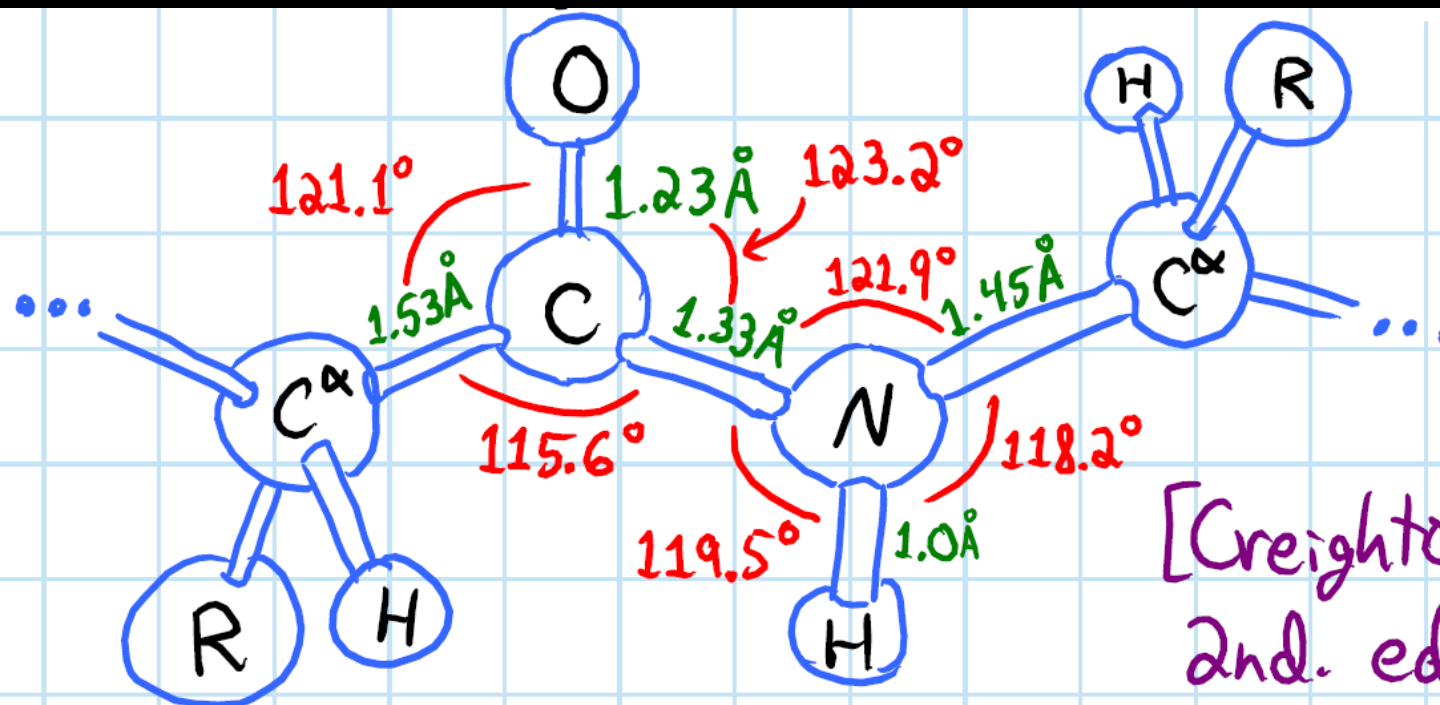
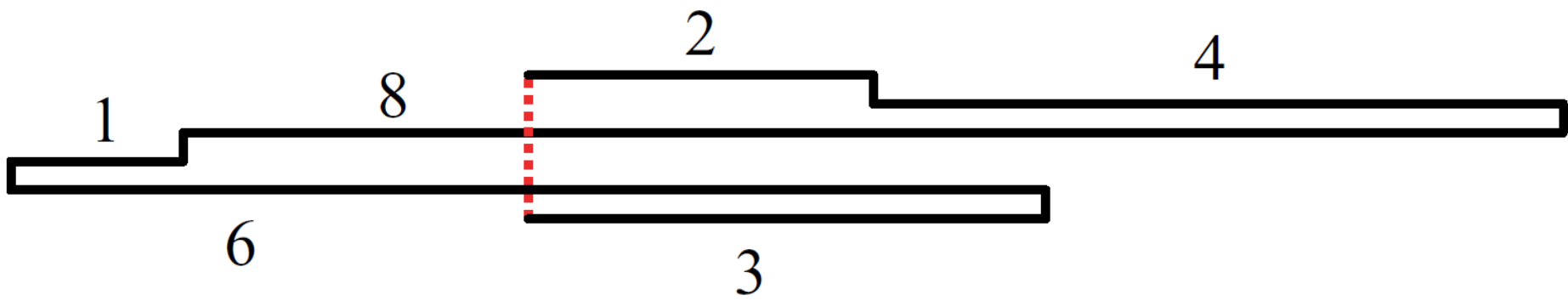


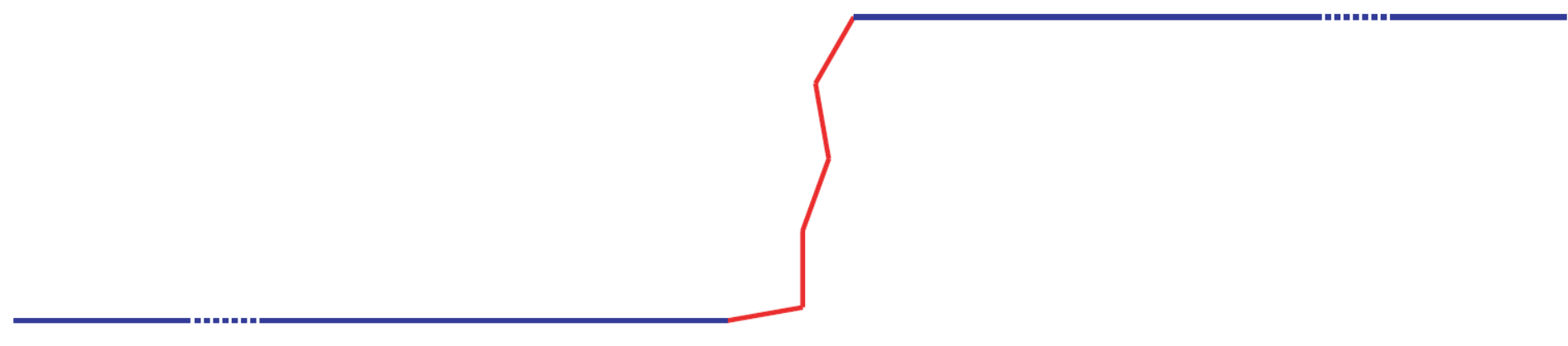
hexokinase (PDB 1QHA)  
drawn by Tim Vickers



