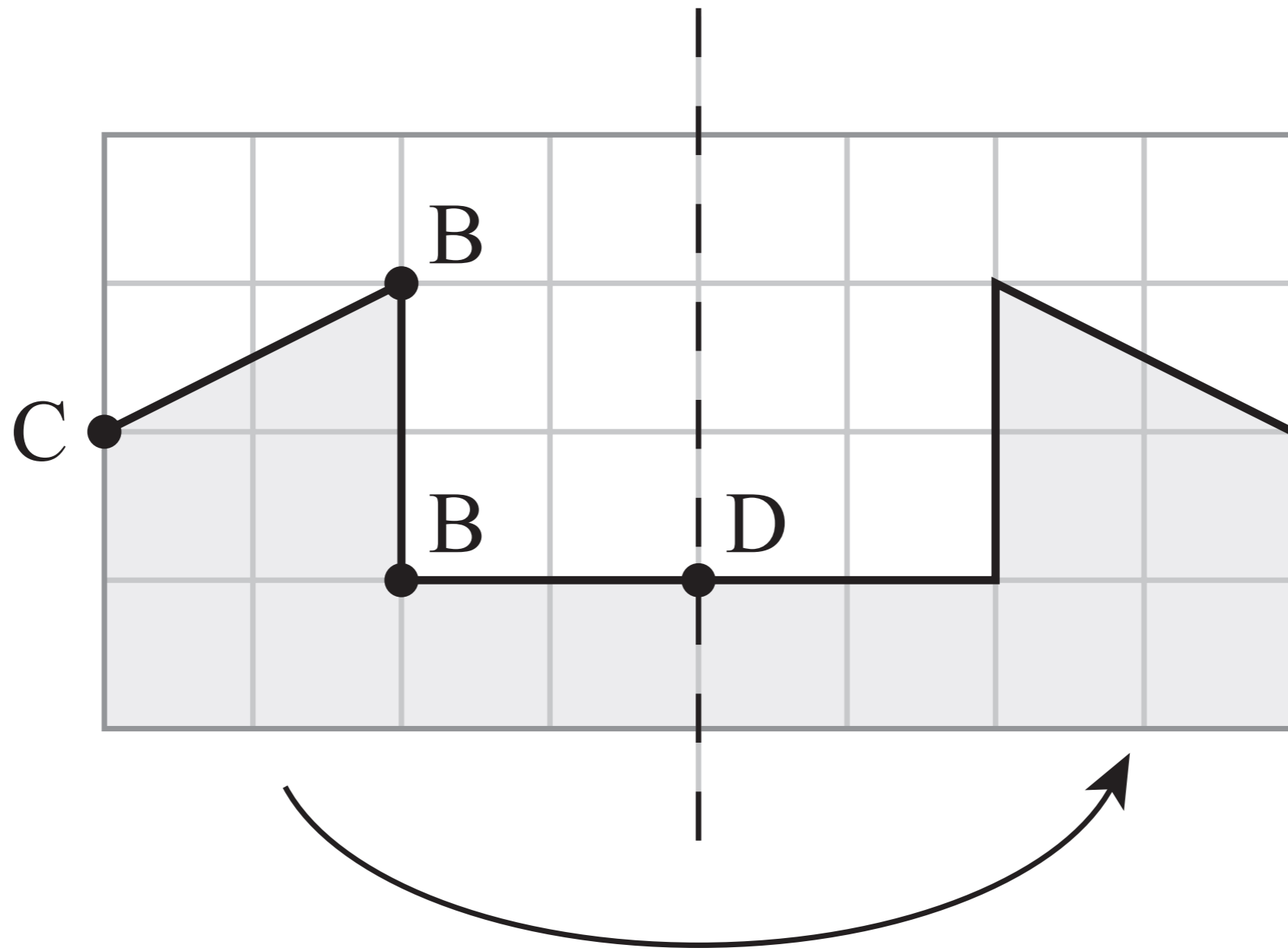


Fig. 2

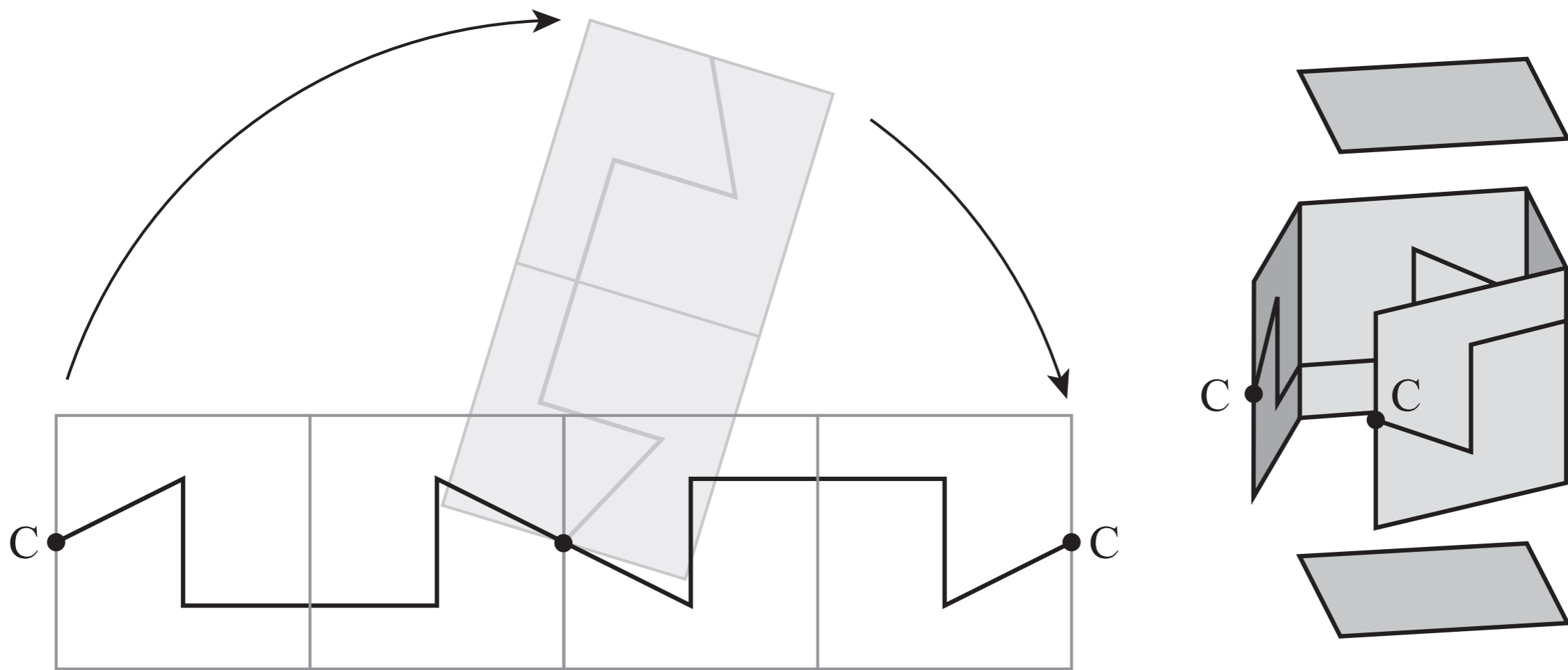


Fig. 2b

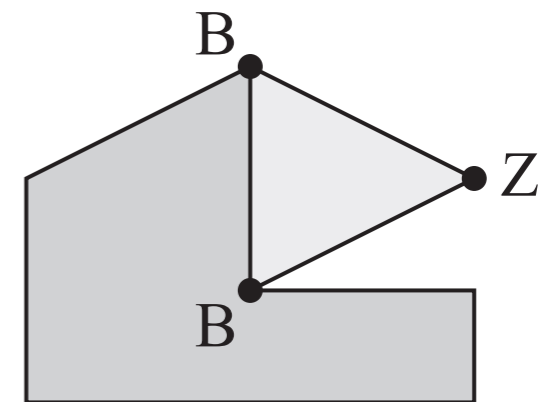
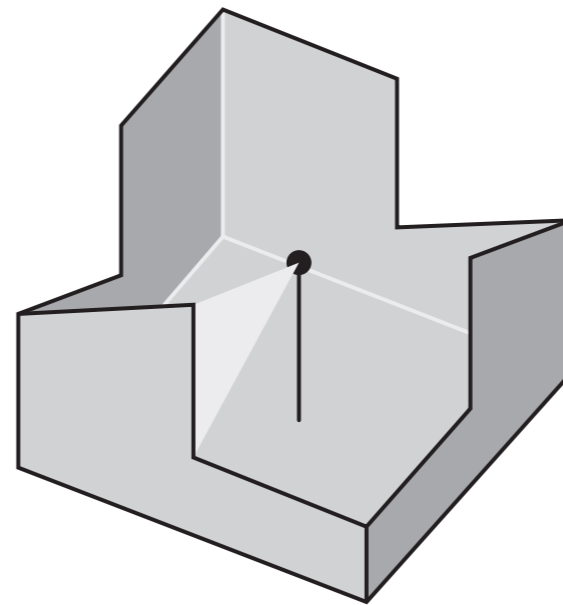
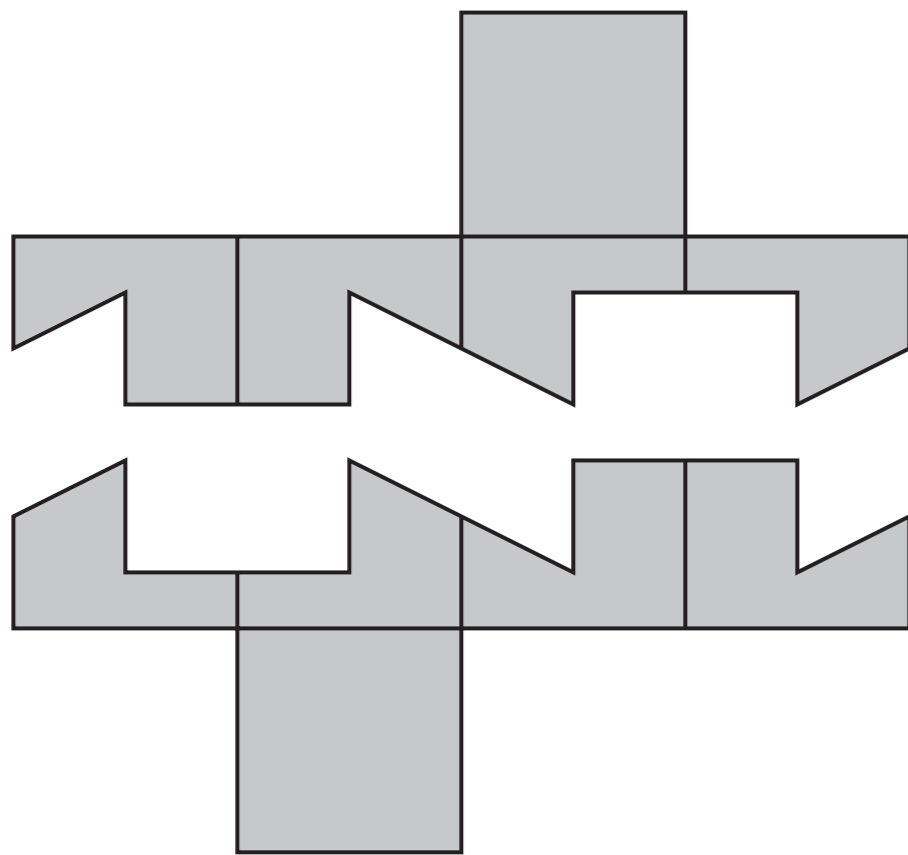
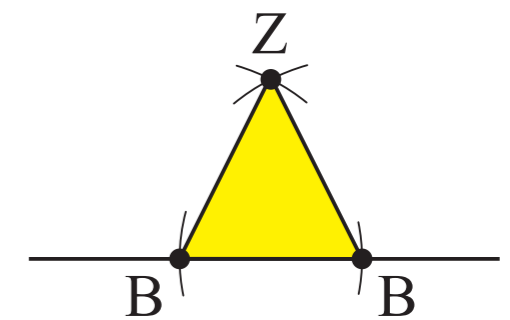
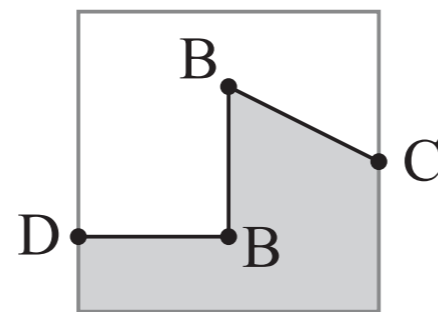
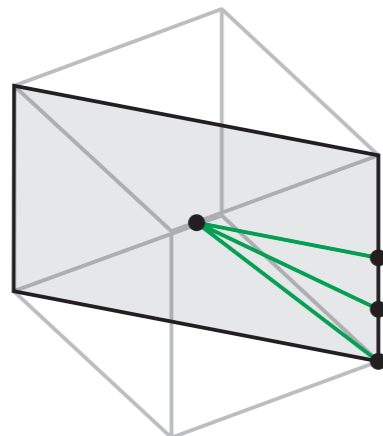
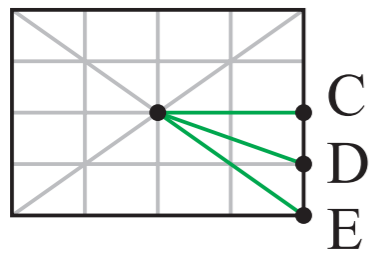
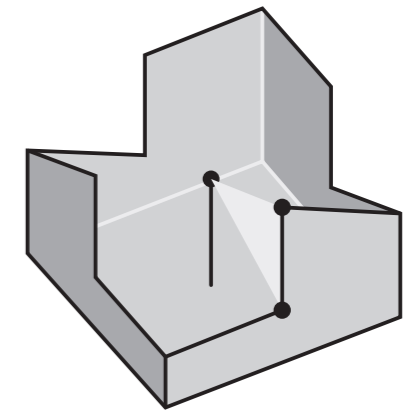
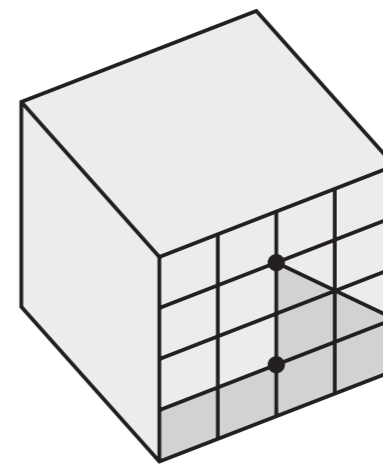
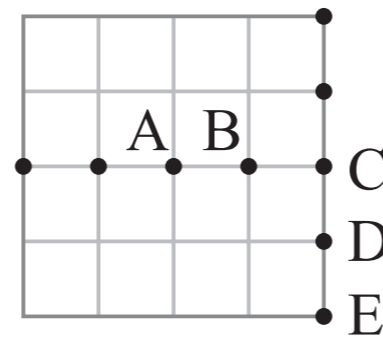
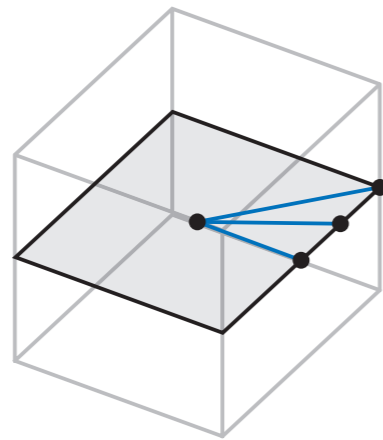
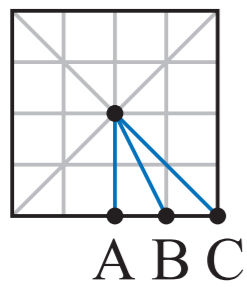