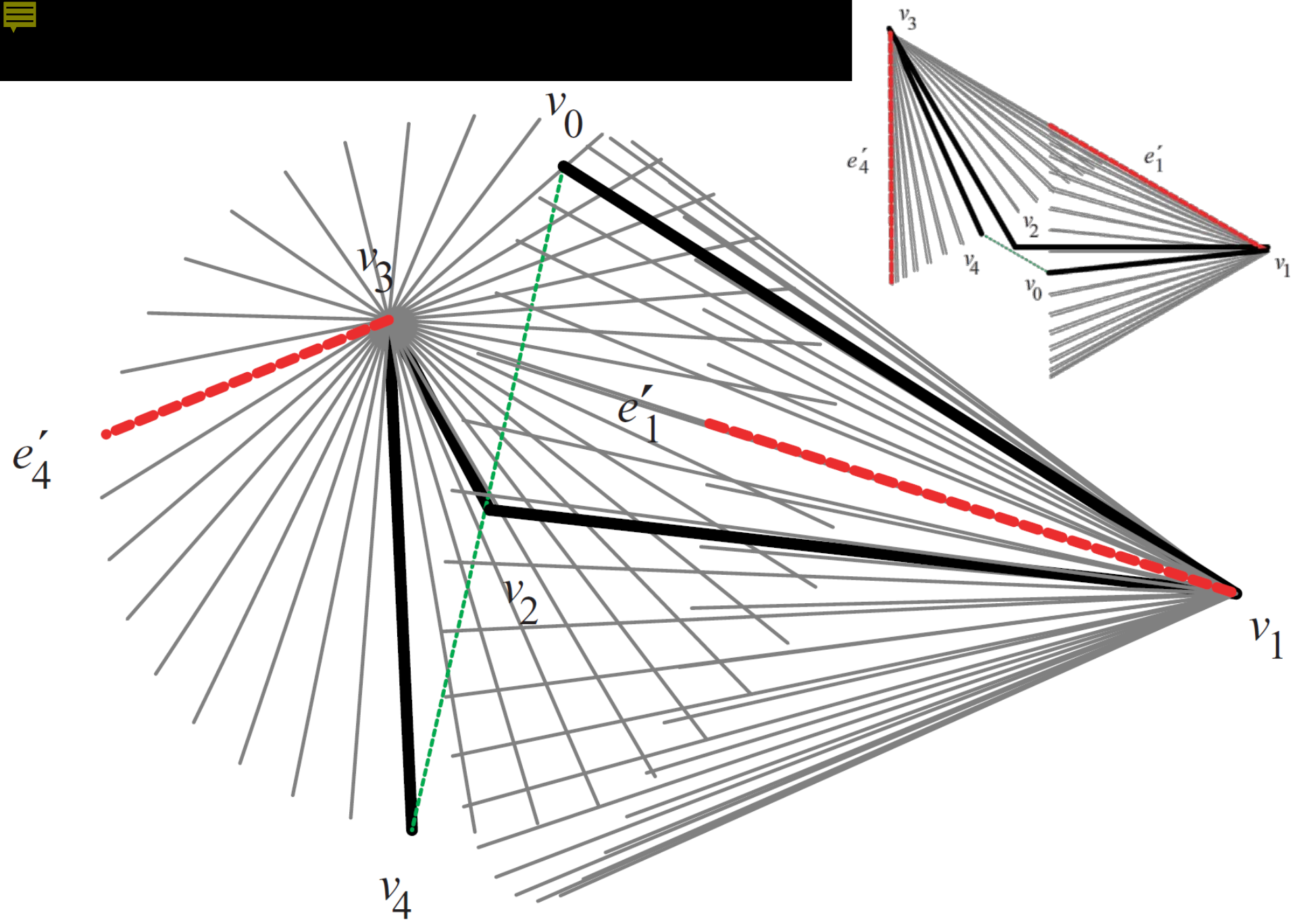
[Creighton: PROTEINS,  
2nd. ed., p. 5]