Fig. 3



1

2

3

4

5

Fig. 4

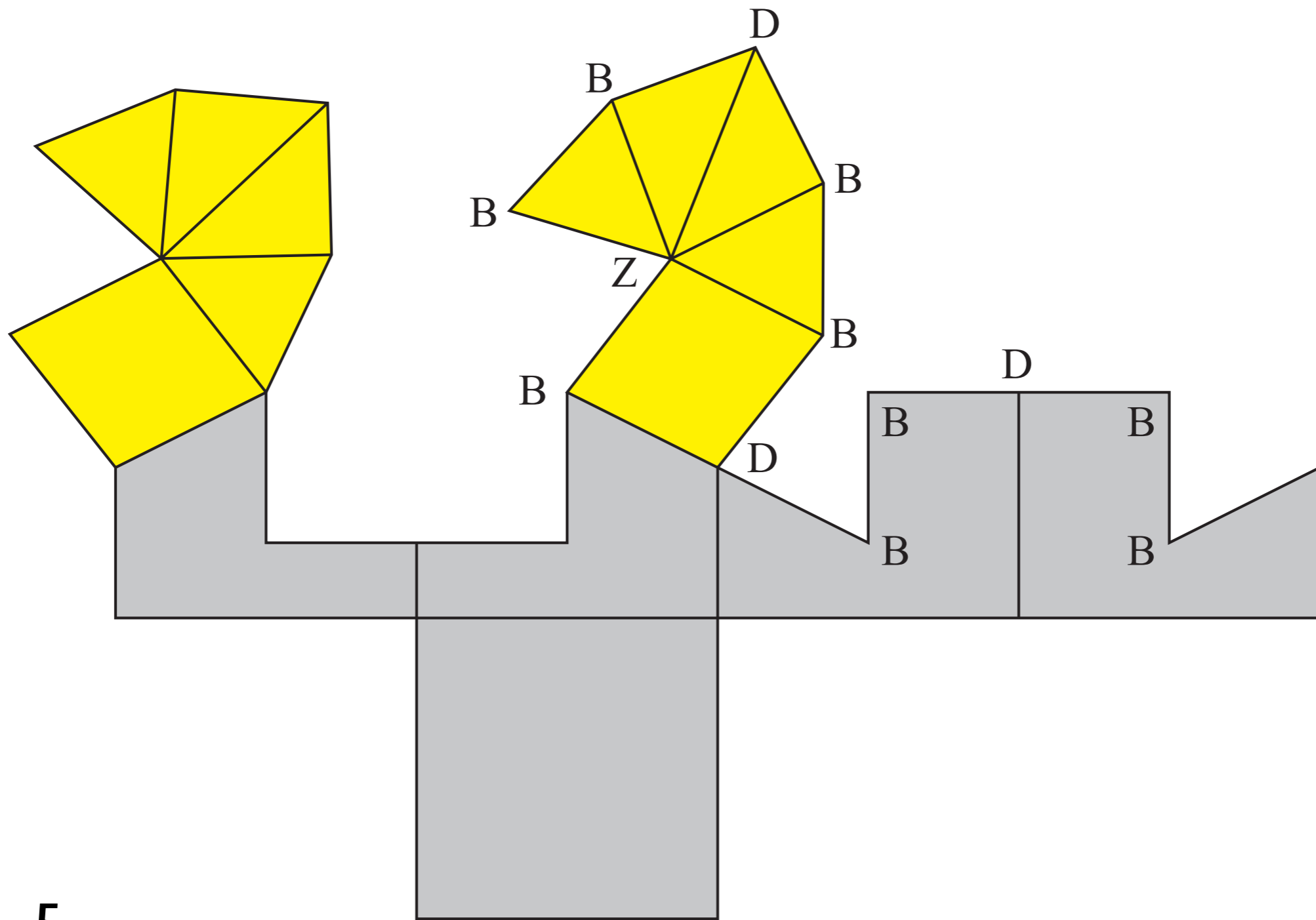


Fig. 5

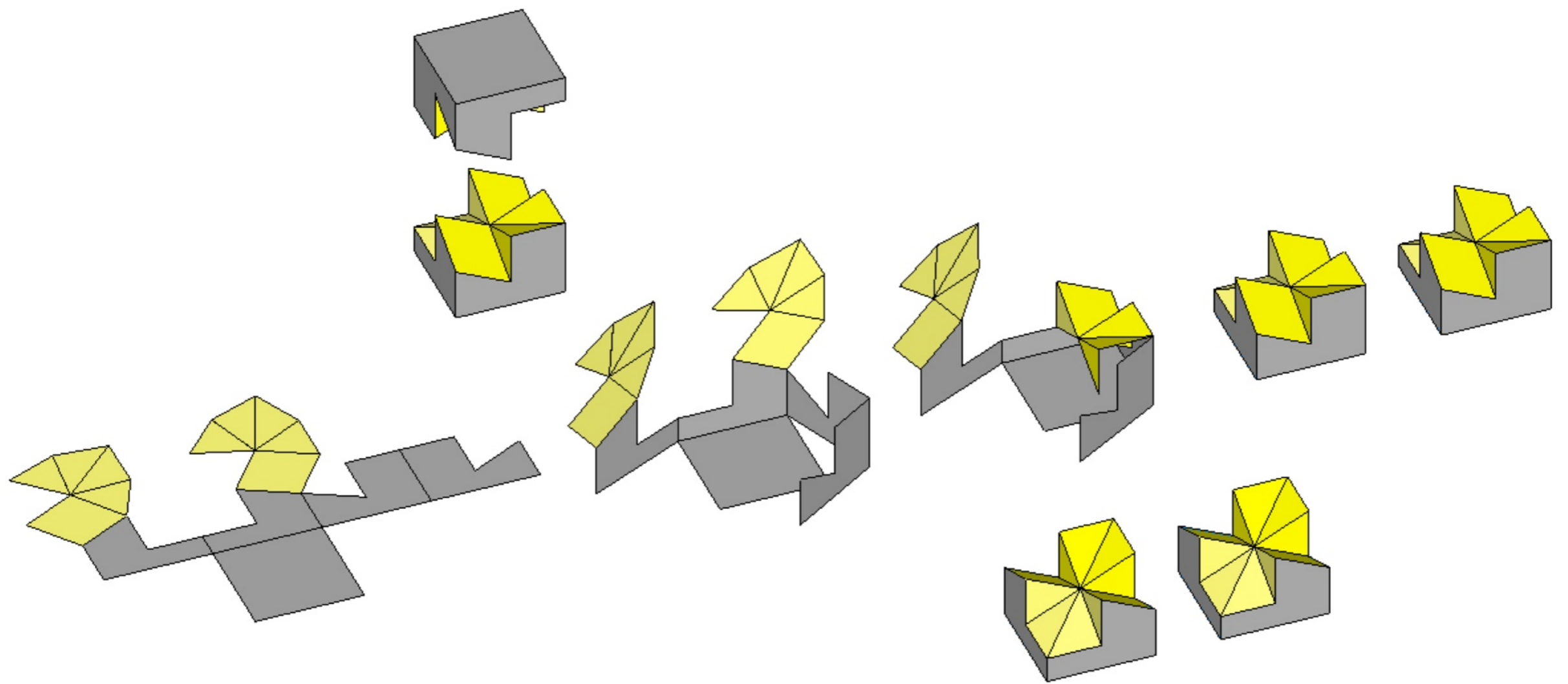
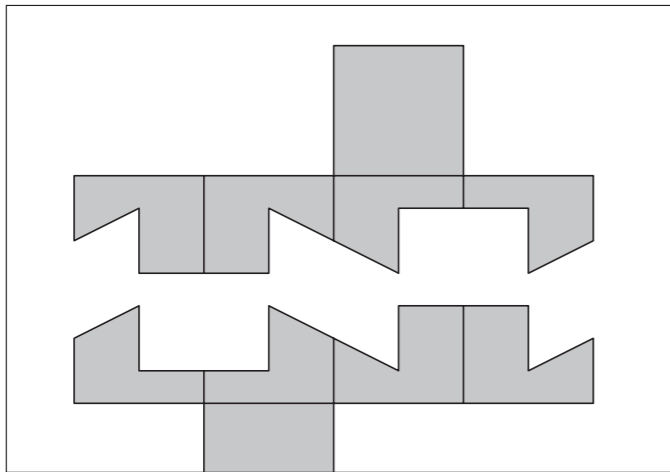
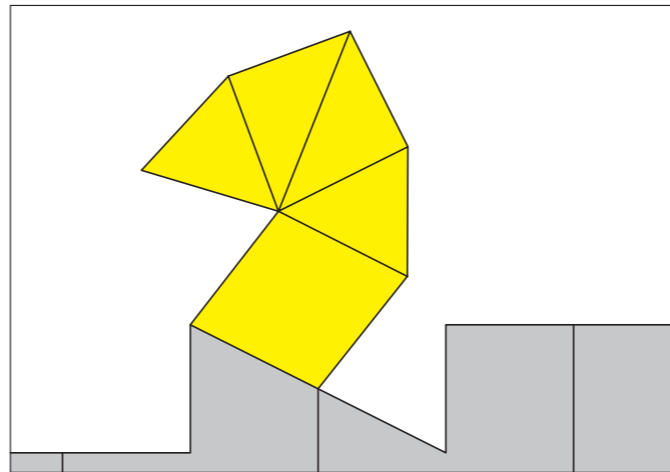


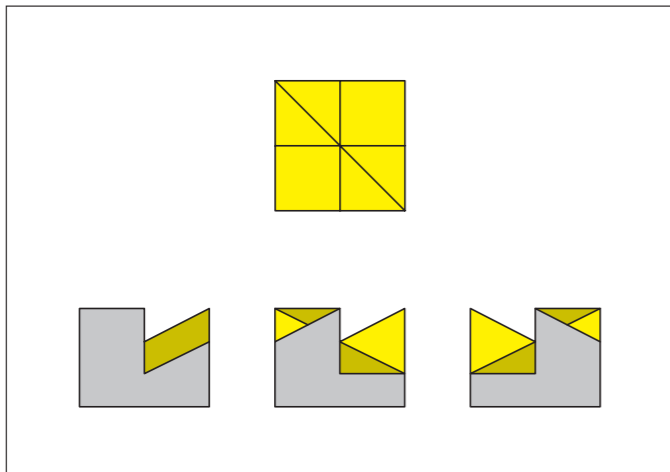
Fig. 6



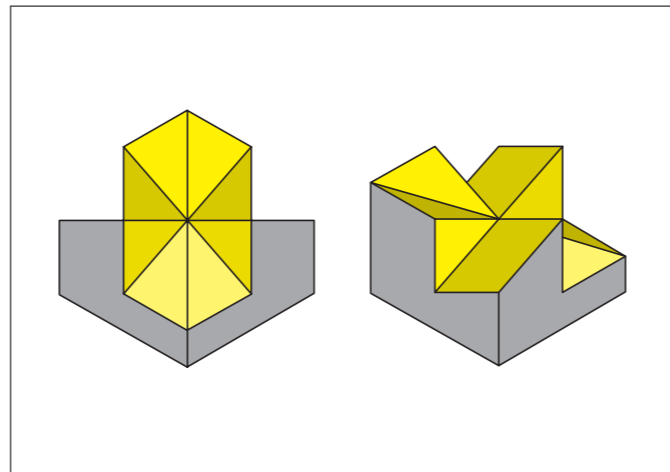
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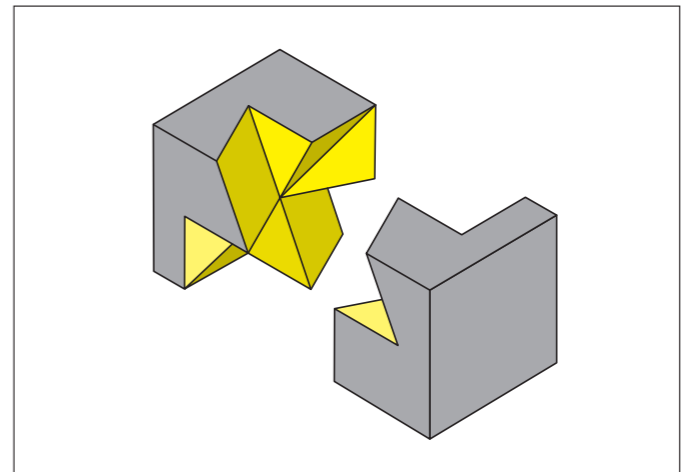
7a



7b



7c



7d

Fig. 7

TRIPLET SECTION

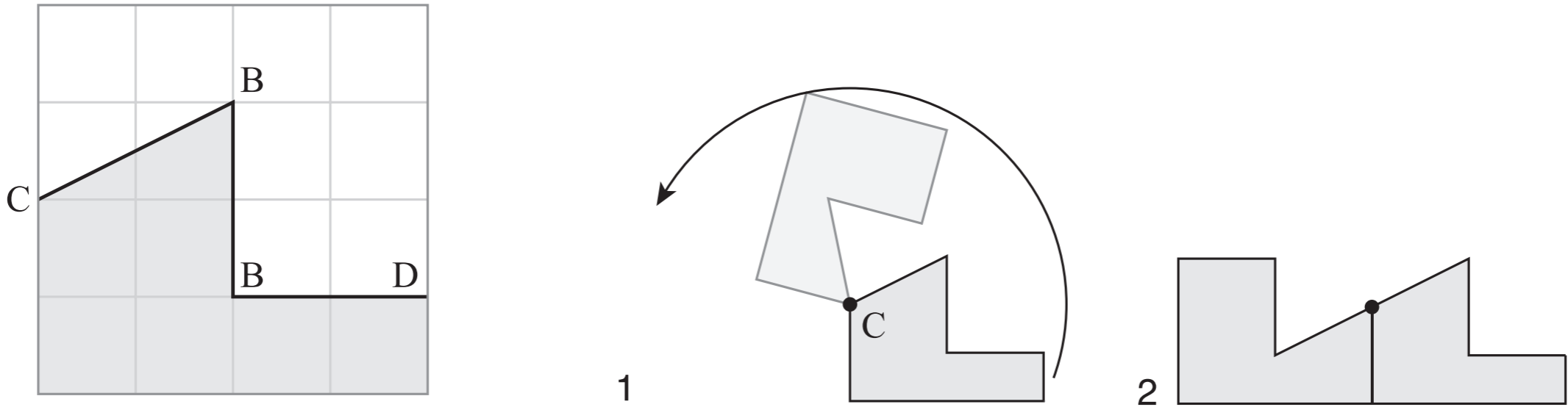


Fig. 8-9

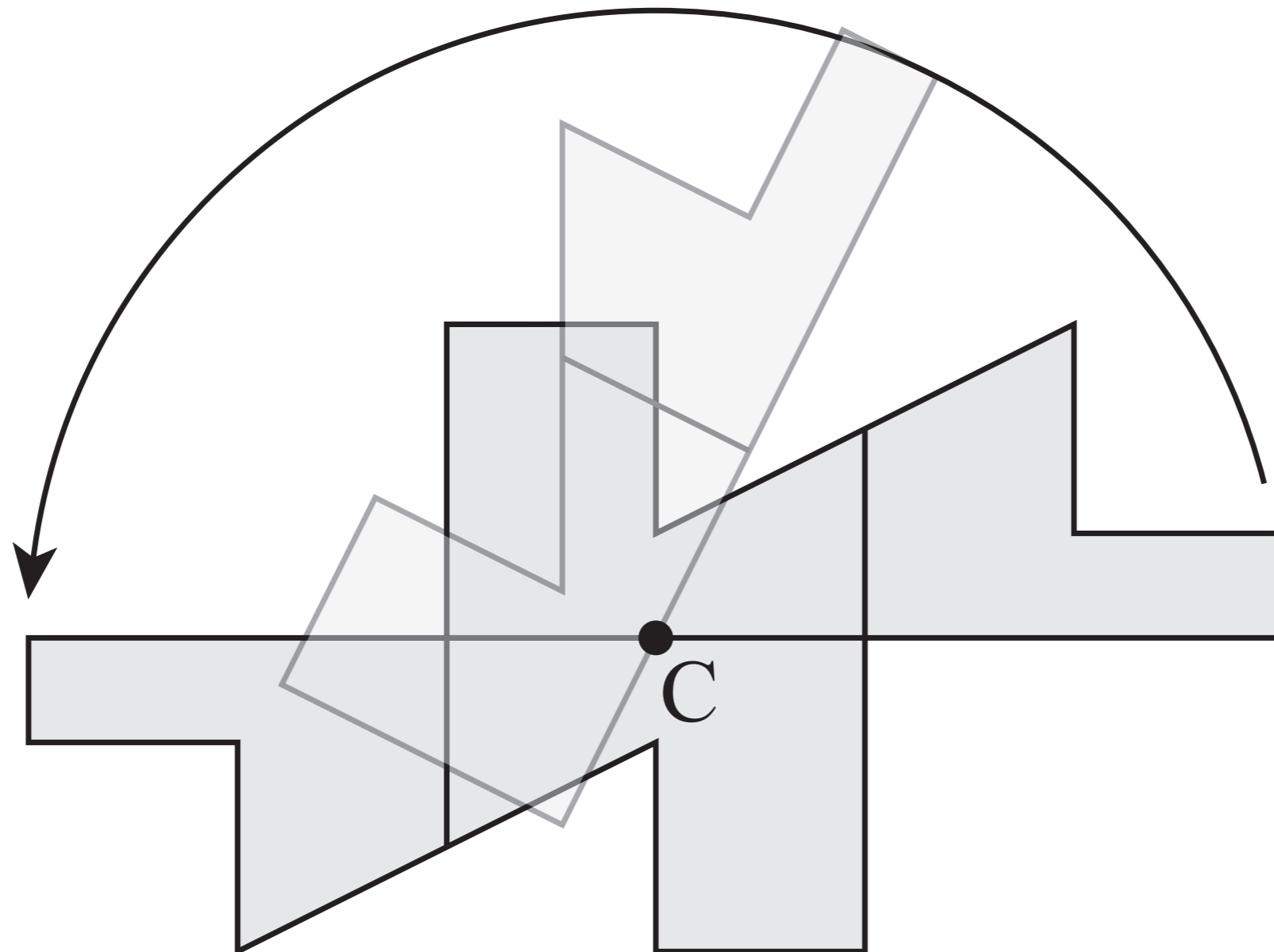


Fig. 9b

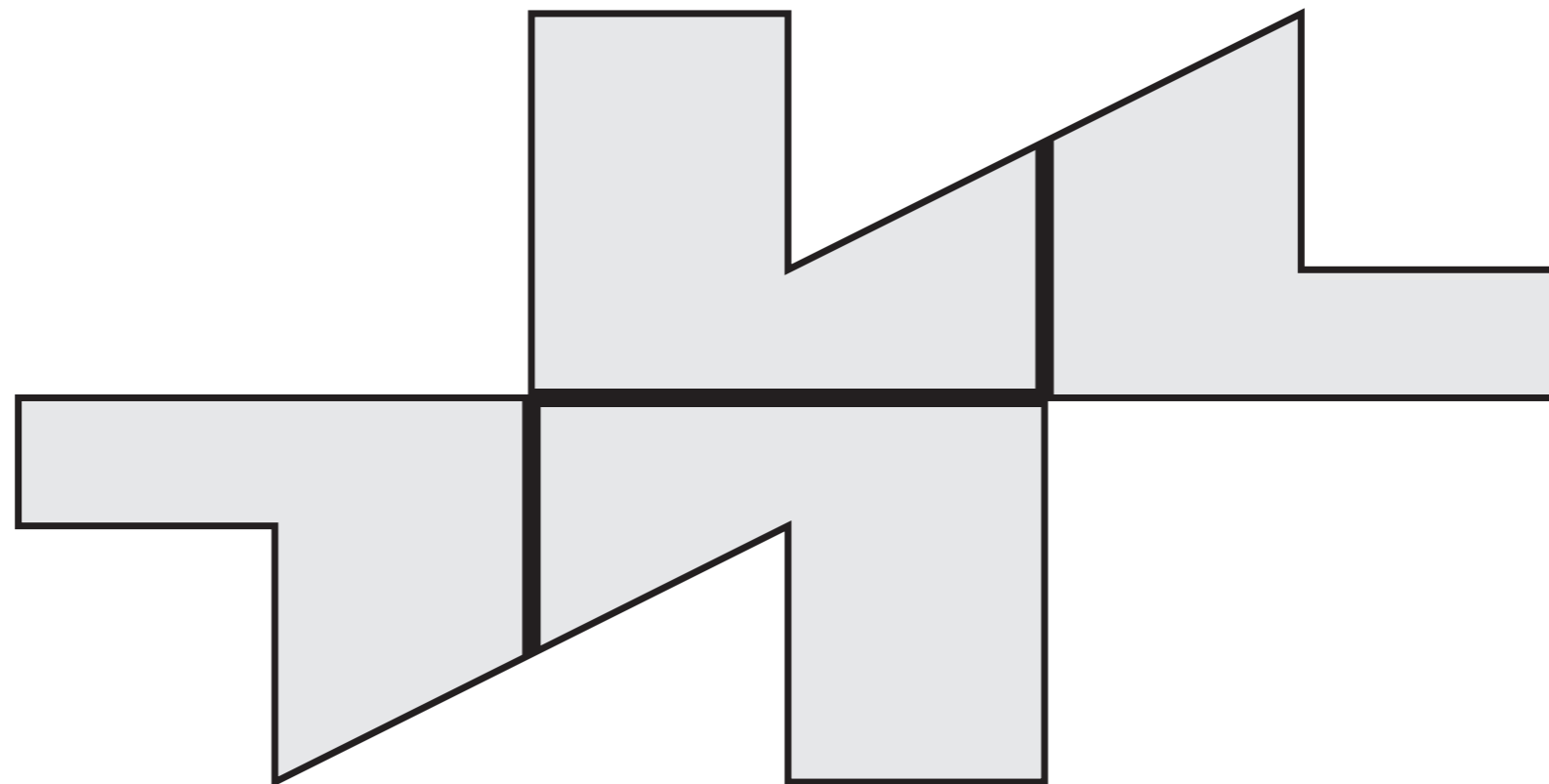


Fig. 9c

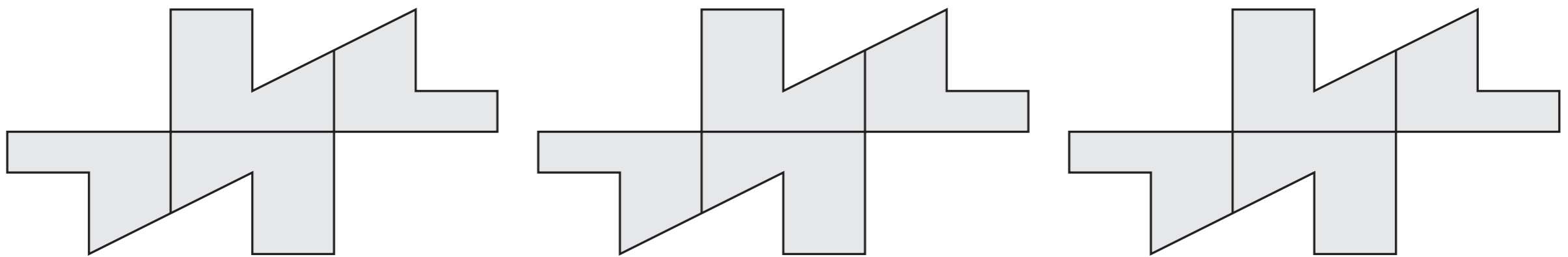


Fig. 10

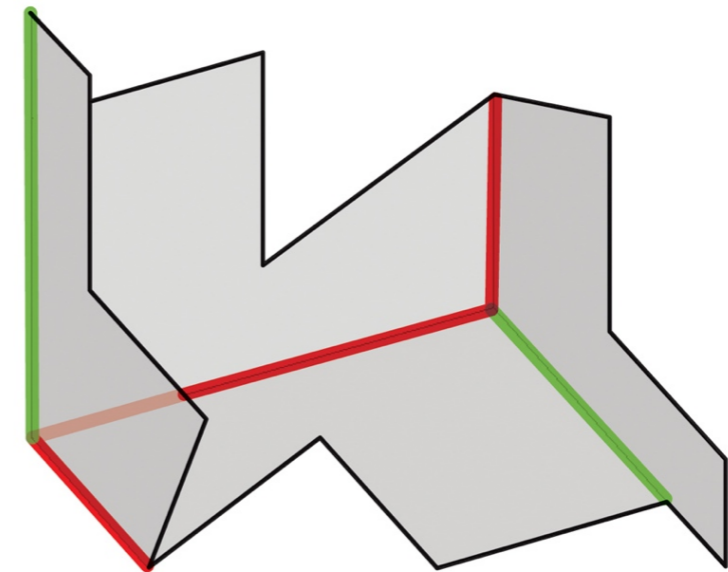
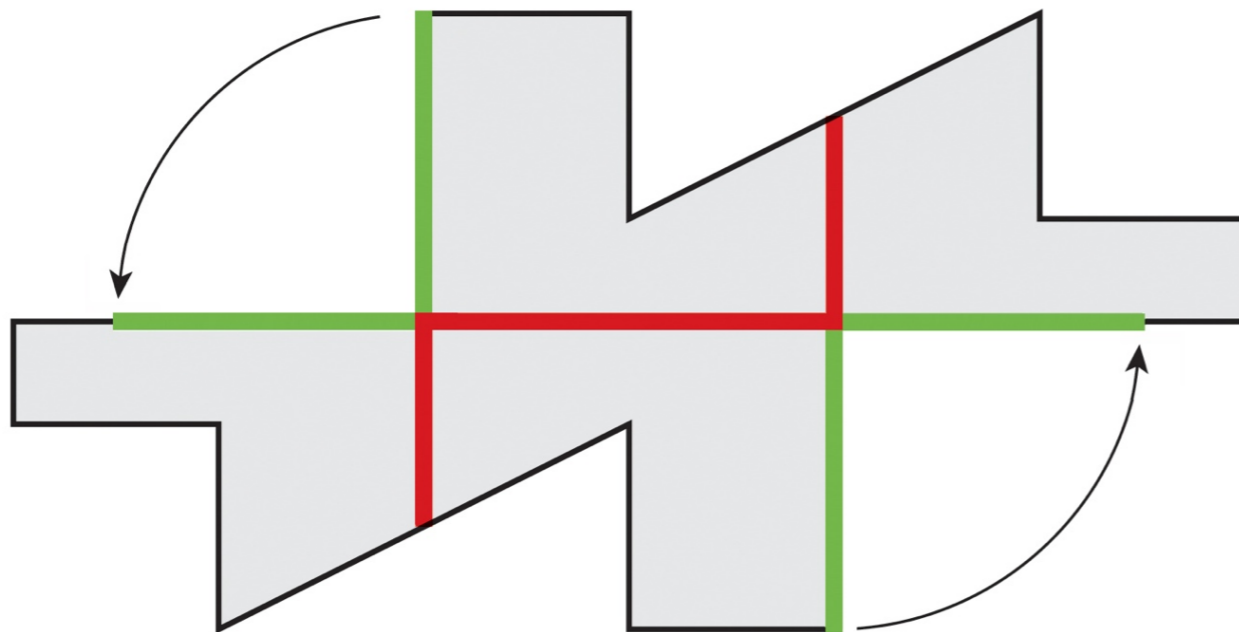


Fig. 11

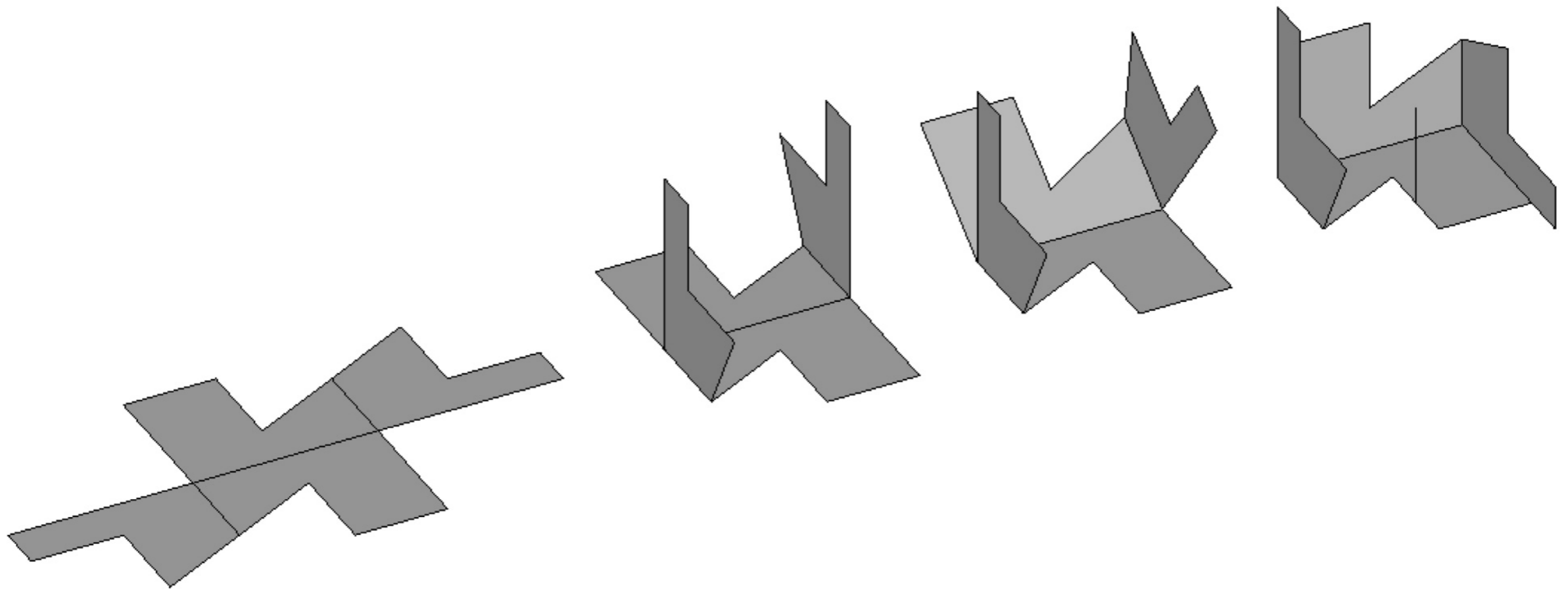


Fig. 12

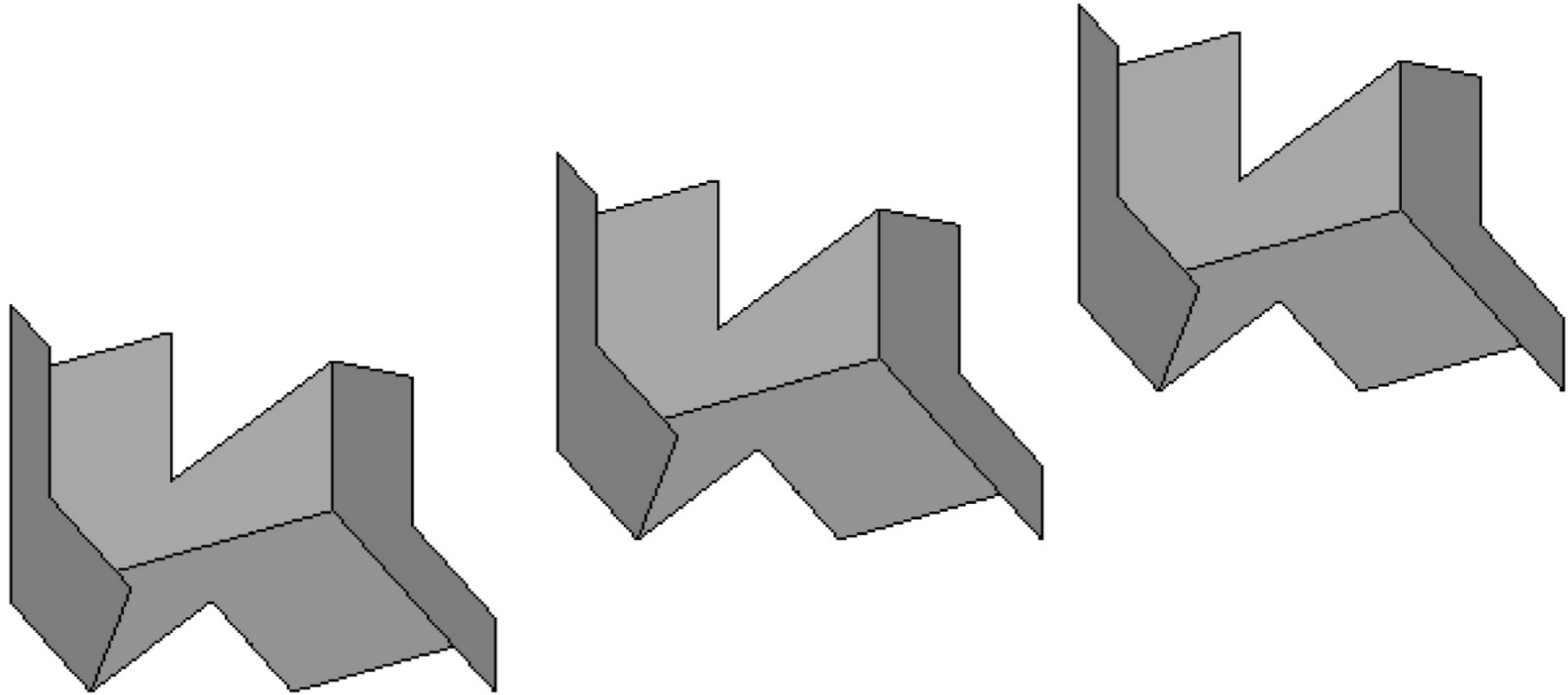


Fig. 12b

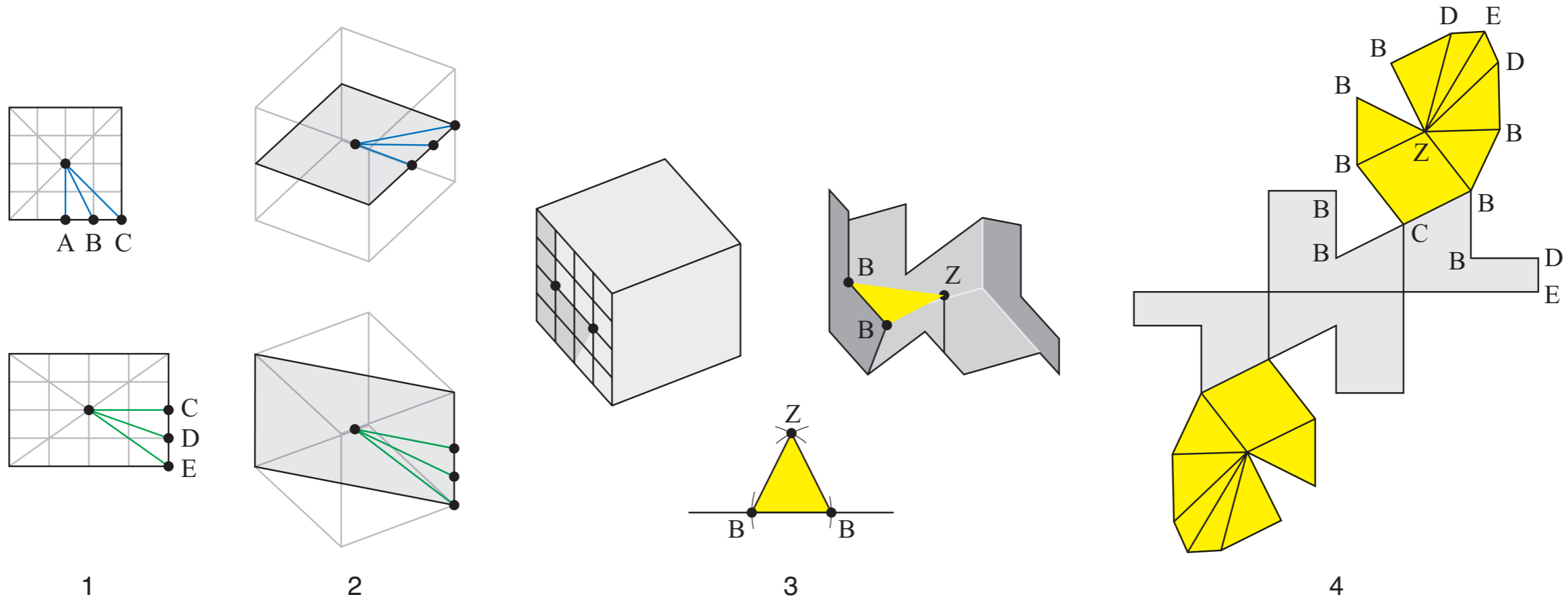


Fig. 13

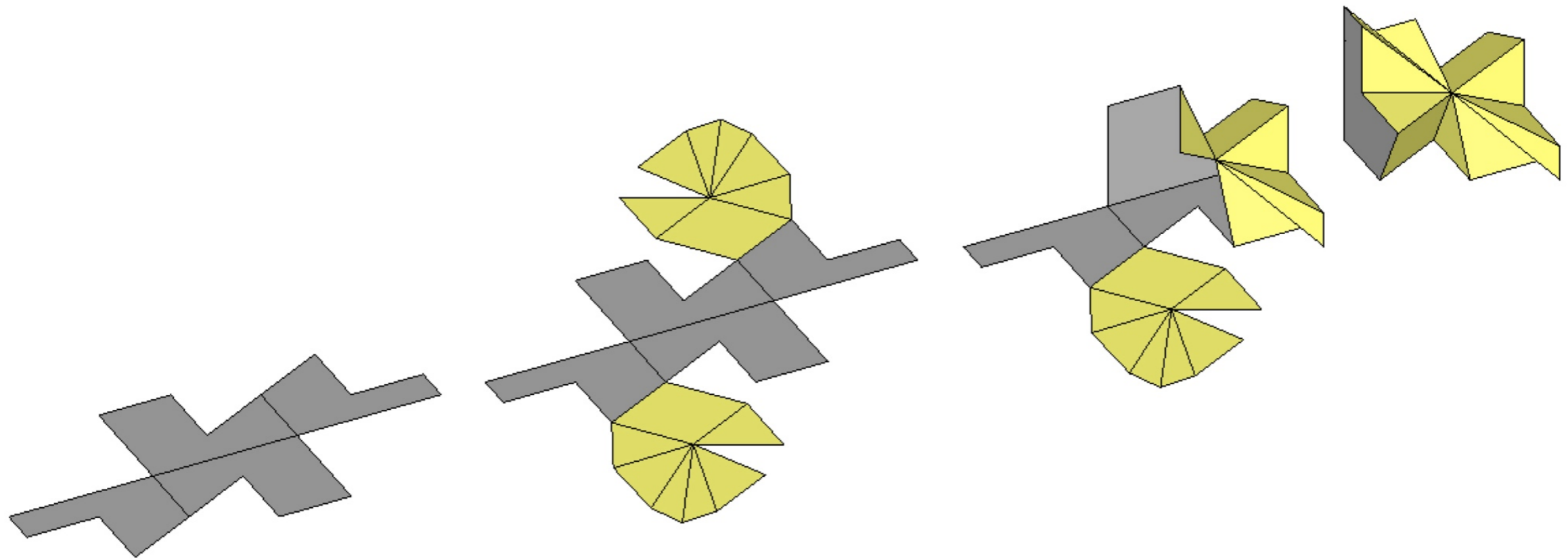


Fig. 14

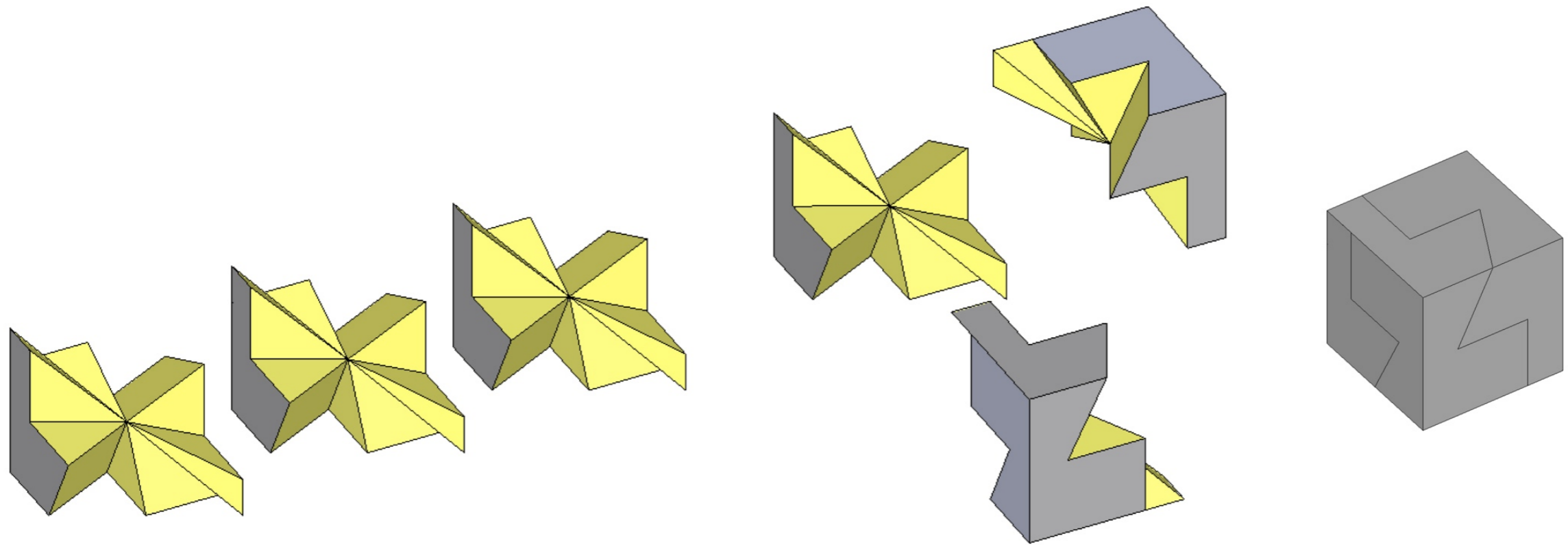


Fig. 15

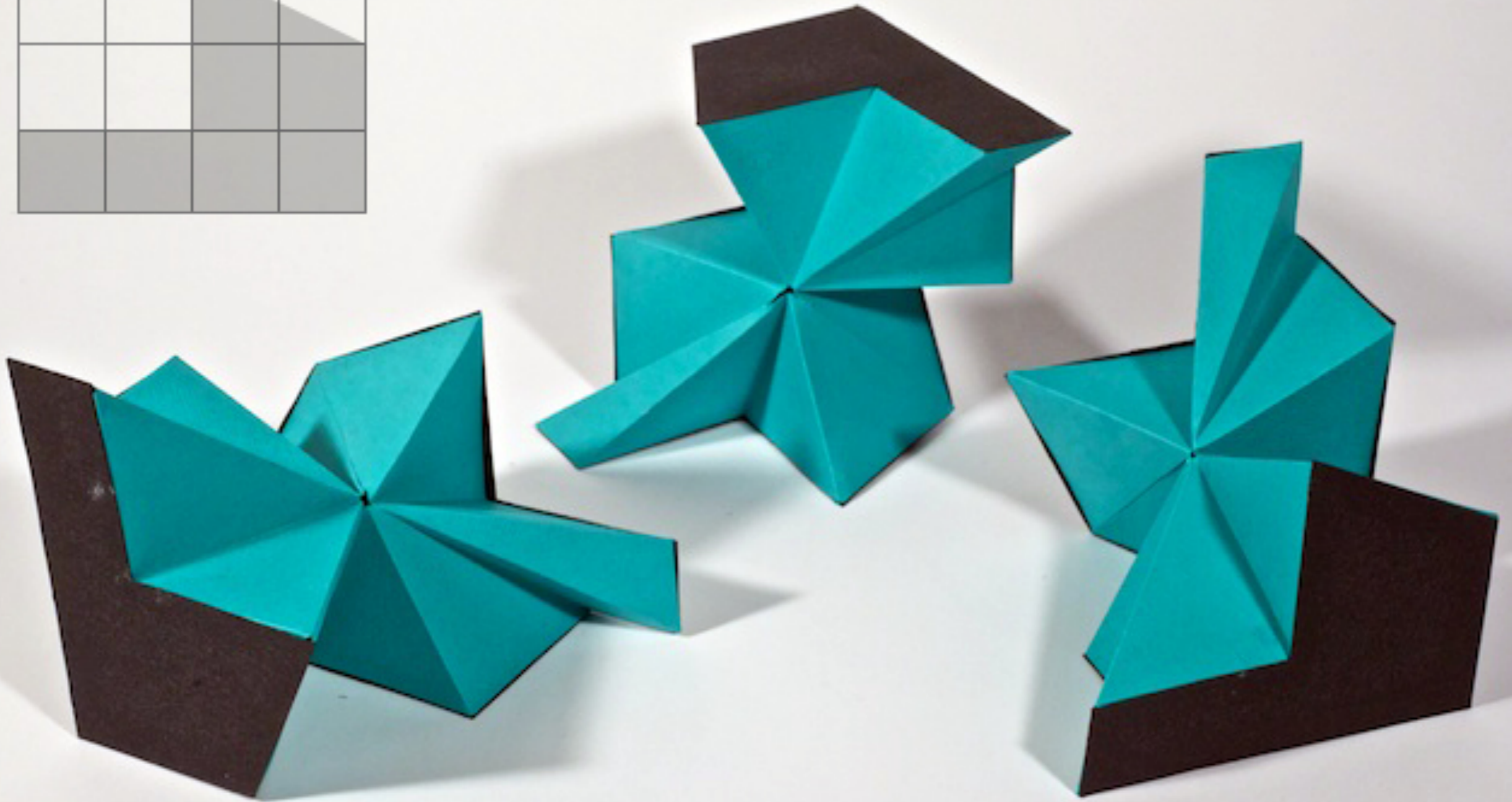
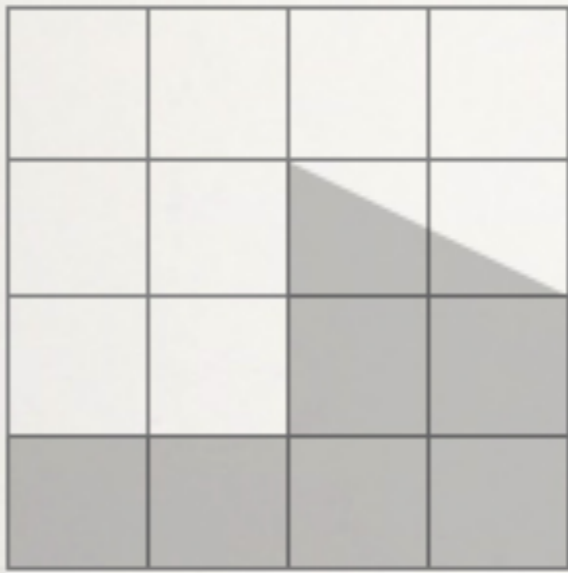