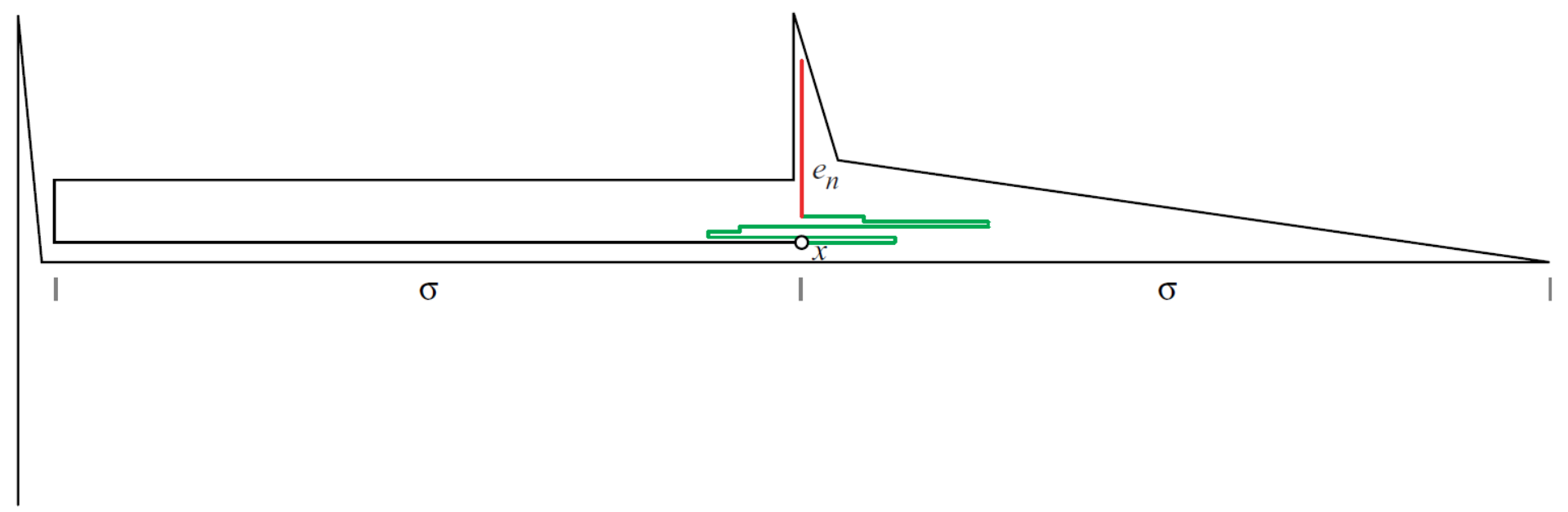
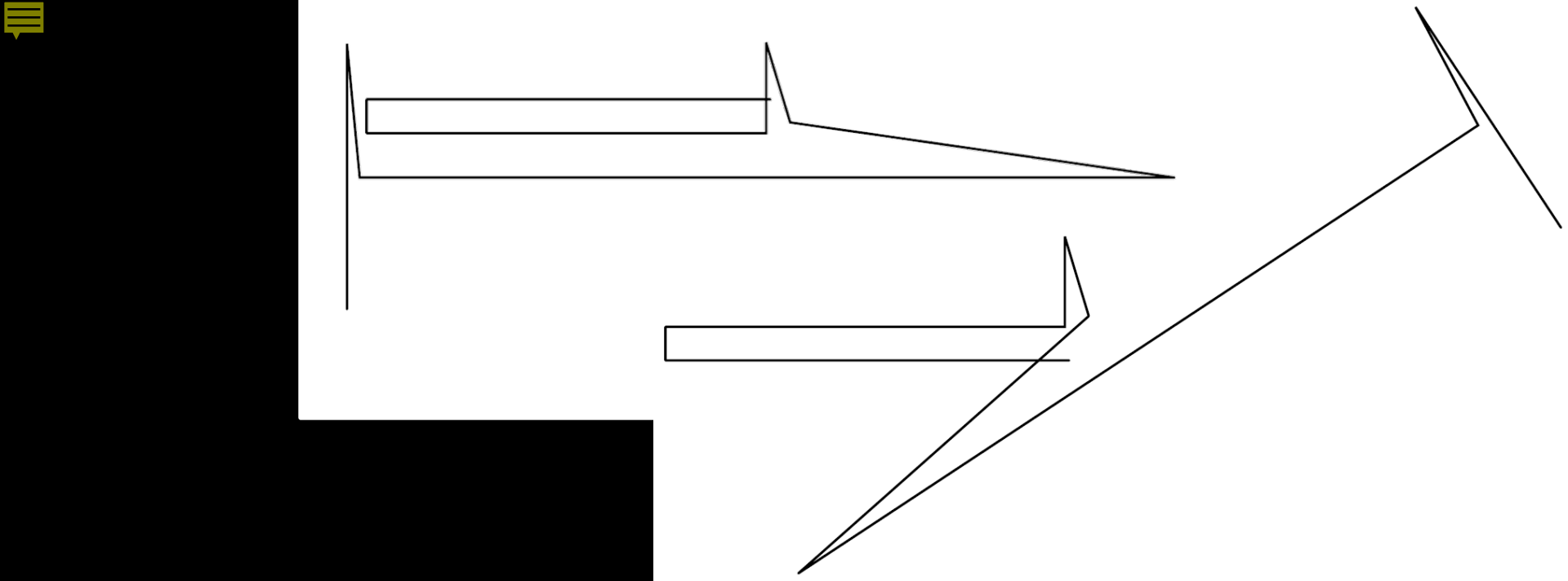


minimum flat span is NP-complete



maximum flat span is NP-complete

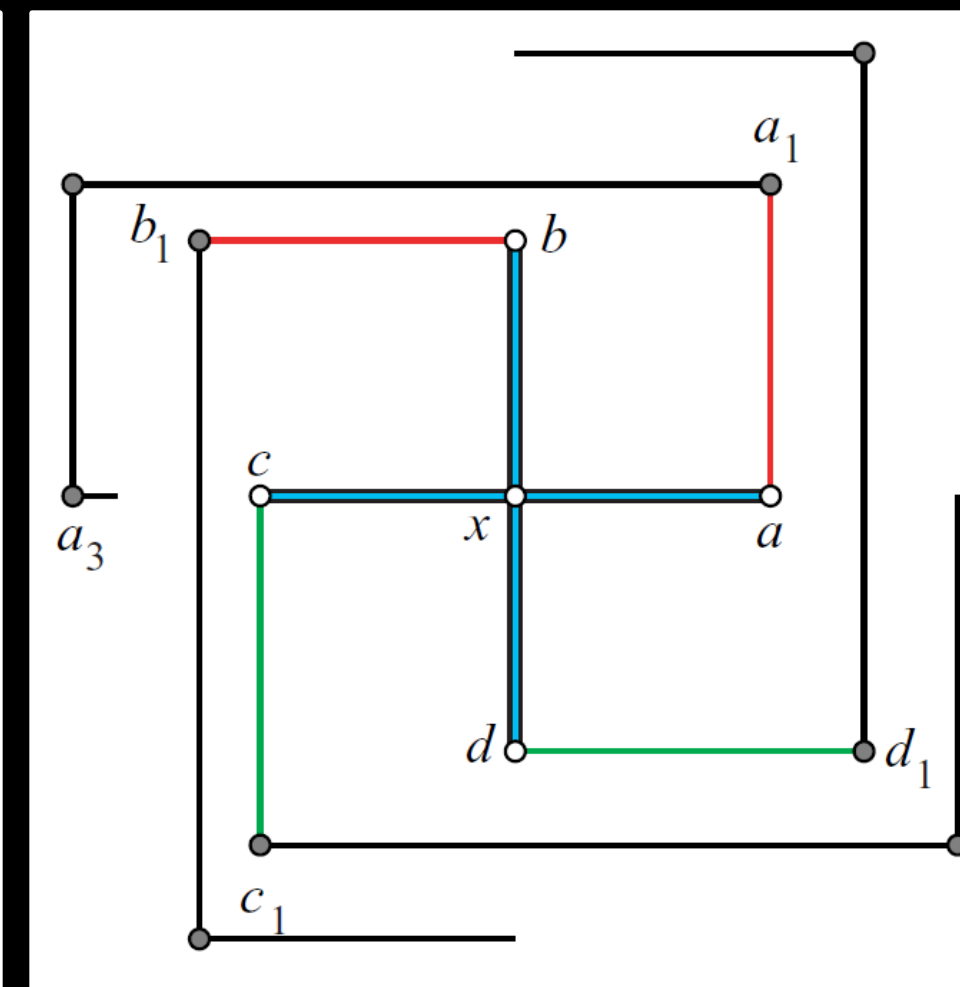
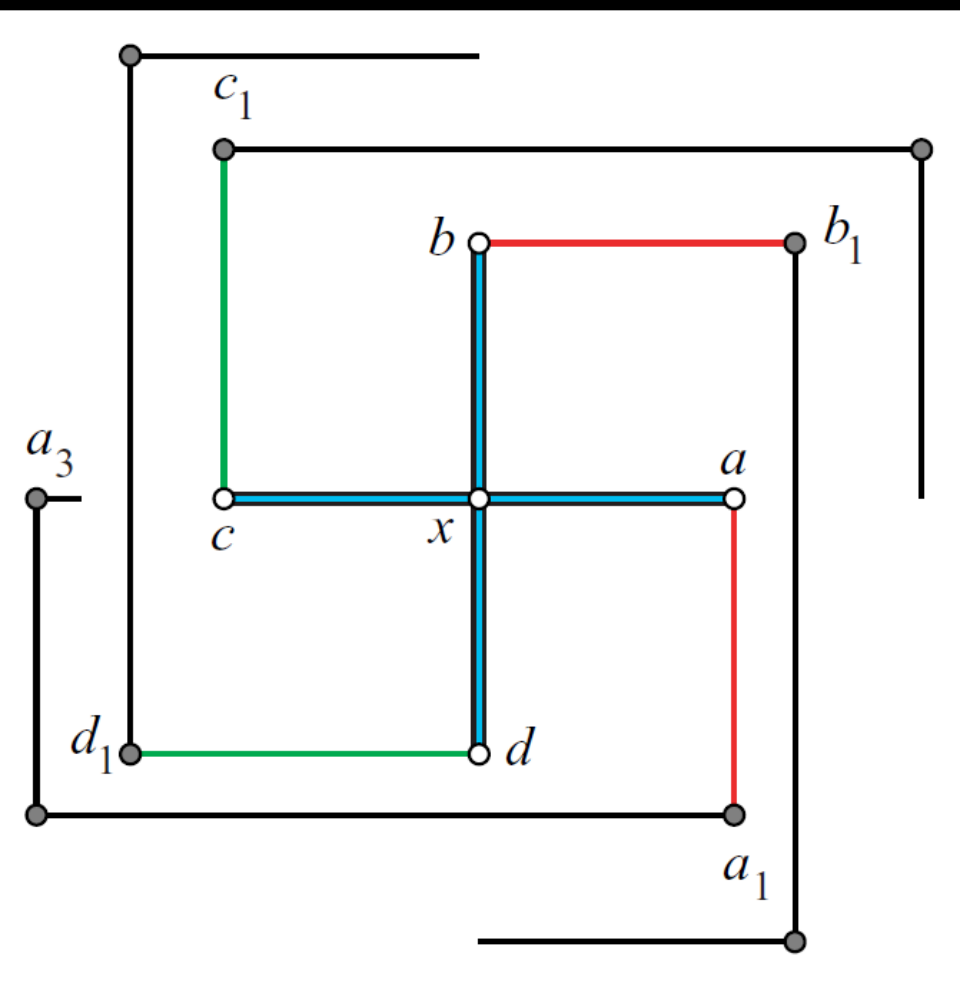