Fig. 15b

HINGES AND ROTATIONS

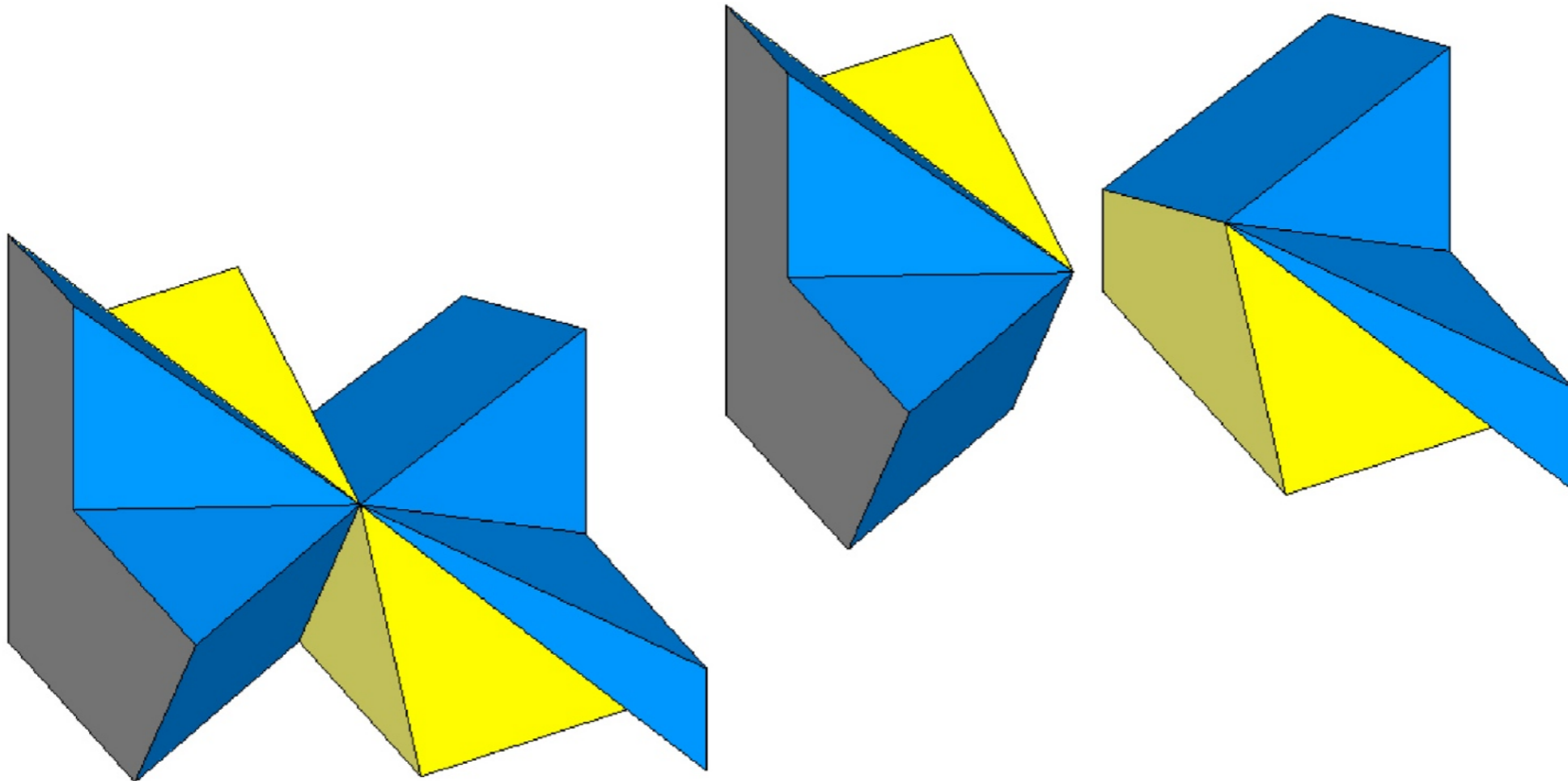


Fig. 16

THE CHAINS OF PAIRS OF SPECULAR MODULES

1. The tetrahedron, the cube..., all polyhedra, can be considered as one of the numerous three-dimensional configurations resulting from the folding of flexible chains of modules.

2. The chains are constituted by pairs of modules in which one component is the mirror image of the other.

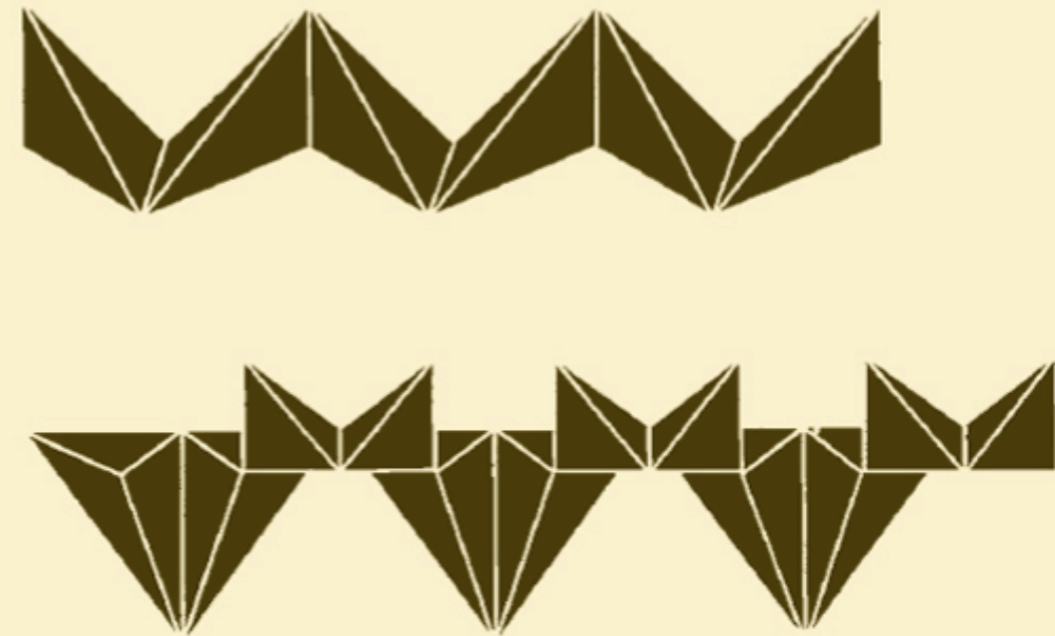


Fig. 16b

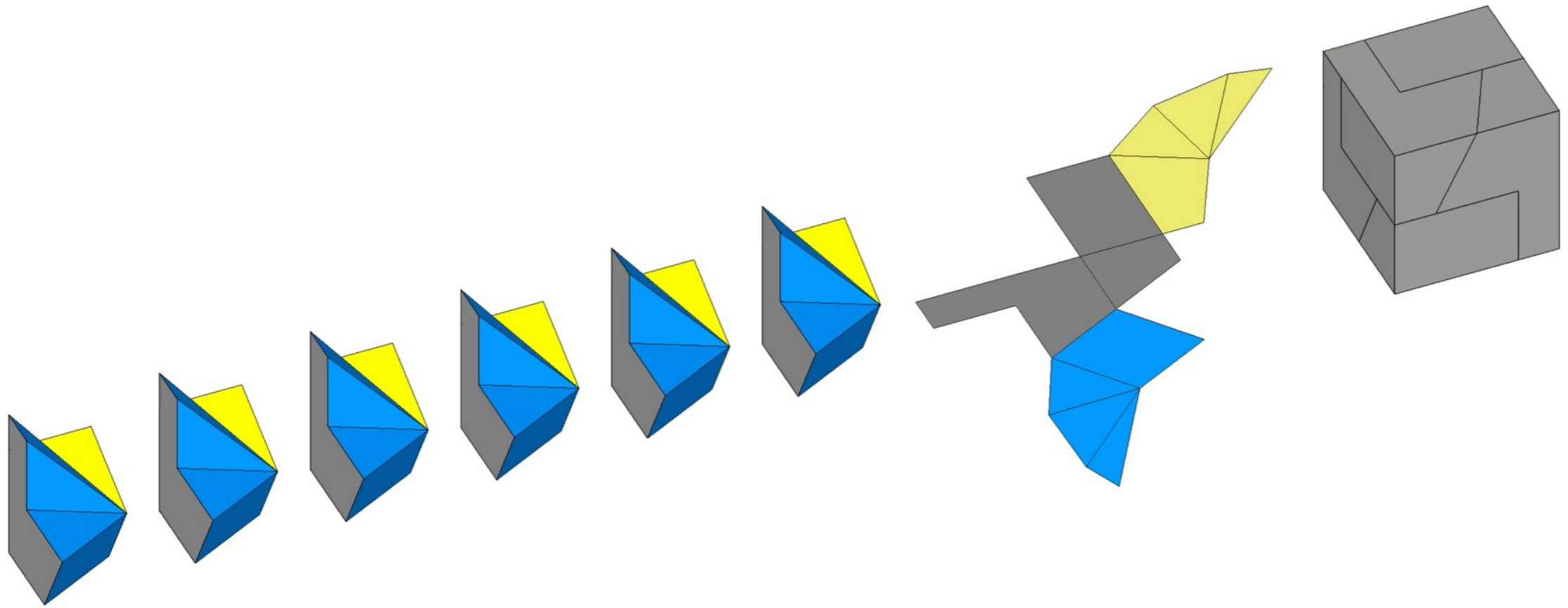


Fig. 17

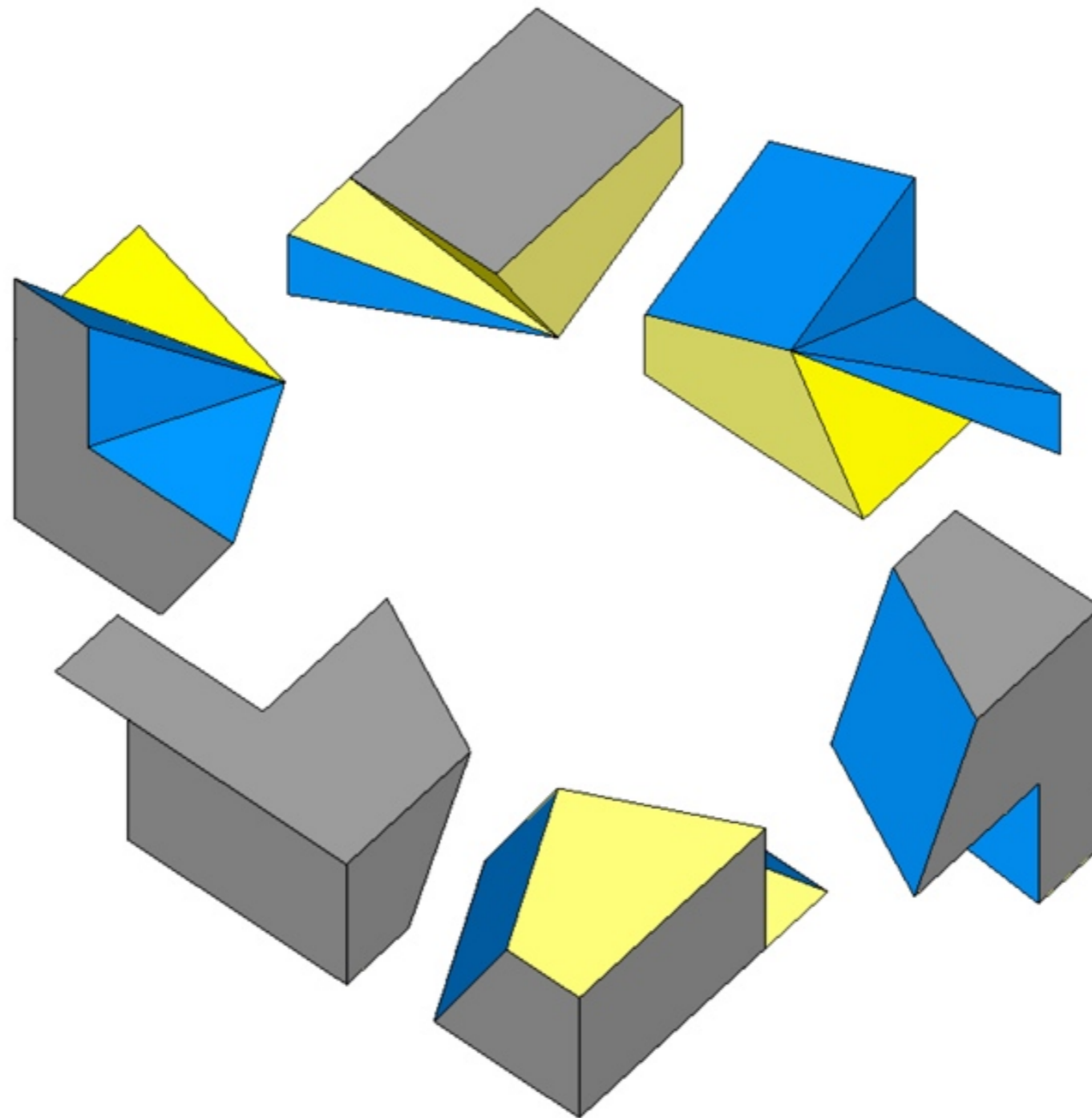


Fig. 17b

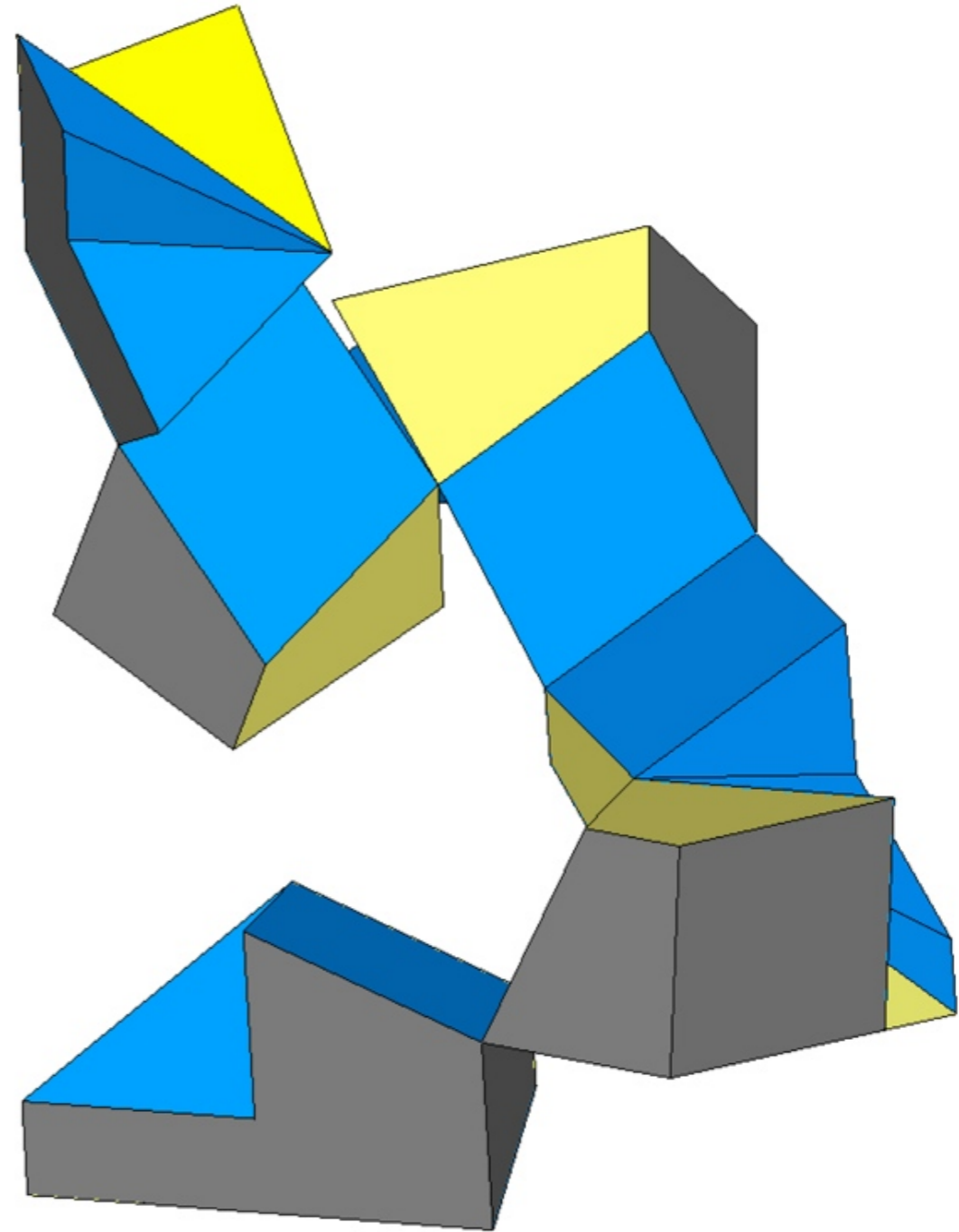
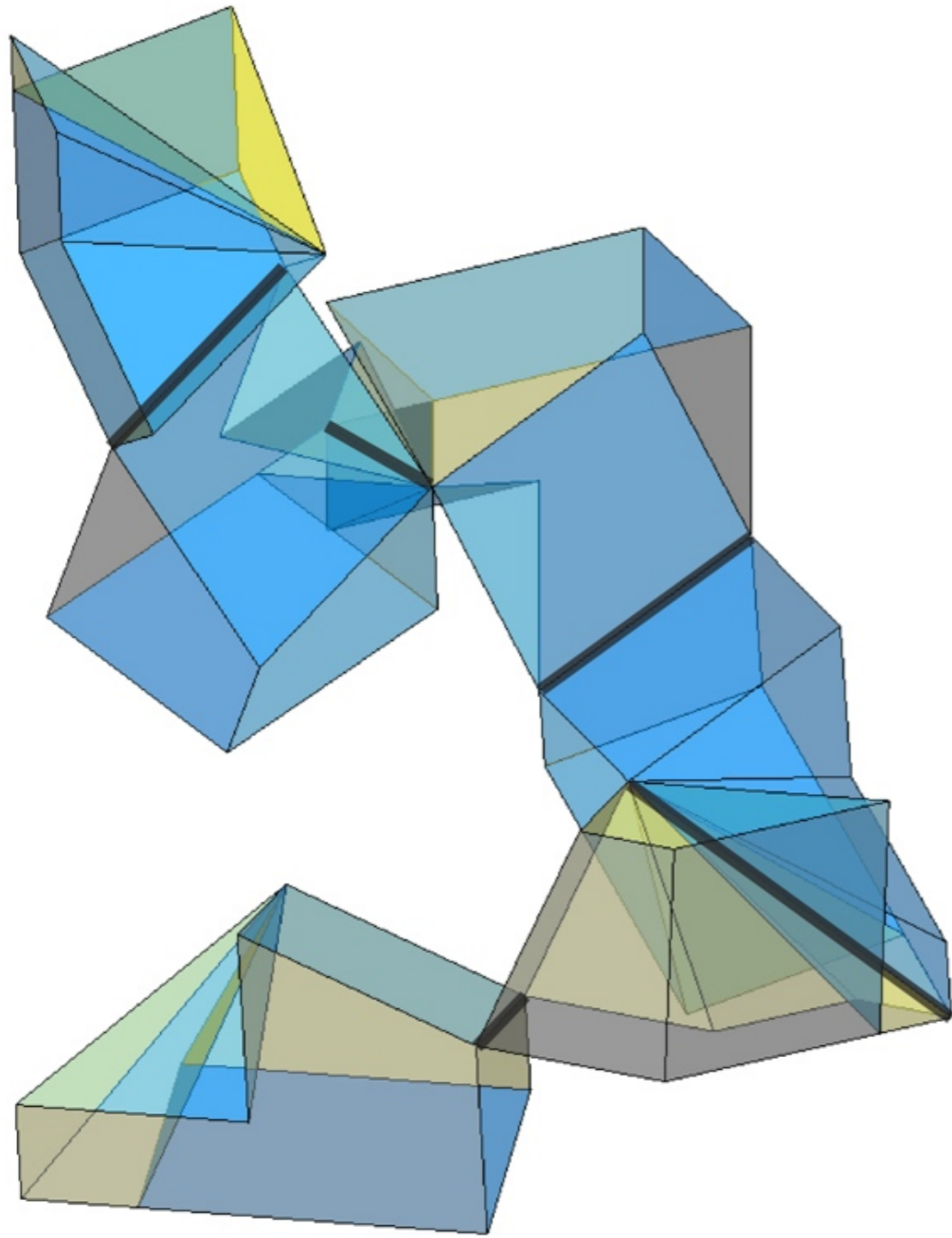