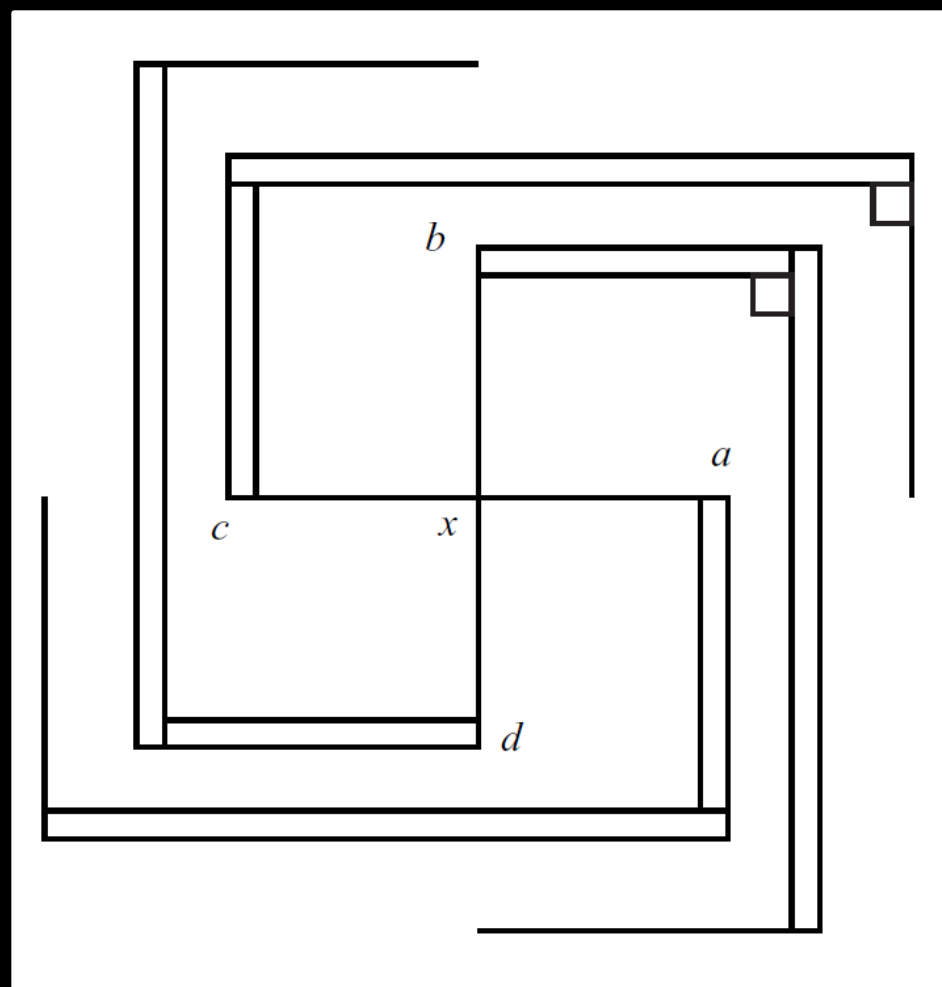
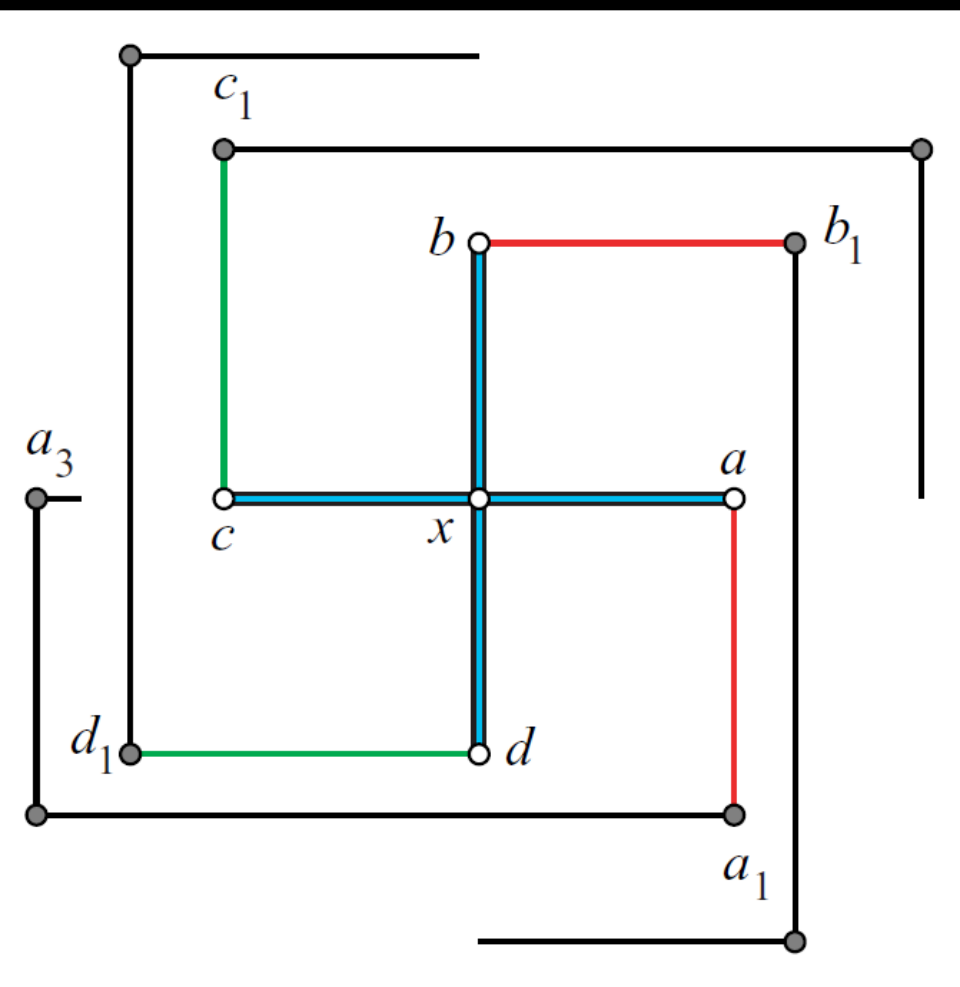
**Table 8.1: Summary of known results**