Fig. 18

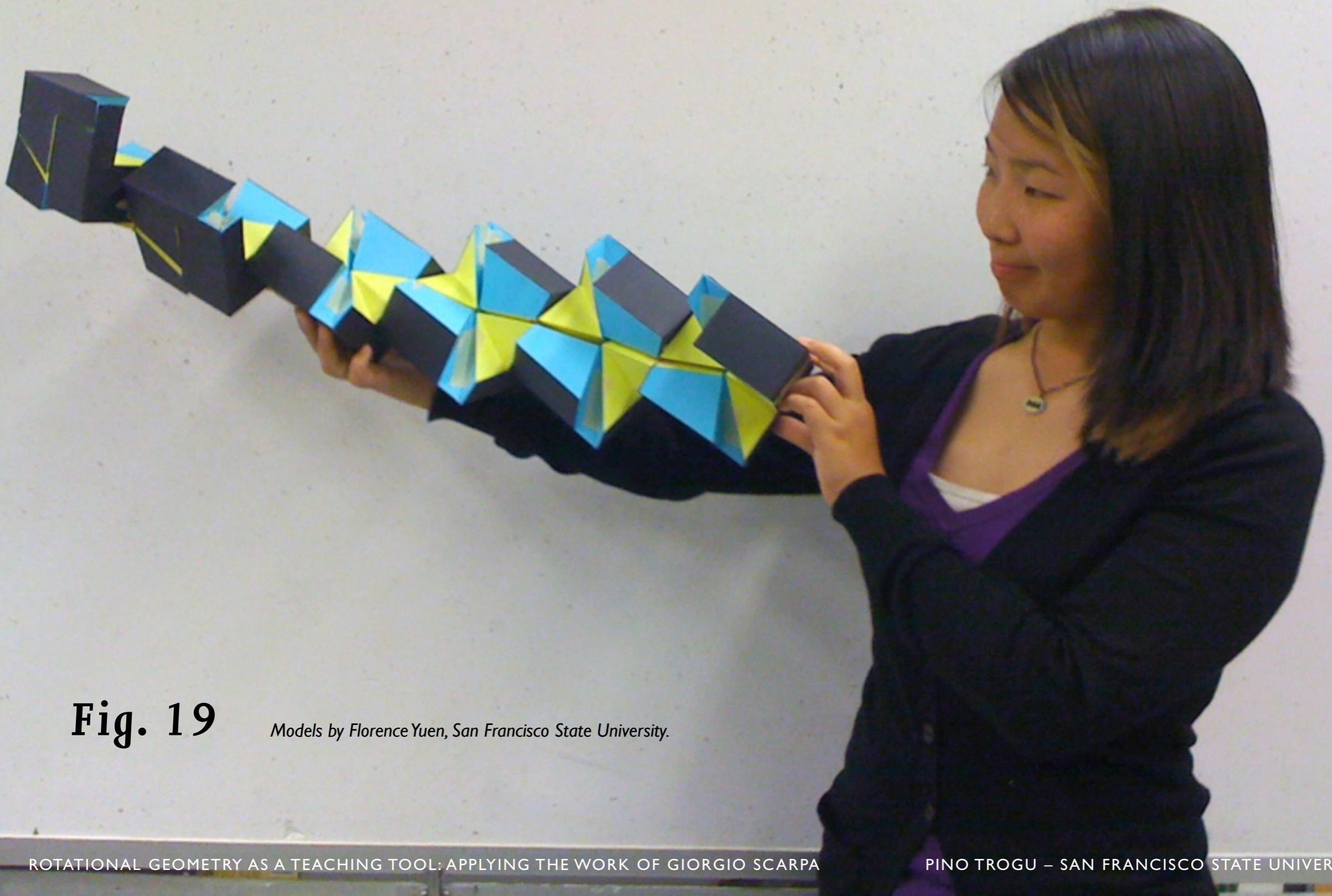
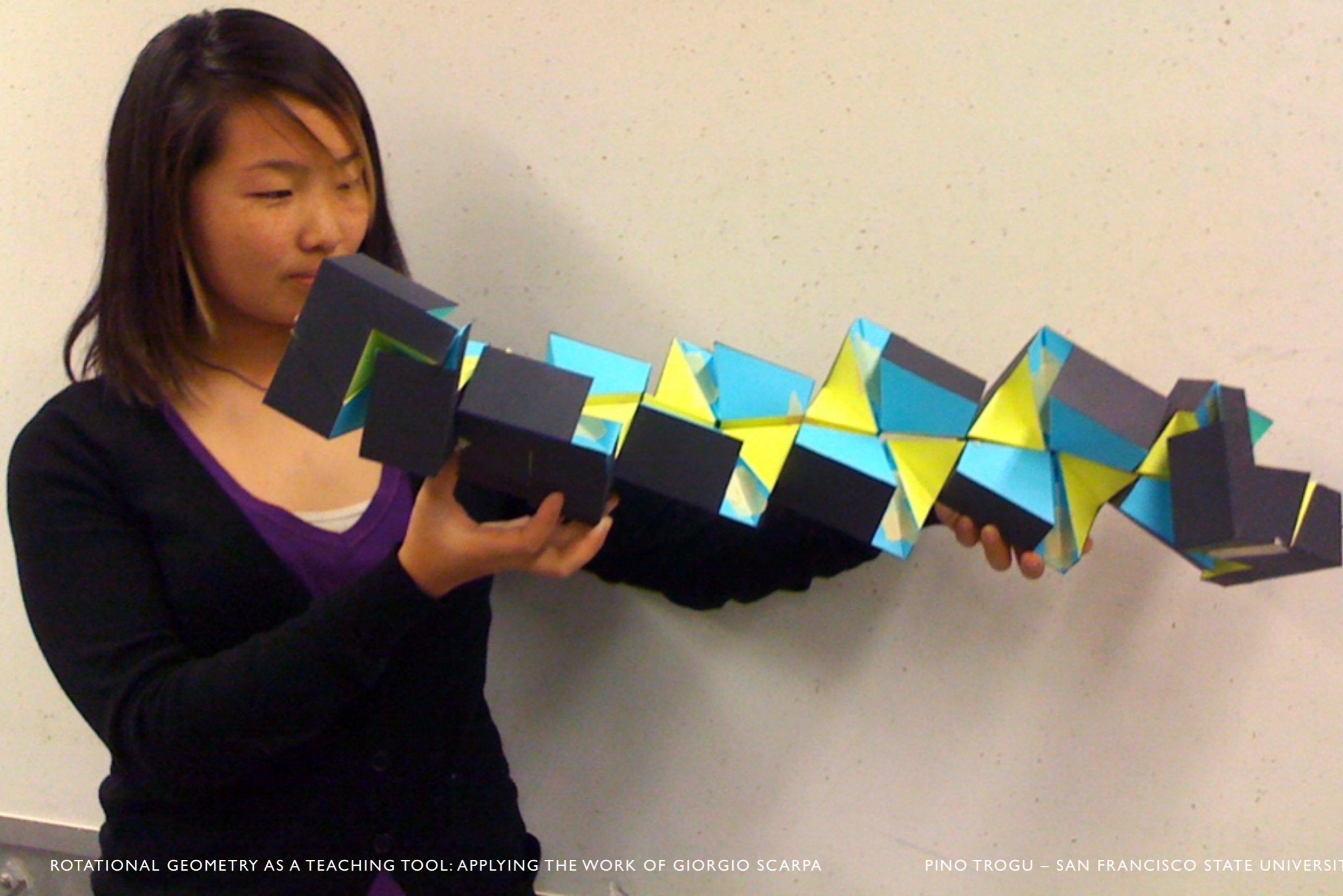
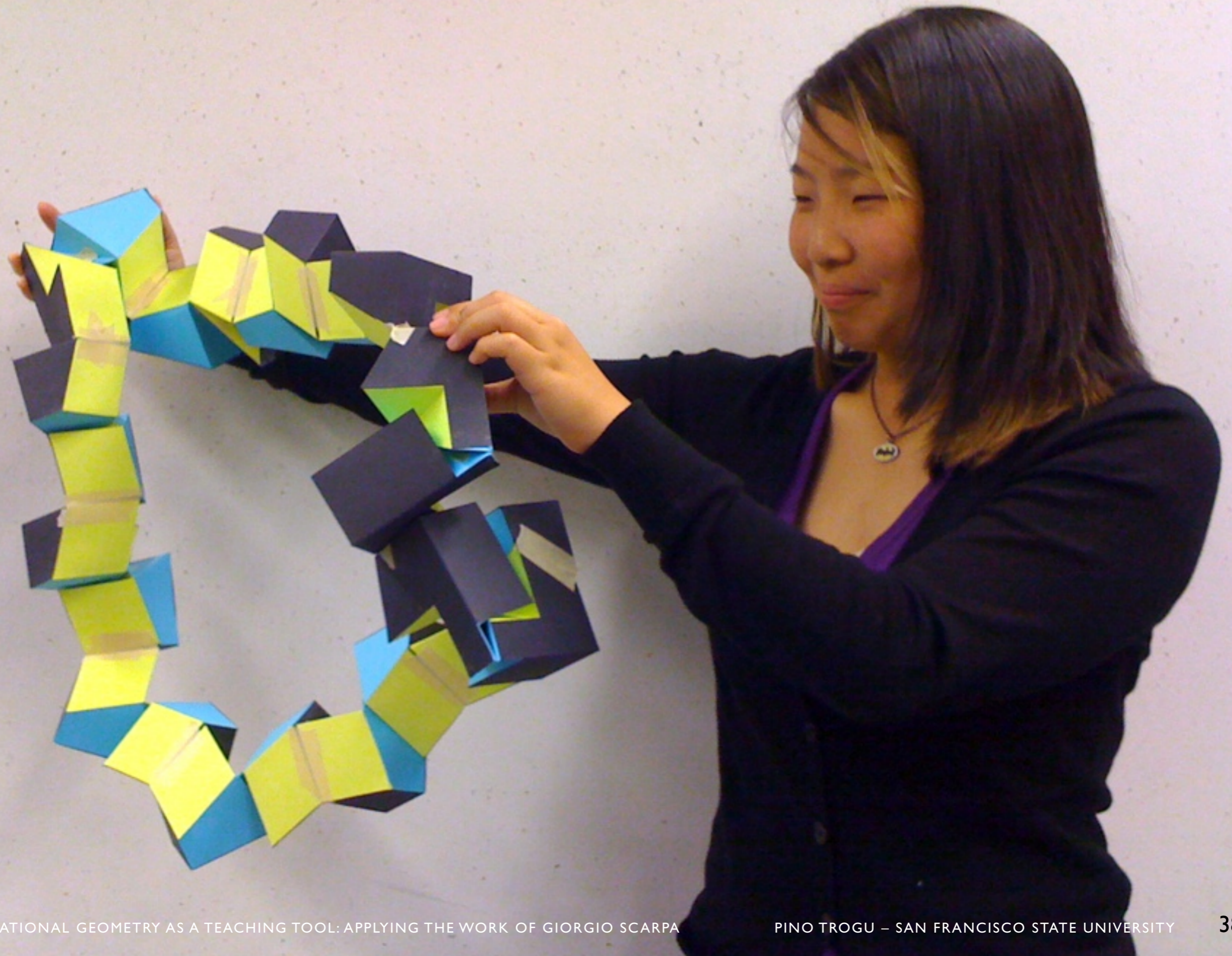


Fig. 19

Models by Florence Yuen, San Francisco State University.







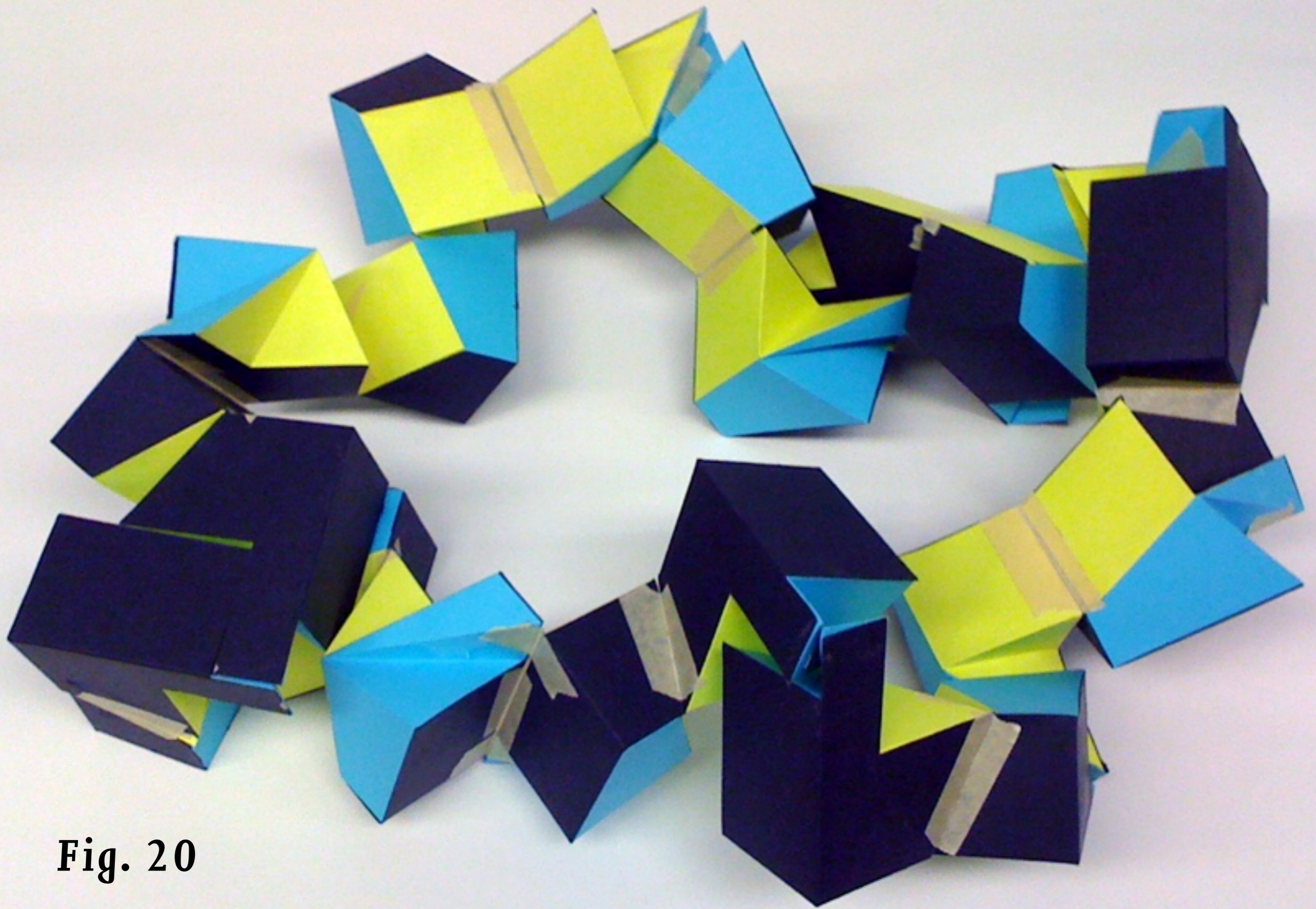
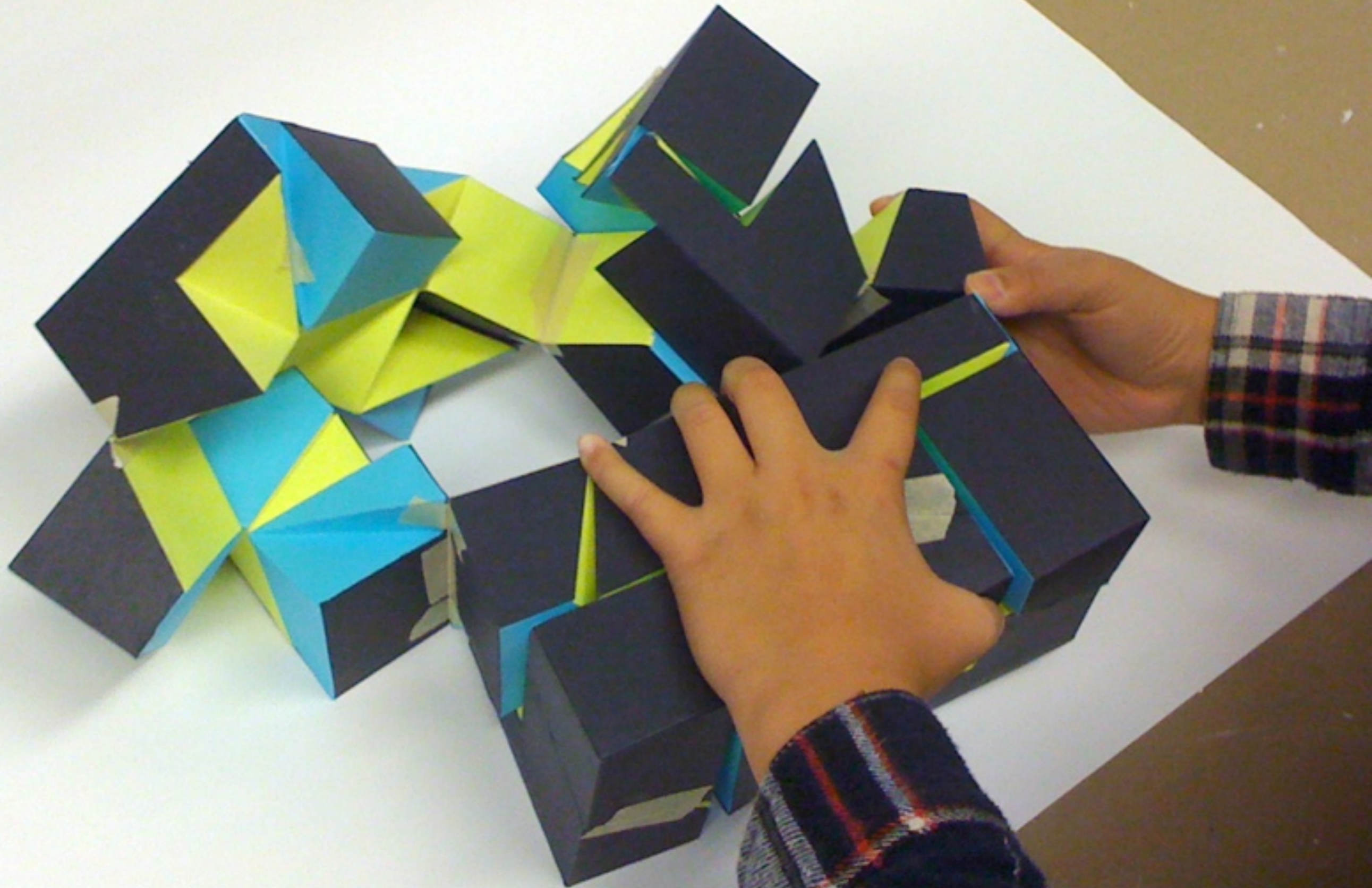
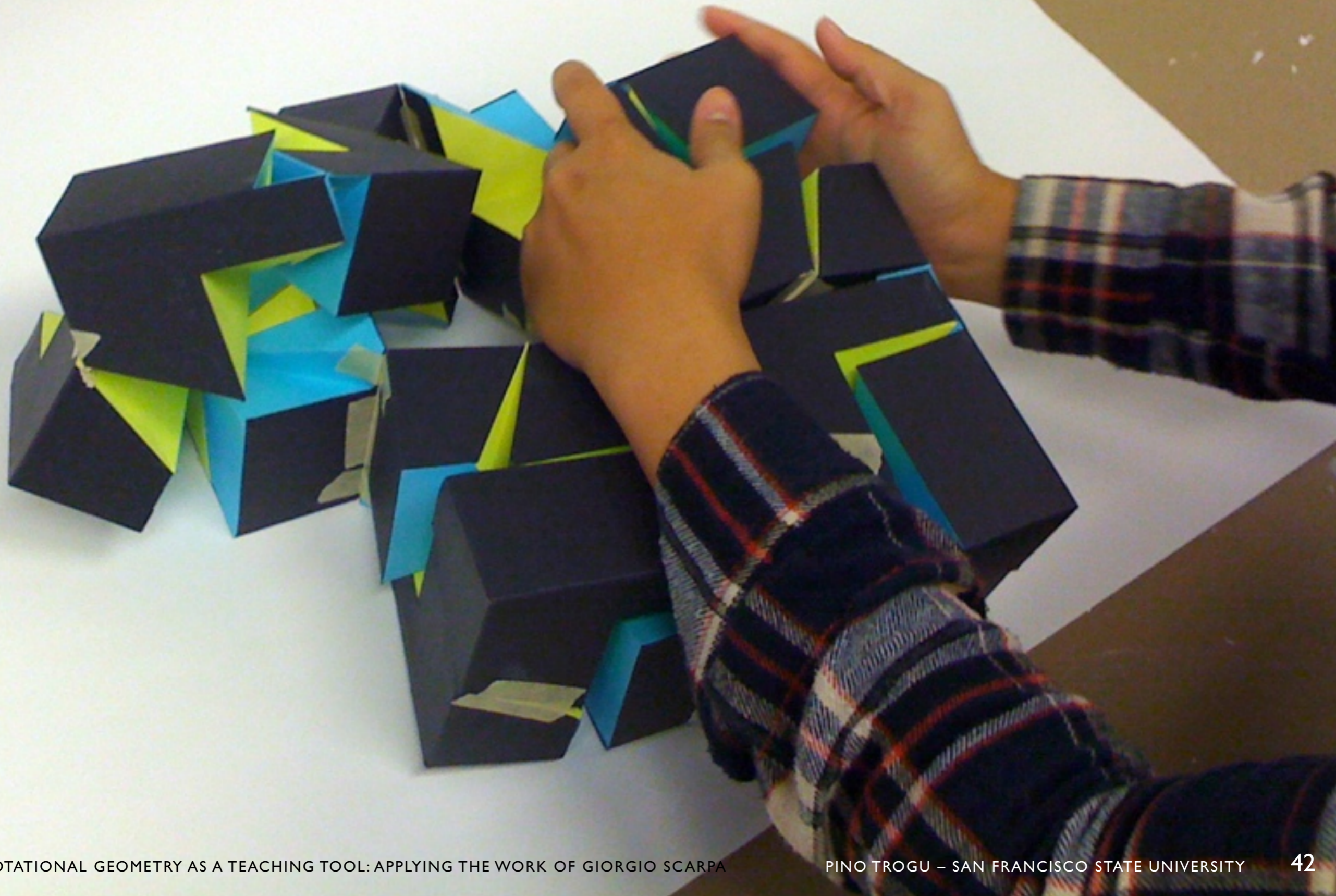
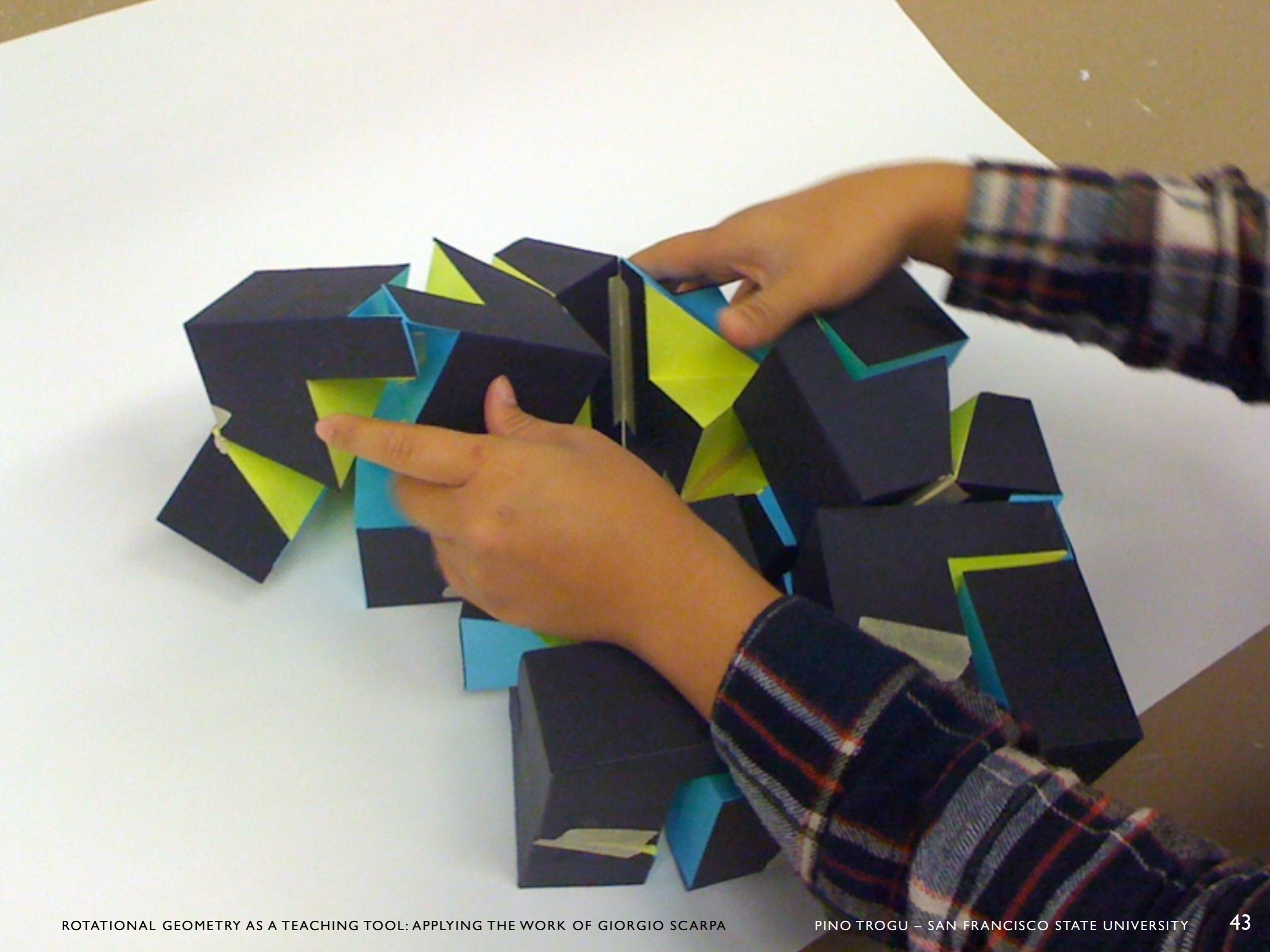
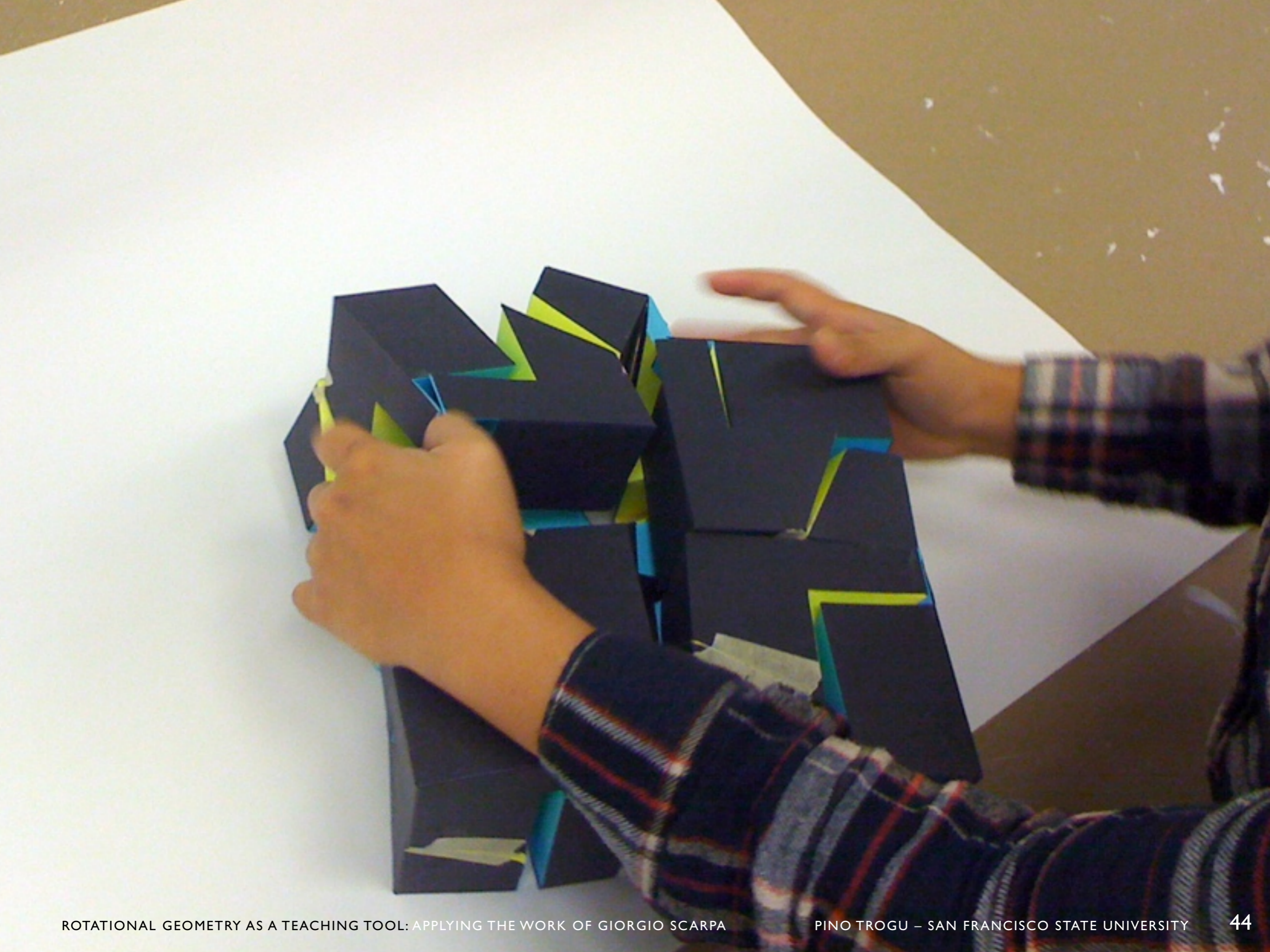


Fig. 20

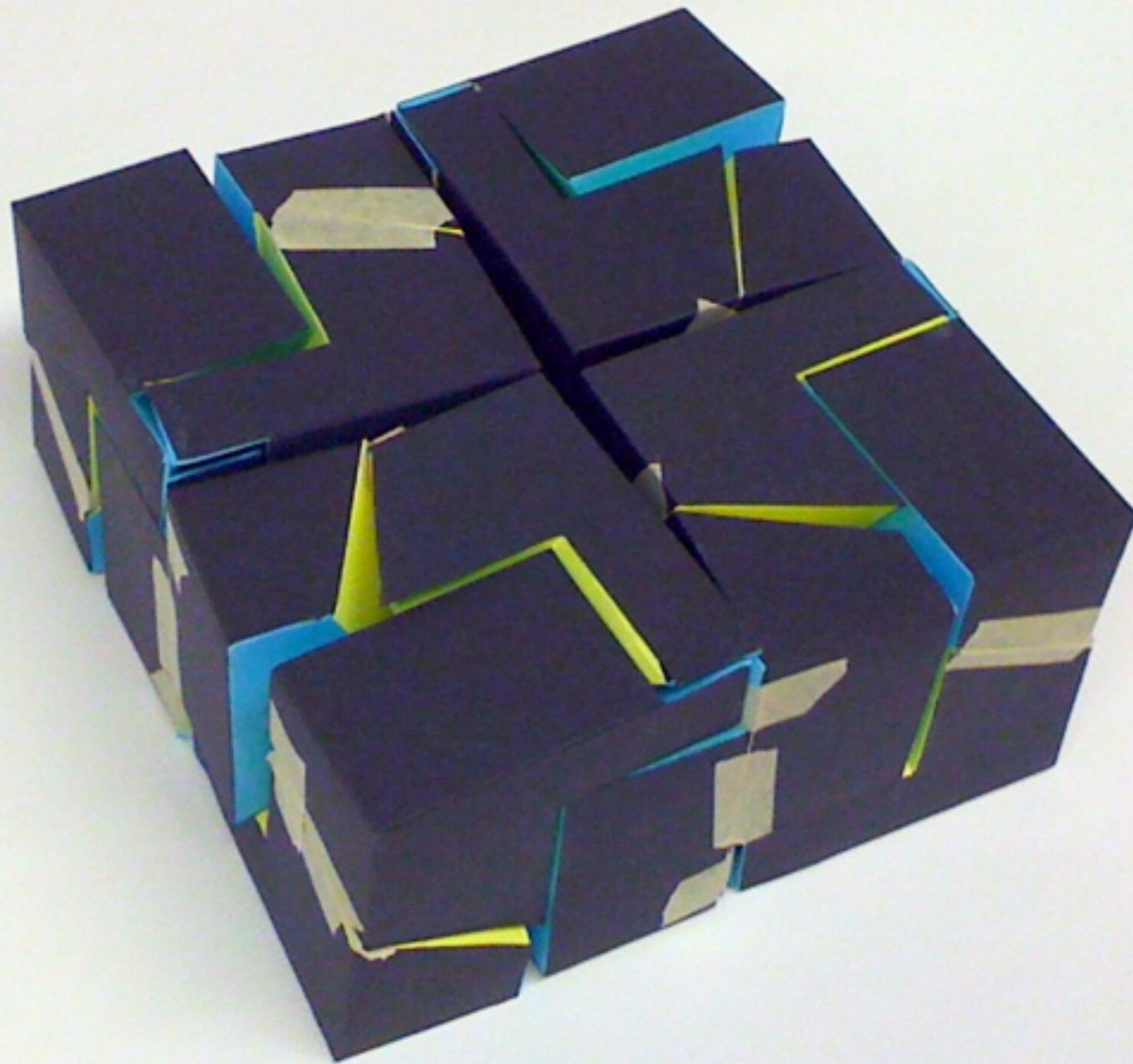








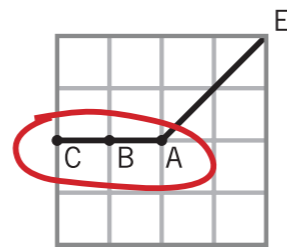




CUBE SECTION – INTERNAL SURFACE

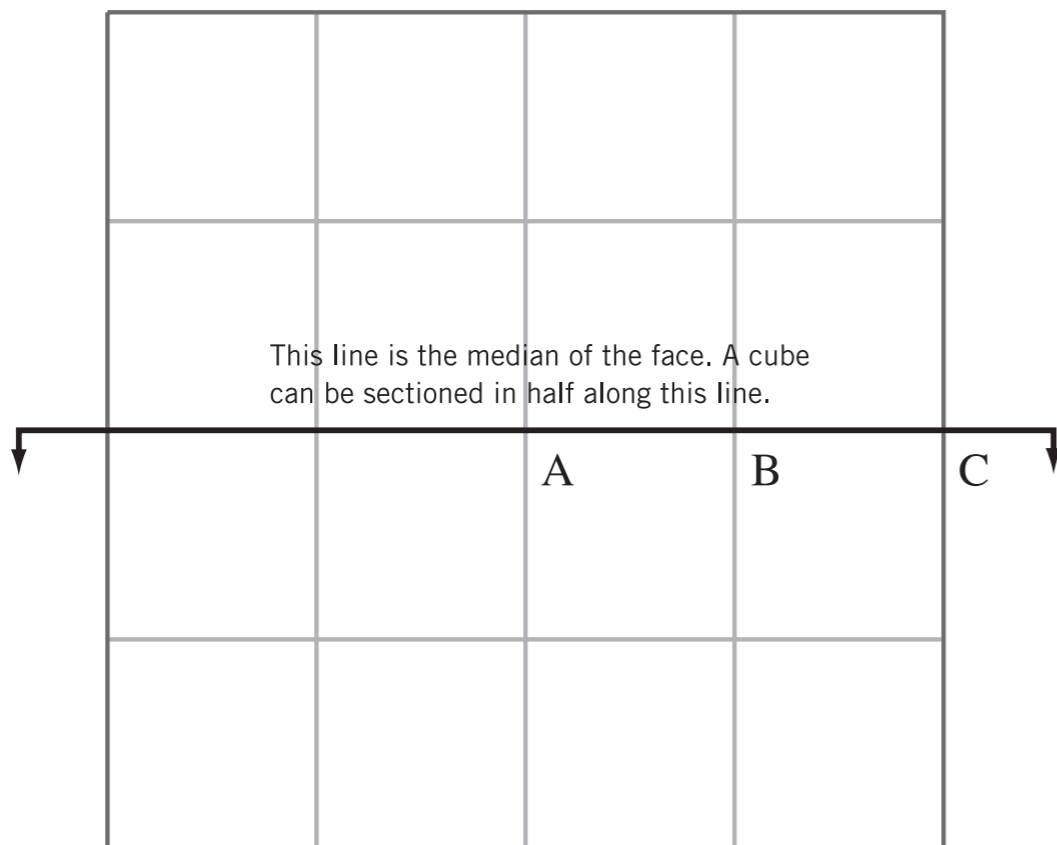
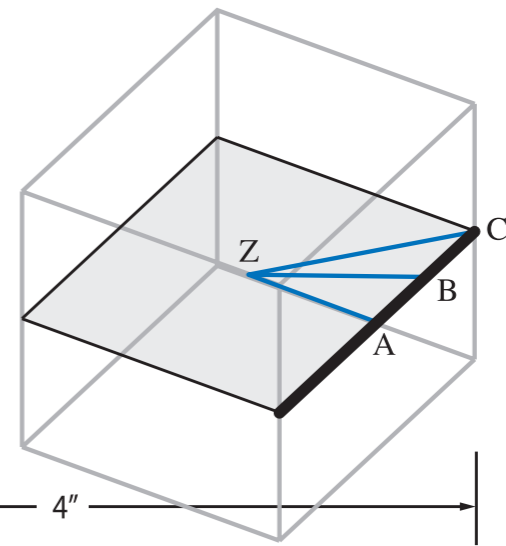
Step 4 Use the given letters to mark any external points of the section that are either on the median or...

NOTE: when printing, select Page Scaling: NONE. Check your drawing after printing to verify dimensions. Check both axes: vertical and horizontal.



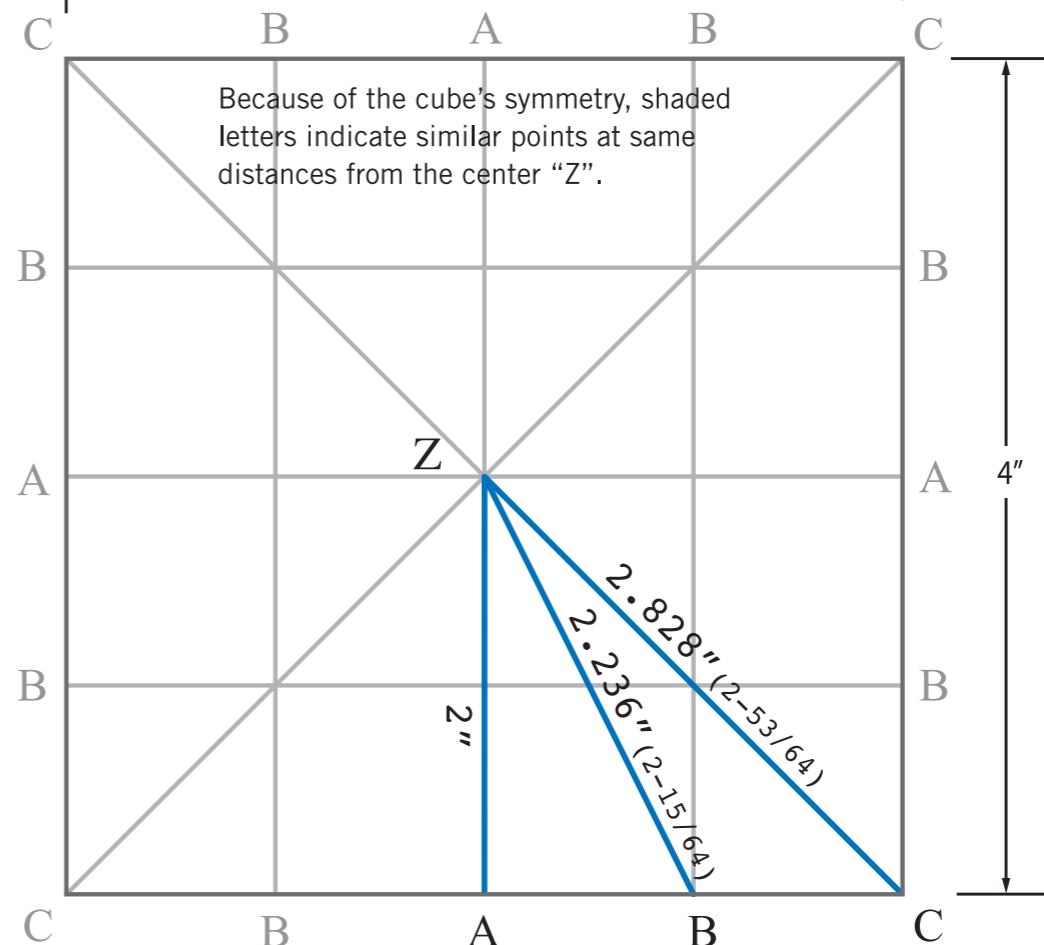
Use this page to find distances for points "A", "B", and "C".

Distances from points on the median to the center of the cube "Z".



Face of the cube sectioned along the median.

NOTE: You can use this grid to draw your section at full scale.

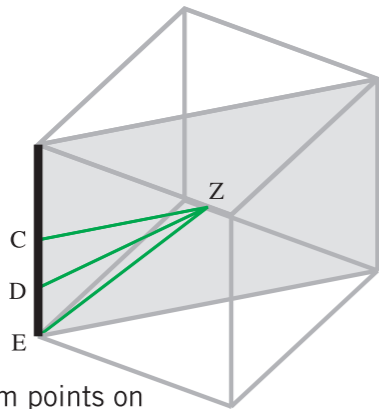


TRUE distances from points on the median to center "Z". Use these distances for the construction of the internal section.

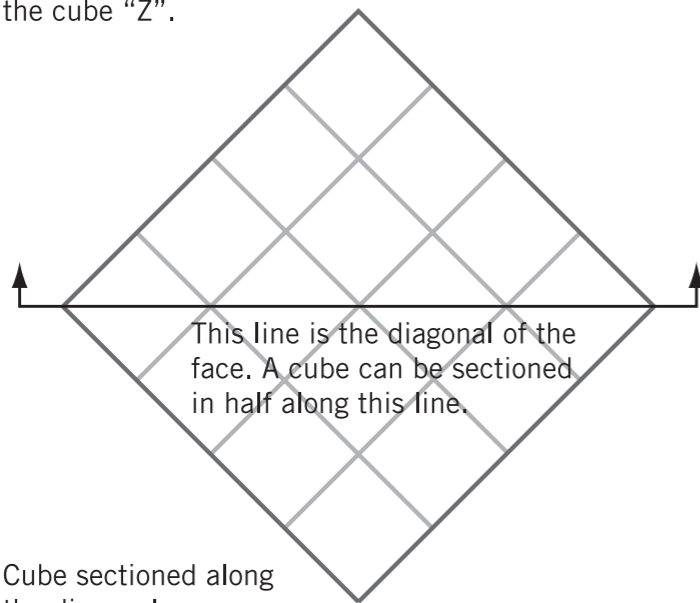
CUBE SECTION – INTERNAL SURFACE

Step 4 ...the edge of the face/cube.