<b>Constraints on fixed-angle linkage</b>		<b>Flat-state connectivity</b>	<b>Reference</b>
<b>Connectivity</b>	<b>Chain Geometry</b>		
Open chain	Has monotone state	Connected	Aloupis and Meijer (2006)
	$\alpha$ orthogonal or obtuse	Connected	Aloupis et al. (2002a)
	$\alpha$ equal acute	Connected	Aloupis et al. (2002b)
	unit; $\alpha \in (60^\circ, 150^\circ)$	Connected	Aloupis et al. (2002b); Aloupis and Meijer (2006)
Multiple pinned open chains	Orthogonal	Connected	Aloupis et al. (2002a)
Closed chain	Unit; orthogonal	Connected	Aloupis et al. (2002a)
Tree	Orthogonal; partially rigid	Disconnected	Aloupis et al. (2002a)
Graph	Orthogonal	Disconnected	Aloupis et al. (2002a)

“Unit” means with unit link lengths; a “monotone state” is a planar, strictly monotone configuration;  $\alpha$  represents the joint angles.



[Aloupis, Demaine, Dujmović, Erickson, Langerman, Meijer, O'Rourke, Overmars, Soss, Streinu, Toussaint 2002]

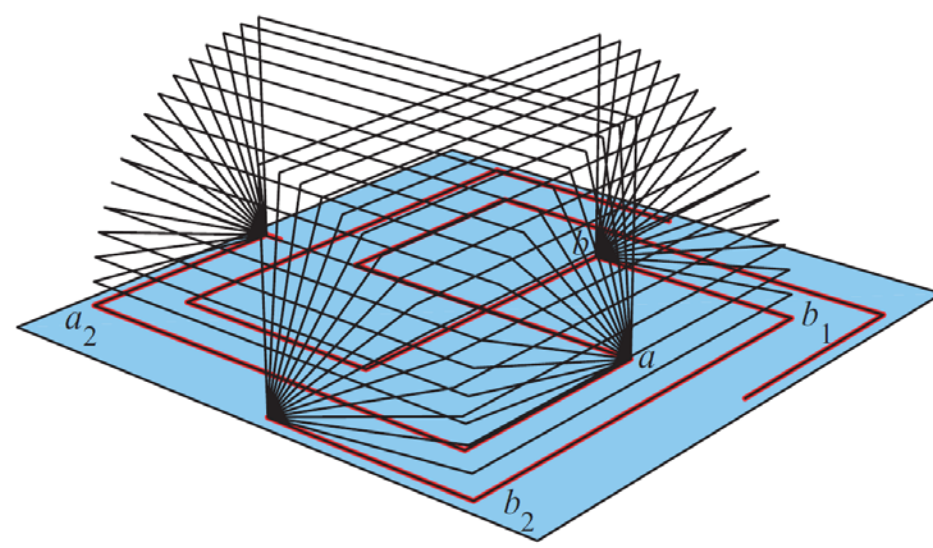
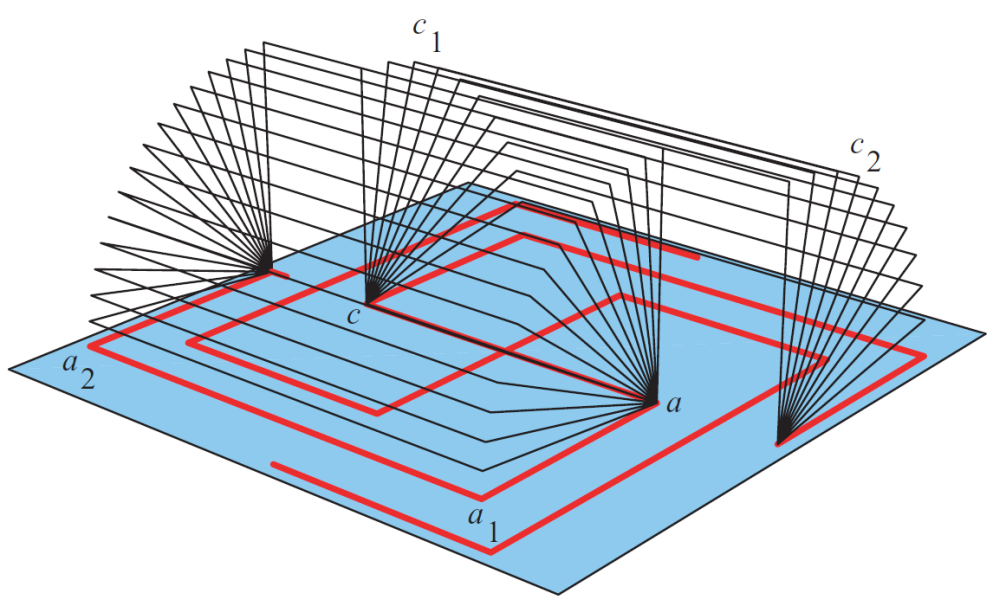
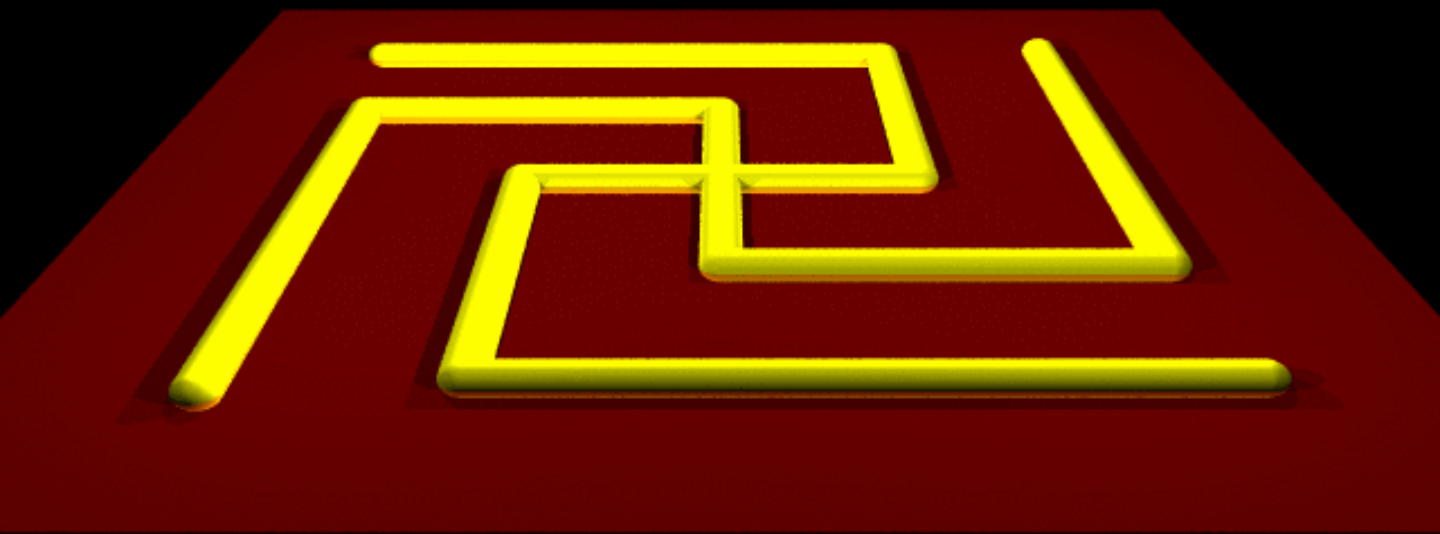


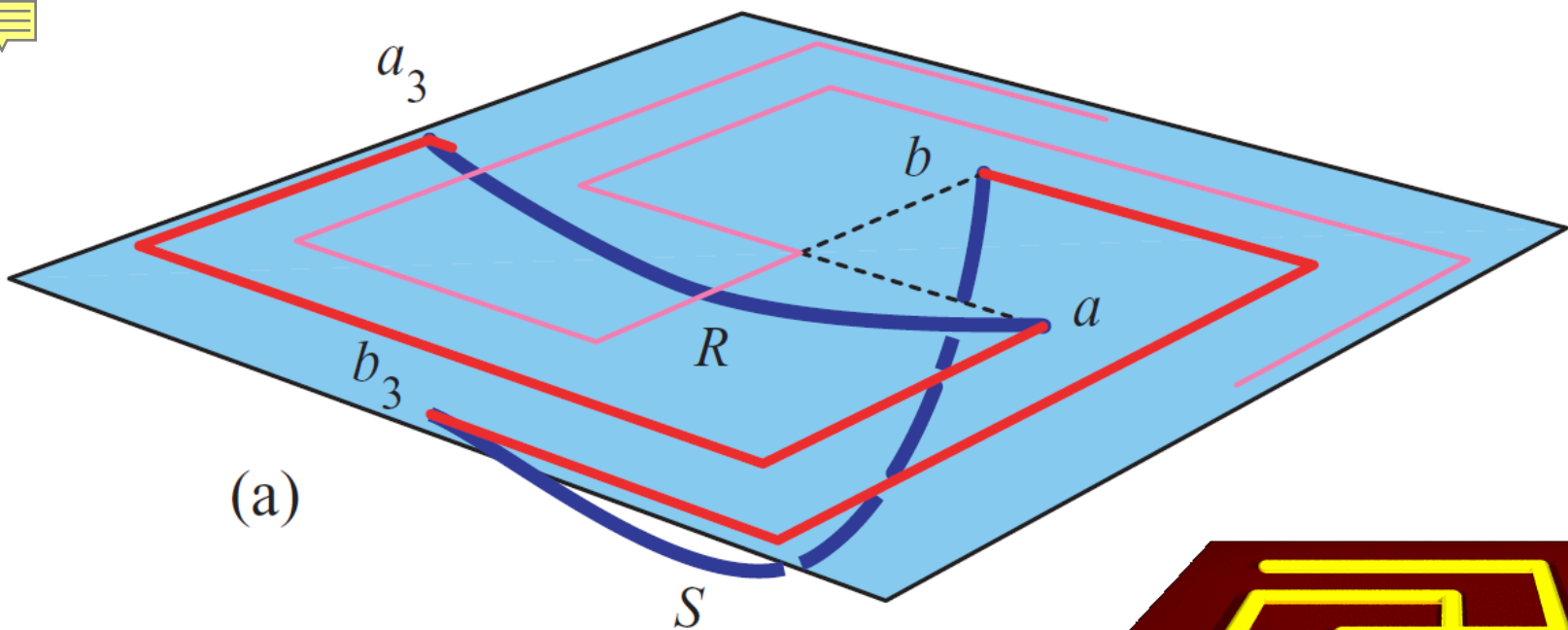
[Aloupis, Demaine, Dujmović, Erickson, Langerman, Meijer, O'Rourke, Overmars, Soss, Streinu, Toussaint 2002]



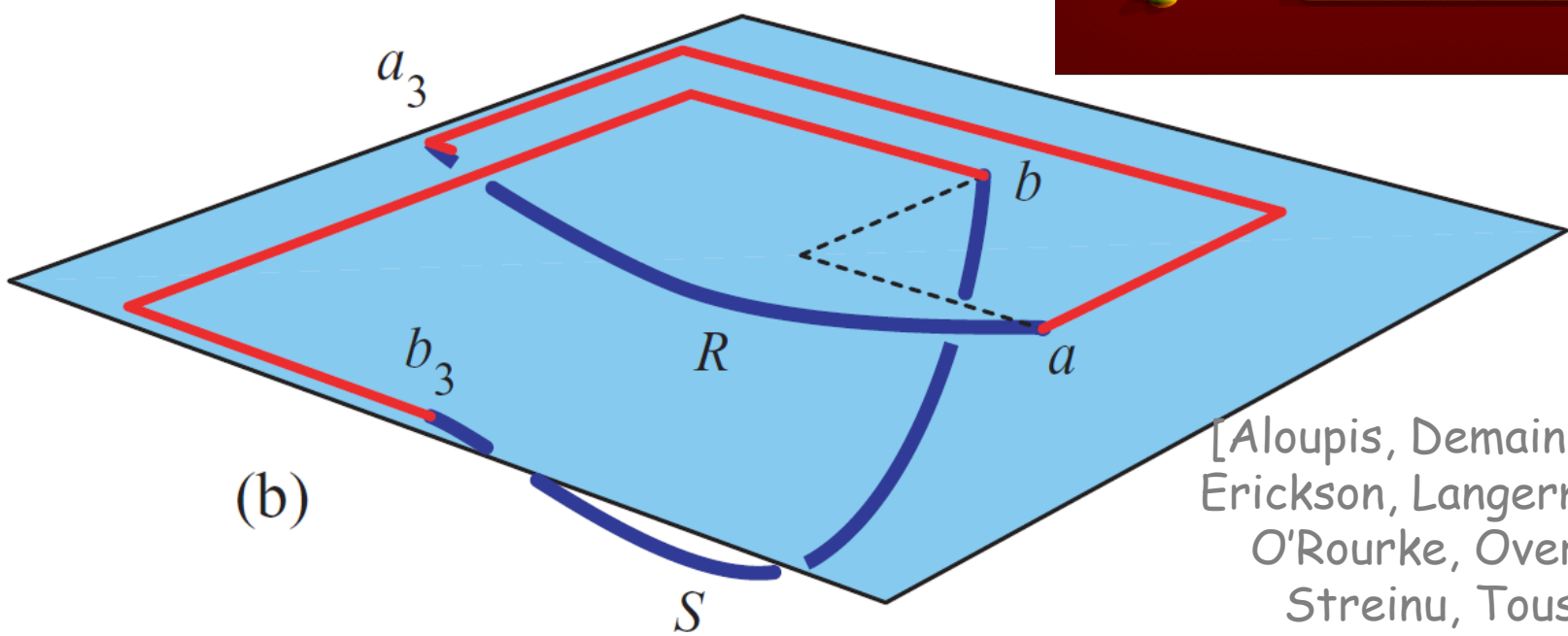
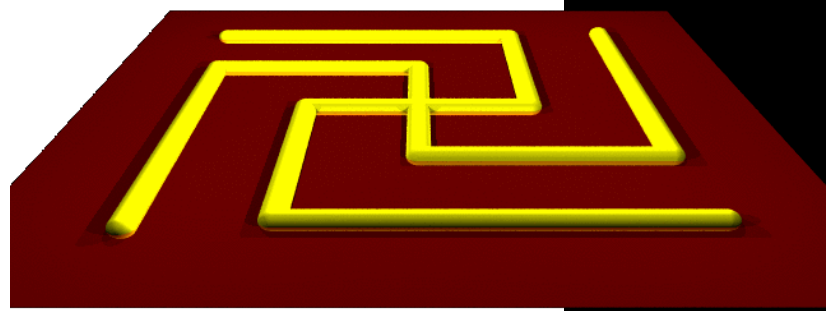


[Aloupis,  
Demaine,  
Dujmović,  
Erickson,  
Langerman,  
Meijer,  
O'Rourke,  
Overmars,  
Soss,  
Streinu,  
Toussaint  
2002]



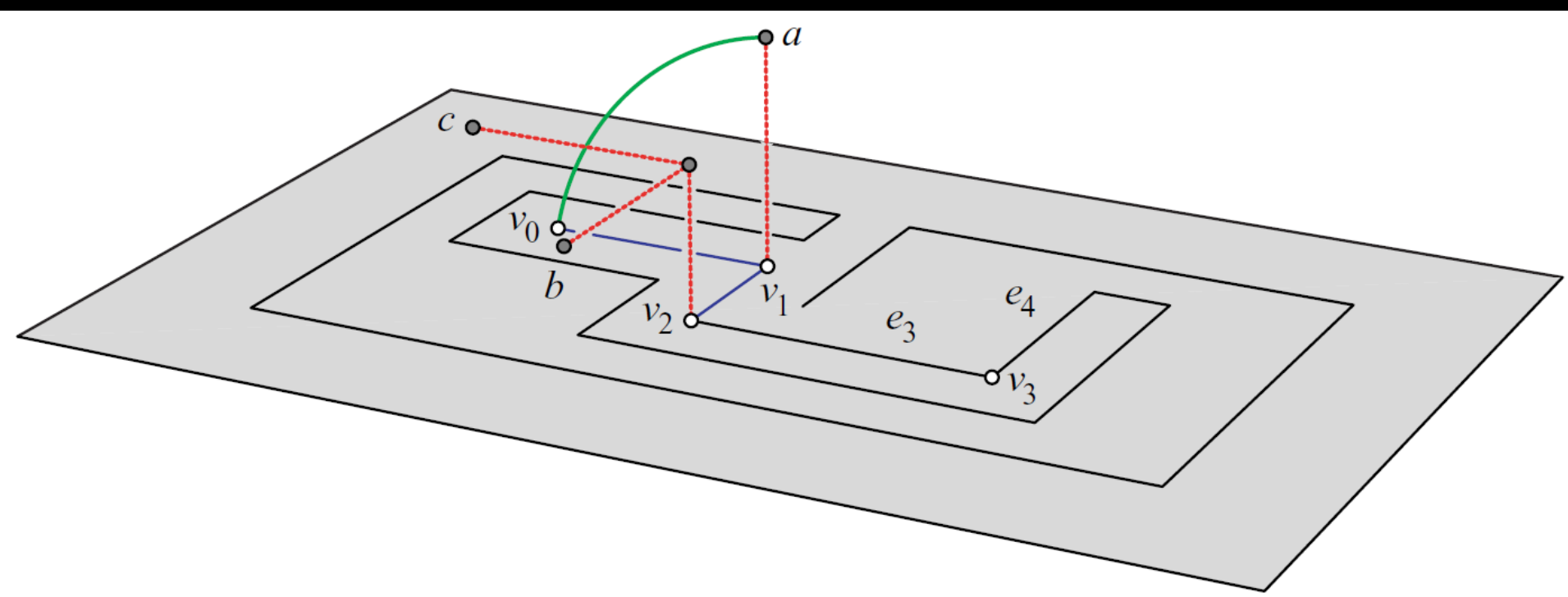


(a)