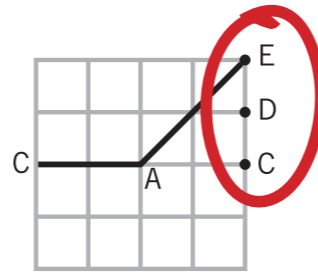
NOTE: when printing, select Page Scaling: NONE.
Check your drawing after printing to verify dimensions.
Check both axes: vertical and horizontal.



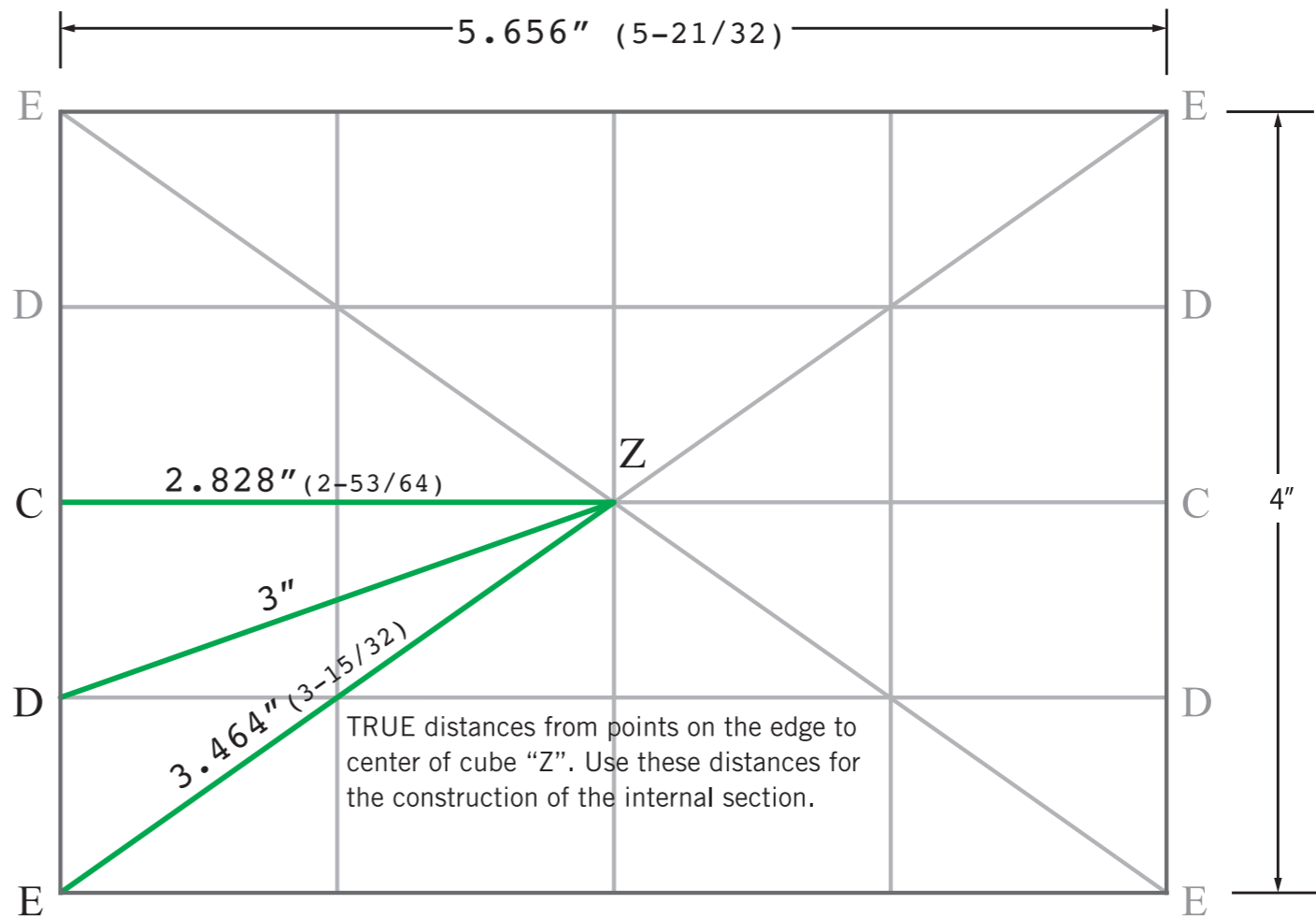
Distances from points on the edge to the center of the cube "Z".



Cube sectioned along the diagonal.



Use this page to find distances for points "C", "D", and "E"

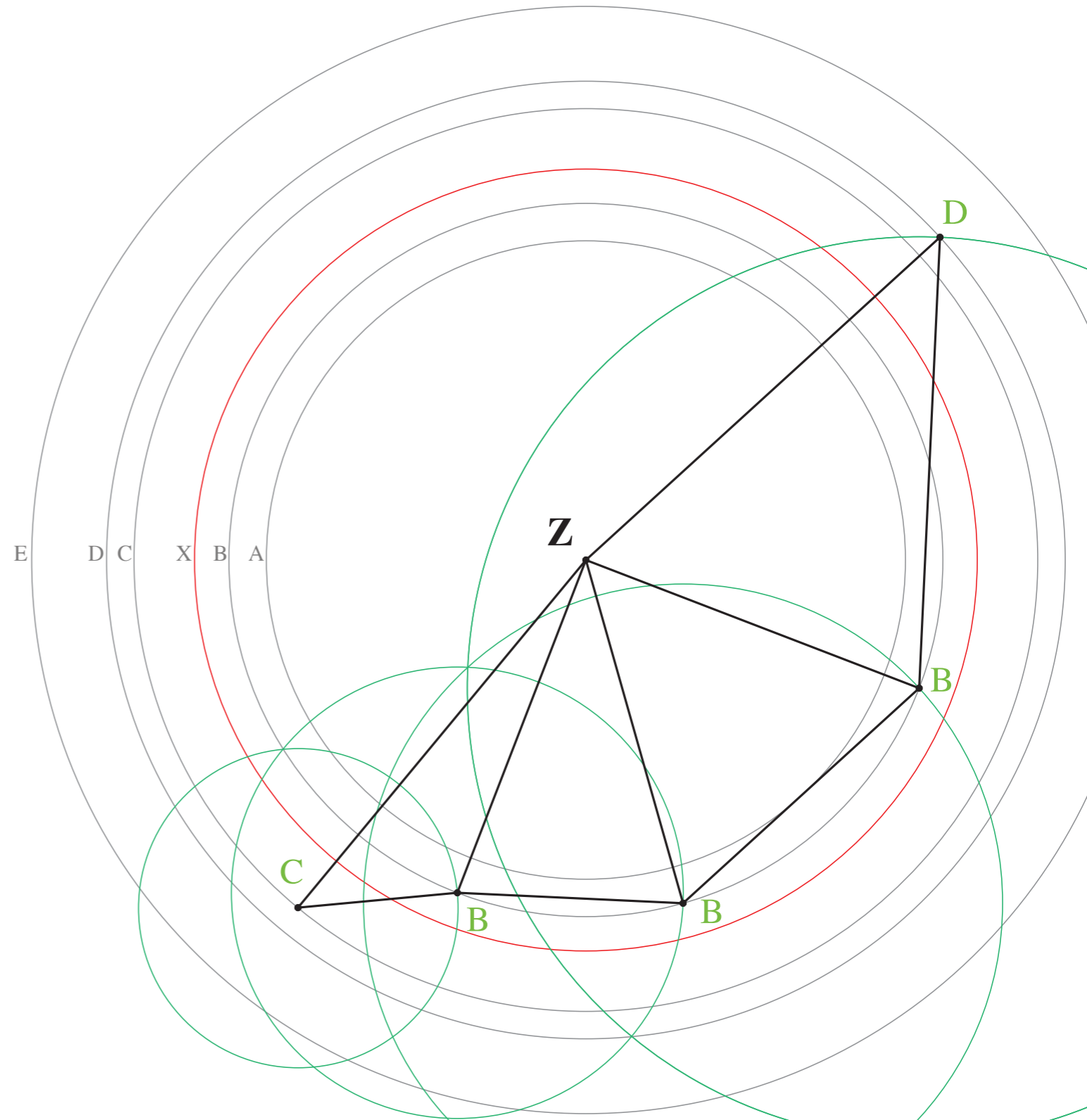
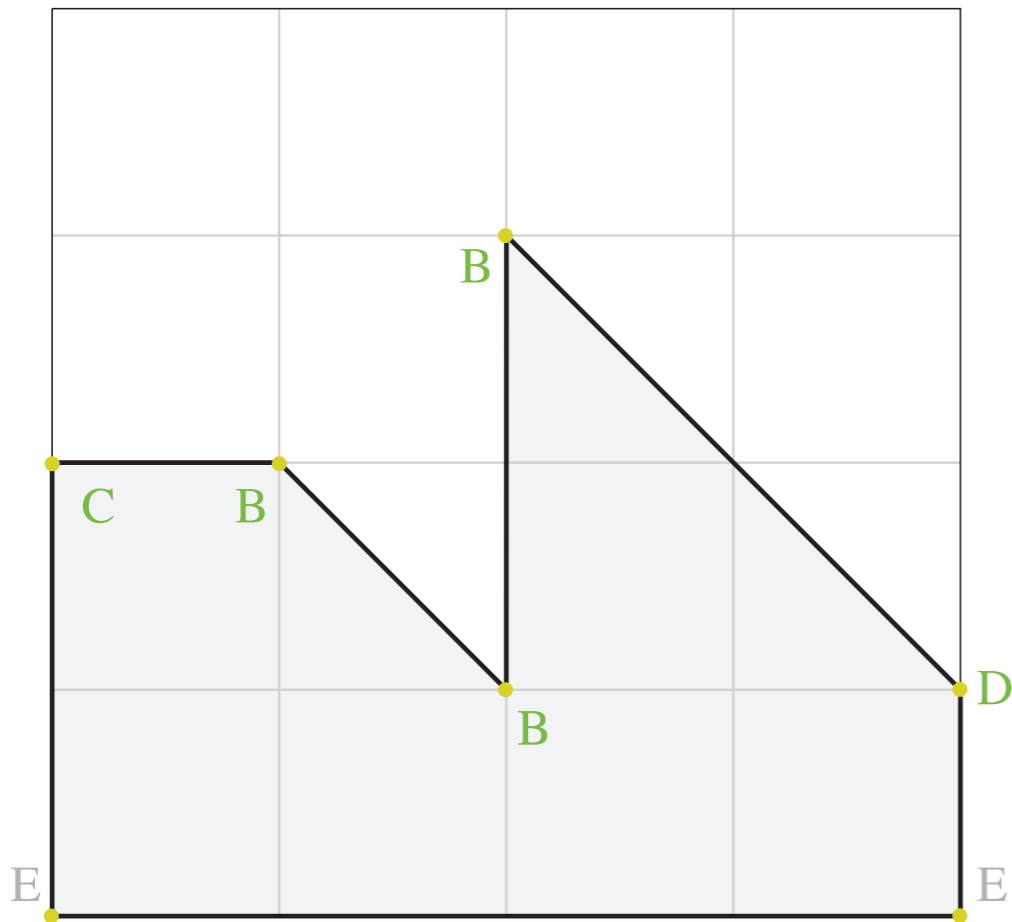


$CB = 1$
 $BB \text{ short} = \text{square root of } 2: 1.4142135623731$
 $BB \text{ long} = 2$
 $BD = \text{square root of } 8: 2.82842712474619$
 (the above are for the example below only, your design may differ)

Circular grid by Slate Werner, San Francisco State University.

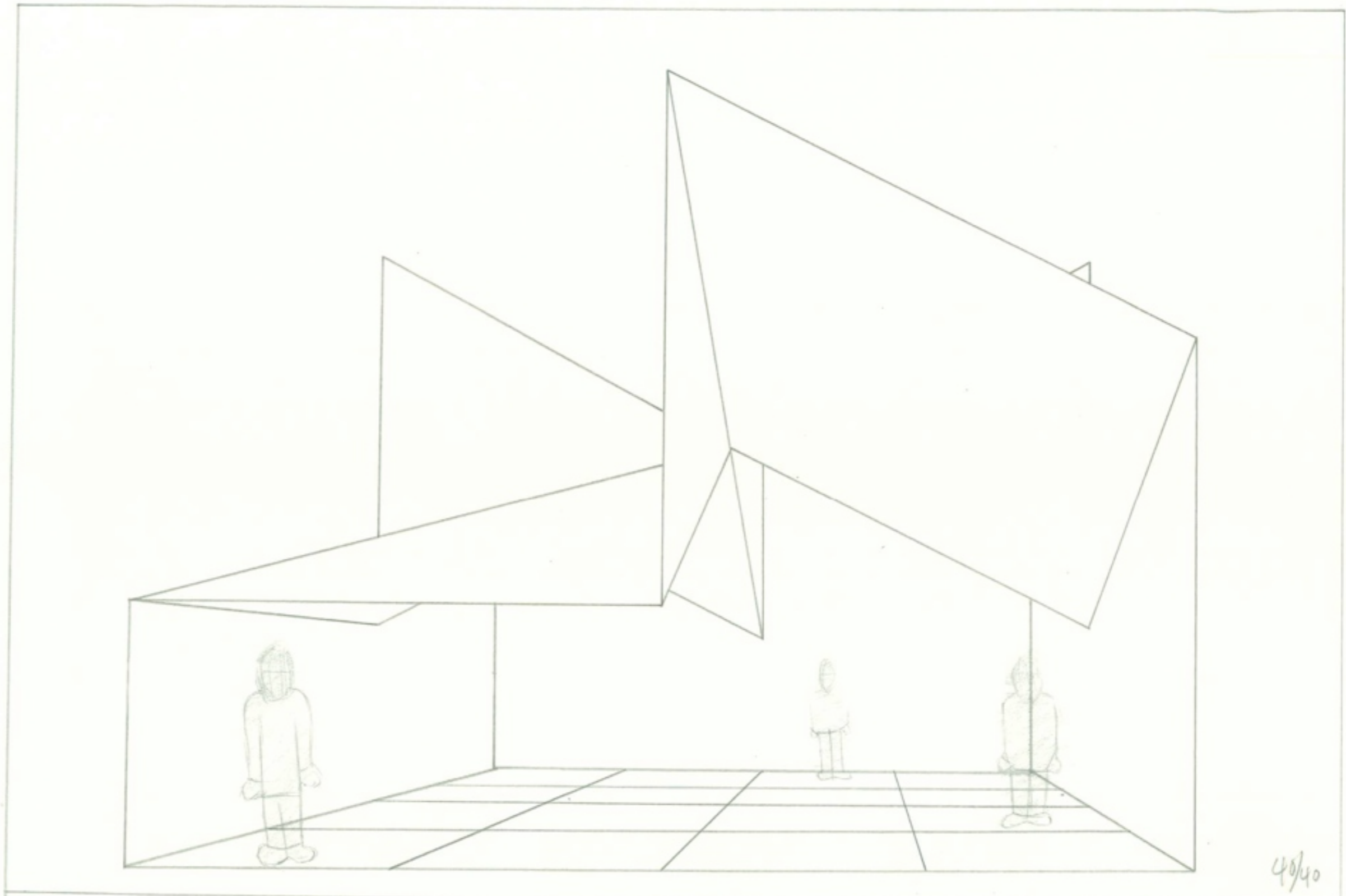
$AZ \text{ (radius)} = 2.0$
 $BZ \text{ (radius)} = 2.234375$
 $CZ \text{ (radius)} = 2.828125$
 $DZ \text{ (radius)} = 3.0$
 $EZ \text{ (radius)} = 3.46875$

 $XZ \text{ (radius)} = 2.44948974278318$
 (square root of 6)



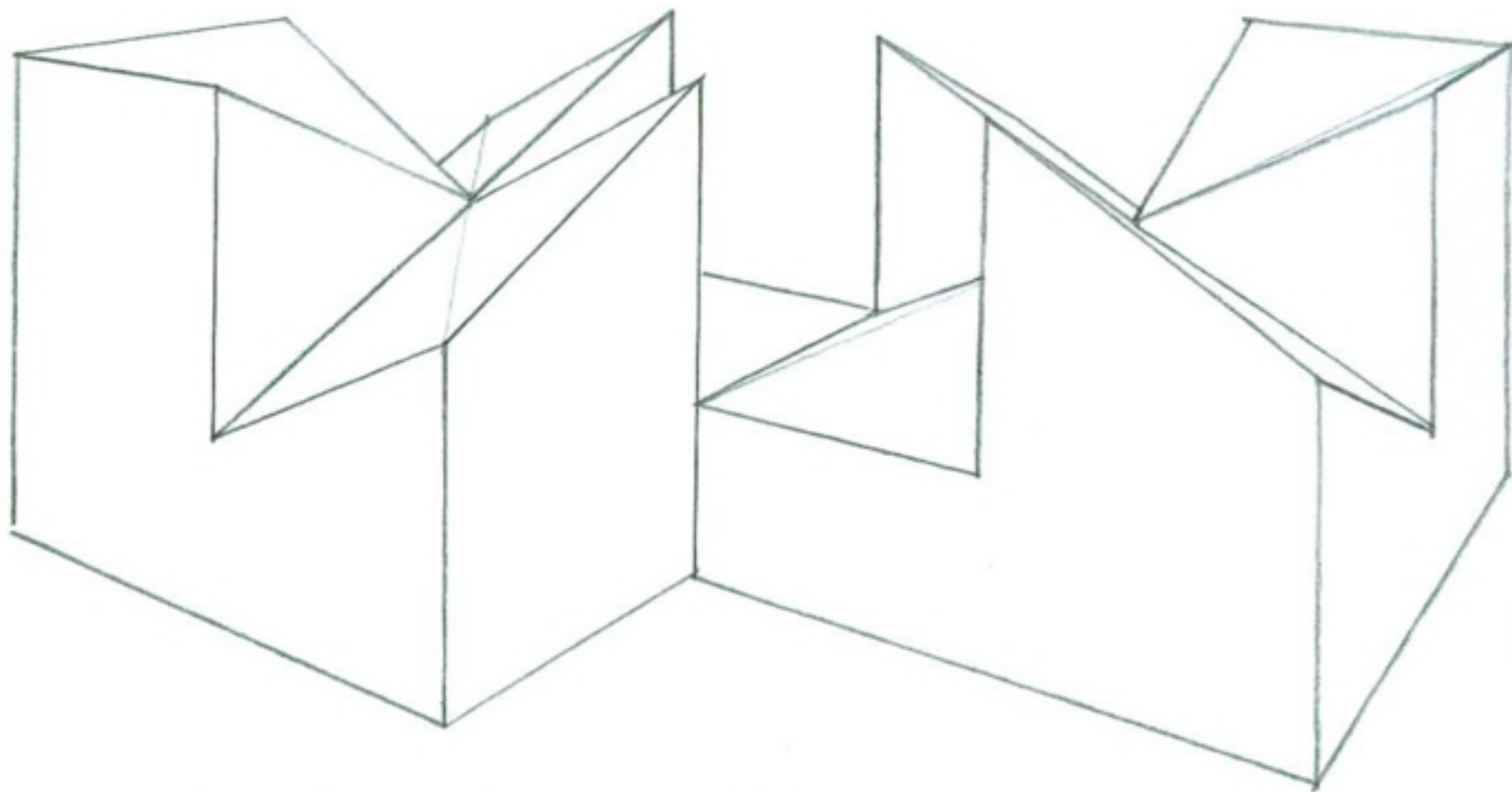






40/40

40 CUBIC MODULE AS ARCHITECTURAL ENVIRONMENT	DAI 320 TROGU	YUEN, FLORENCE	NOVEMBER 17, 2010
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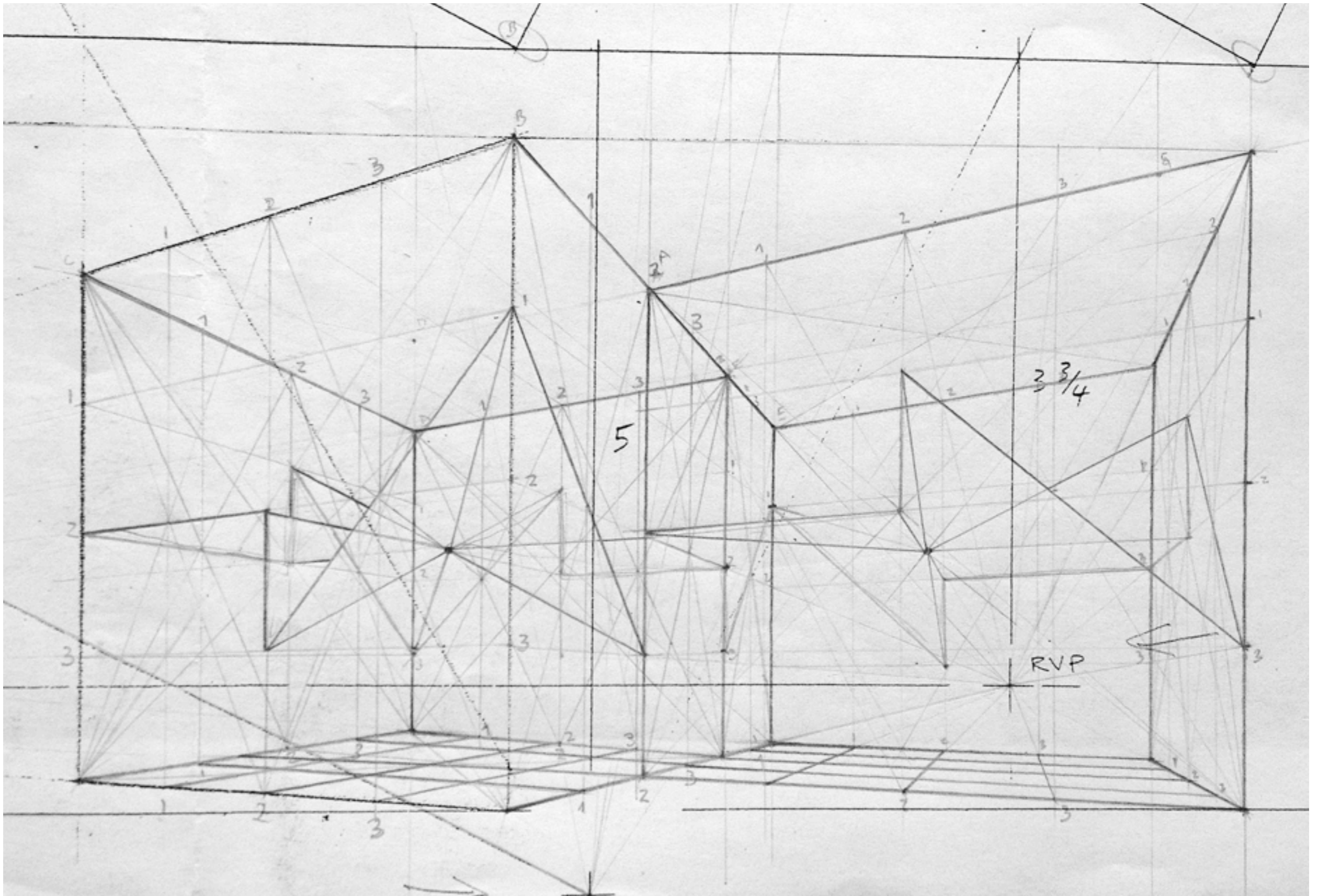
40
40

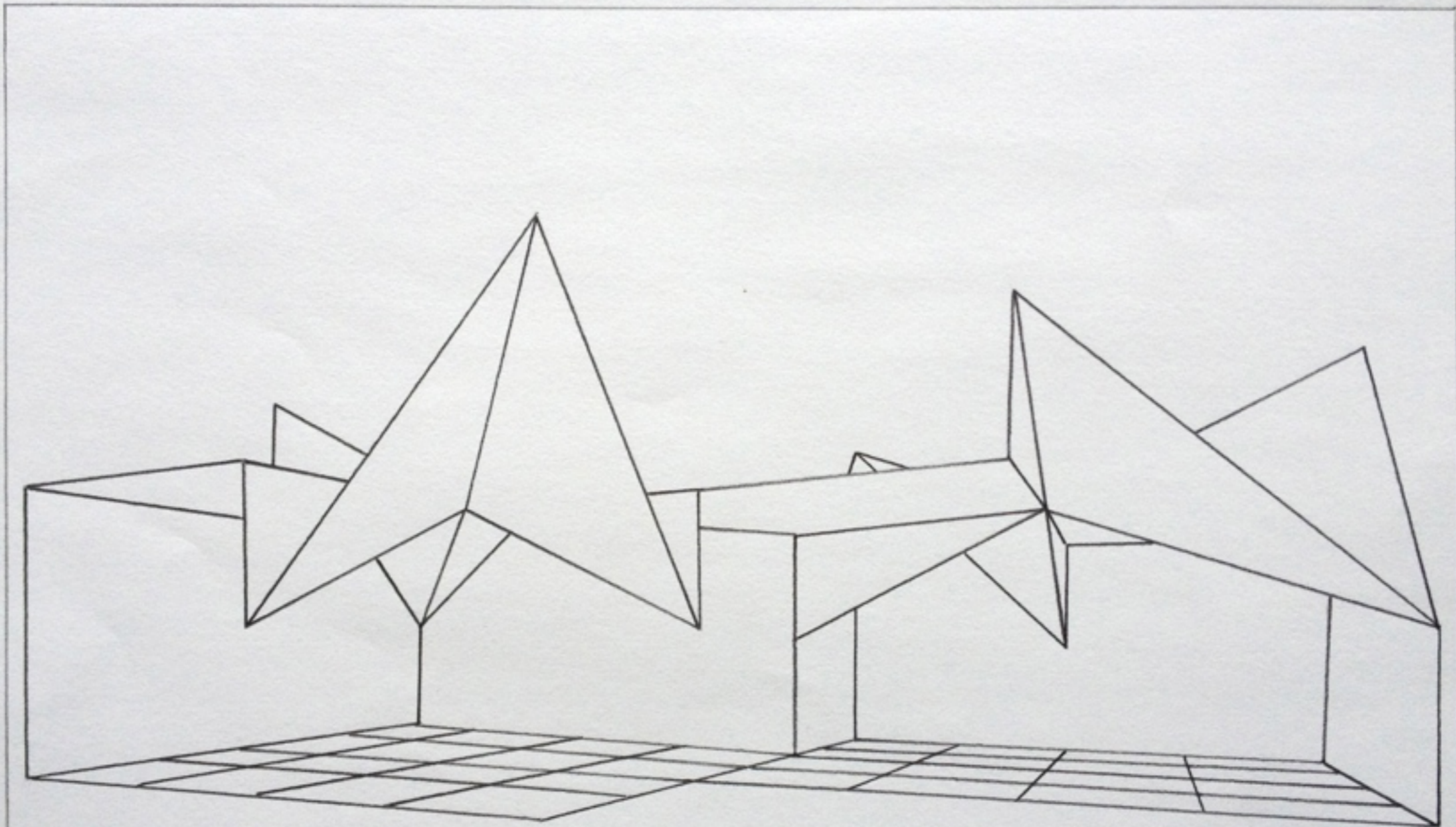
43 TWO CUBIC
MODULES

DAI 320 TROGU

YUEN, FLORENCE

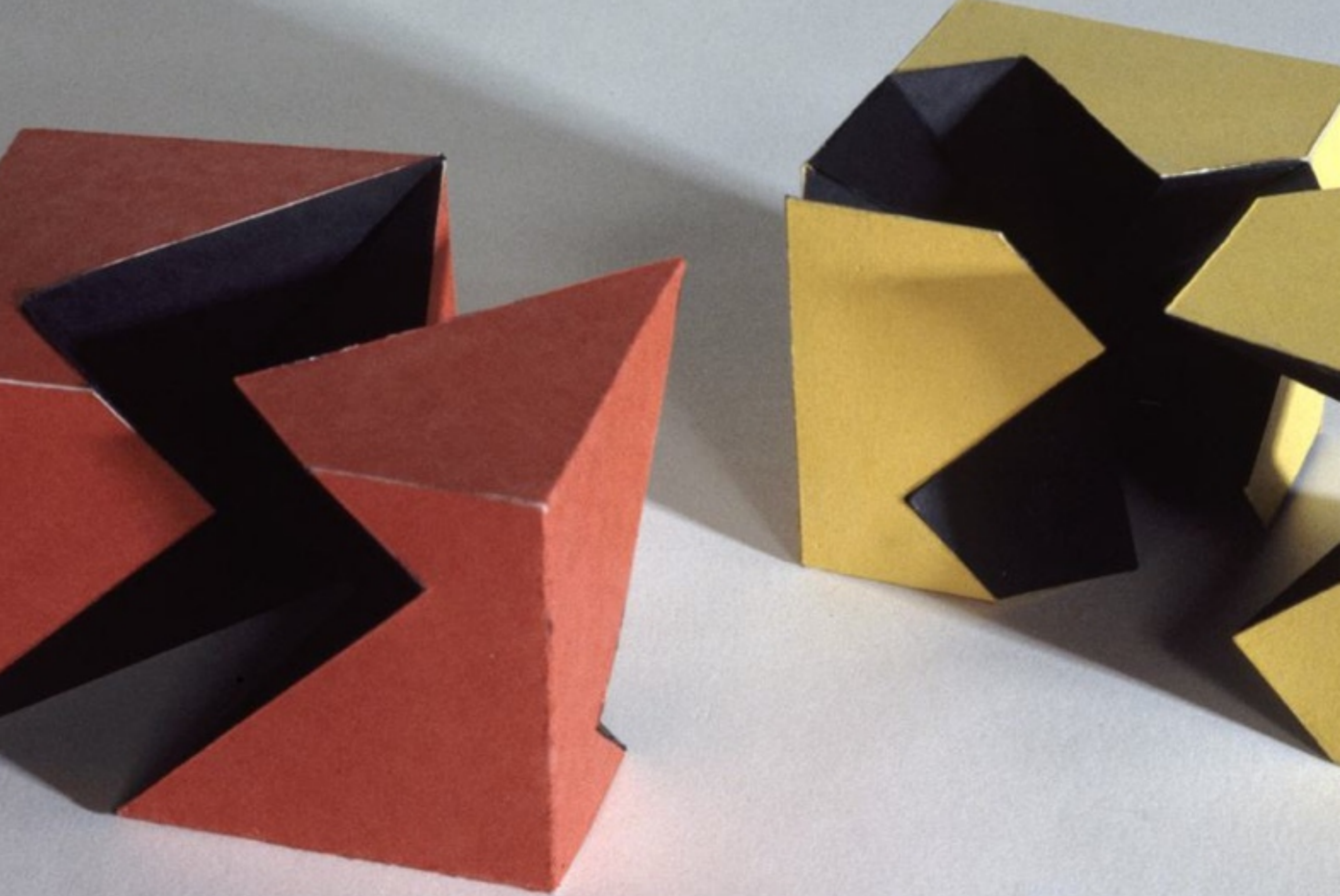
DEC. 13, 2010

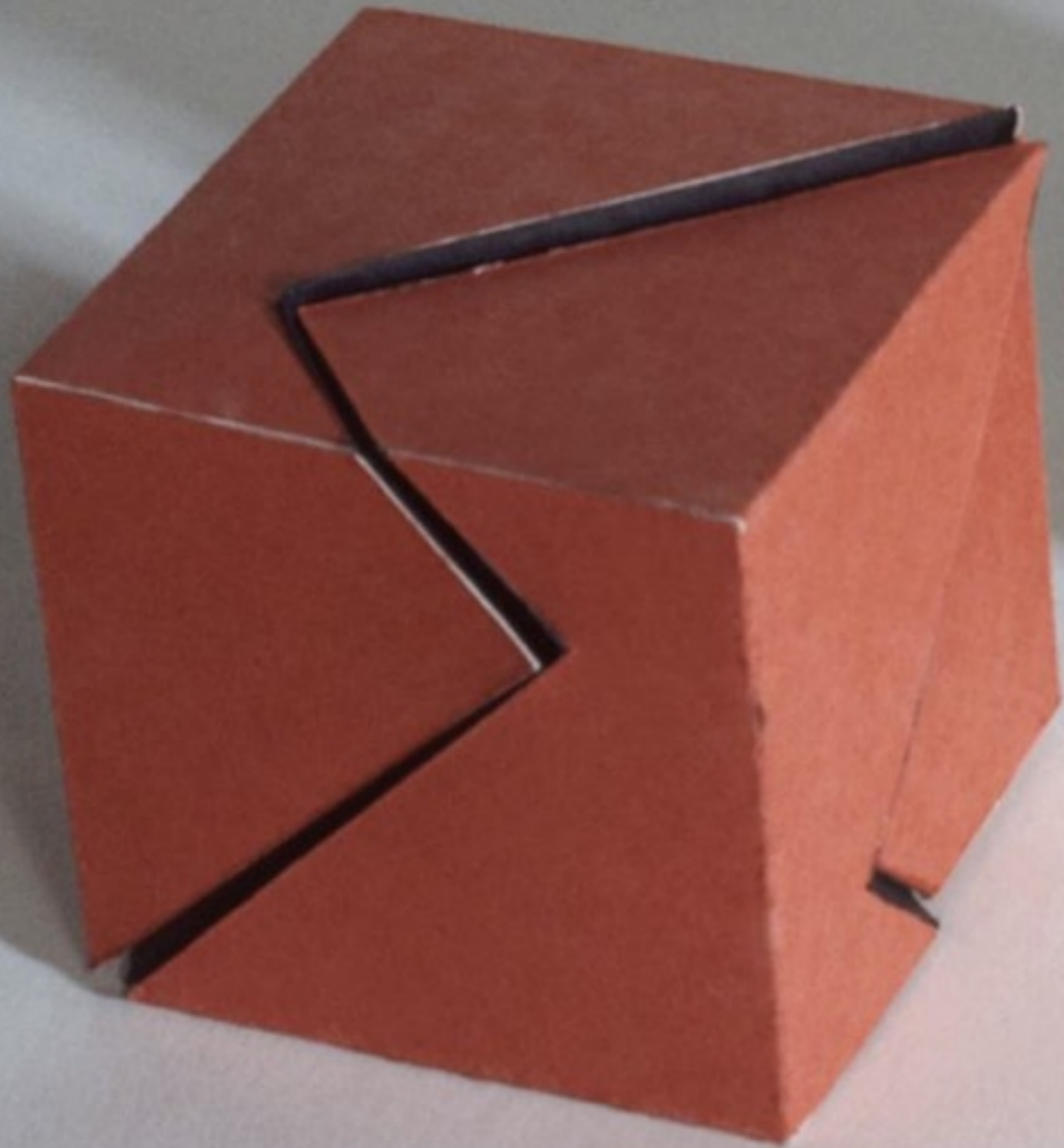


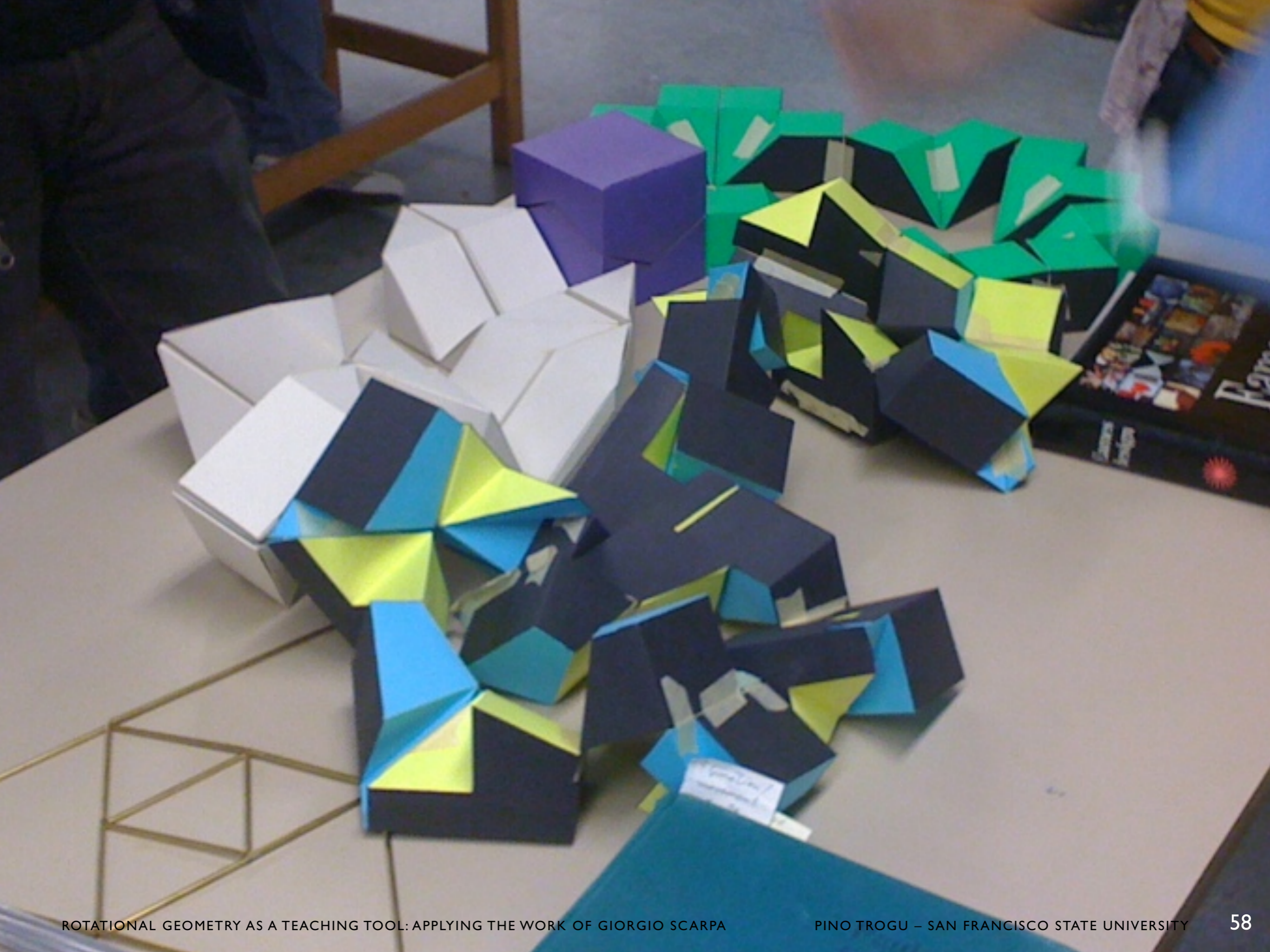


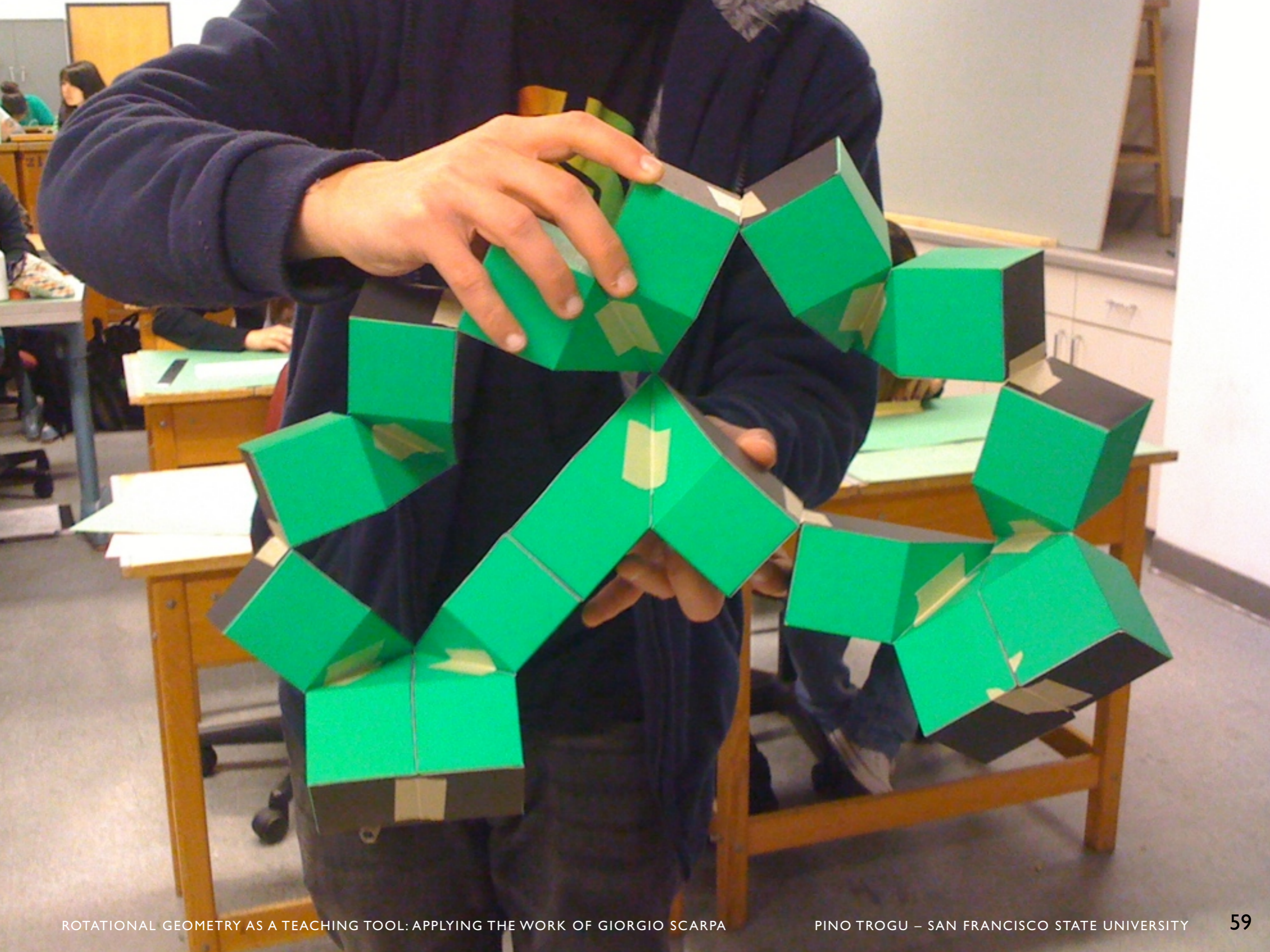
05/06

#44 TWO CUBIC MODULES (LOWER HORIZONLINE)	DAI320 TROGU	ECHEVERRIA, MICHEL	MAY 16, 2012
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Giorgio Scarpa online.sfsu.edu/trogu/scarpa/
Cube Section online.sfsu.edu/trogu/scarpa/cube

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