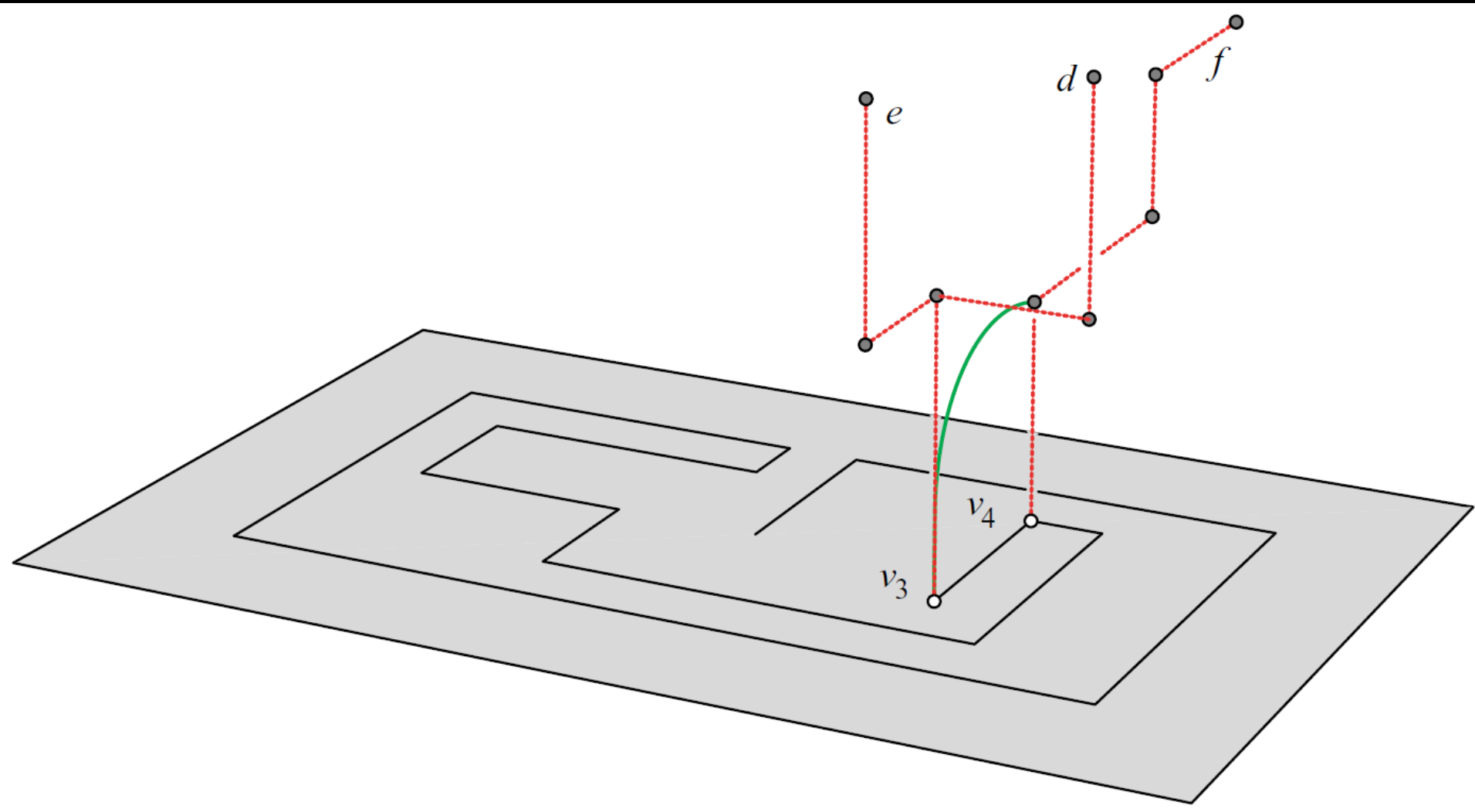


(b)

[Aloupis, Demaine, Dujmović, Erickson, Langerman, Meijer, O'Rourke, Overmars, Soss, Streinu, Toussaint 2002]



[Aloupis, Demaine, Dujmović, Erickson,  
Langerman, Meijer, O'Rourke, Overmars,  
Soss, Streinu, Toussaint 2002]



[Aloupis, Demaine, Dujmović, Erickson,  
Langerman, Meijer, O'Rourke, Overmars,  
Soss, Streinu, Toussaint 2002]

Date: Sat, 11 May 2002 09:37:05

From: Stefan Langerman <sl@jeff.cs.mcgill.ca>

To: Joseph O'Rourke <orourke@turing.csc.smith.edu>

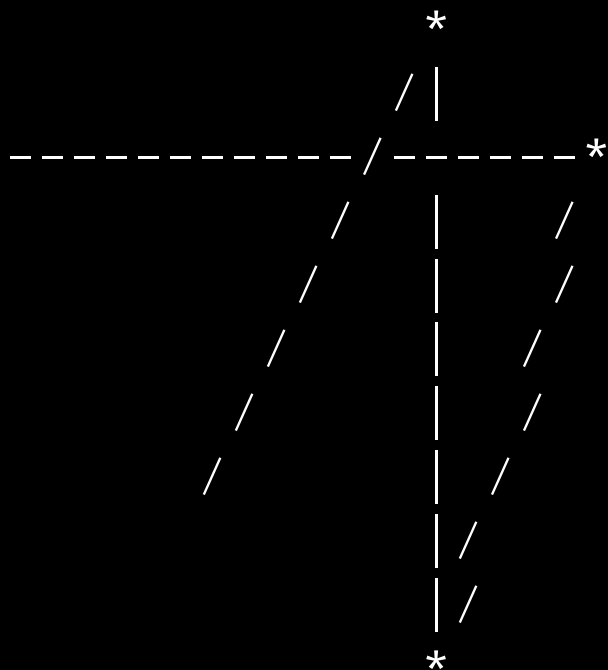
Cc: Erik Demaine <edemaine@mit.edu>

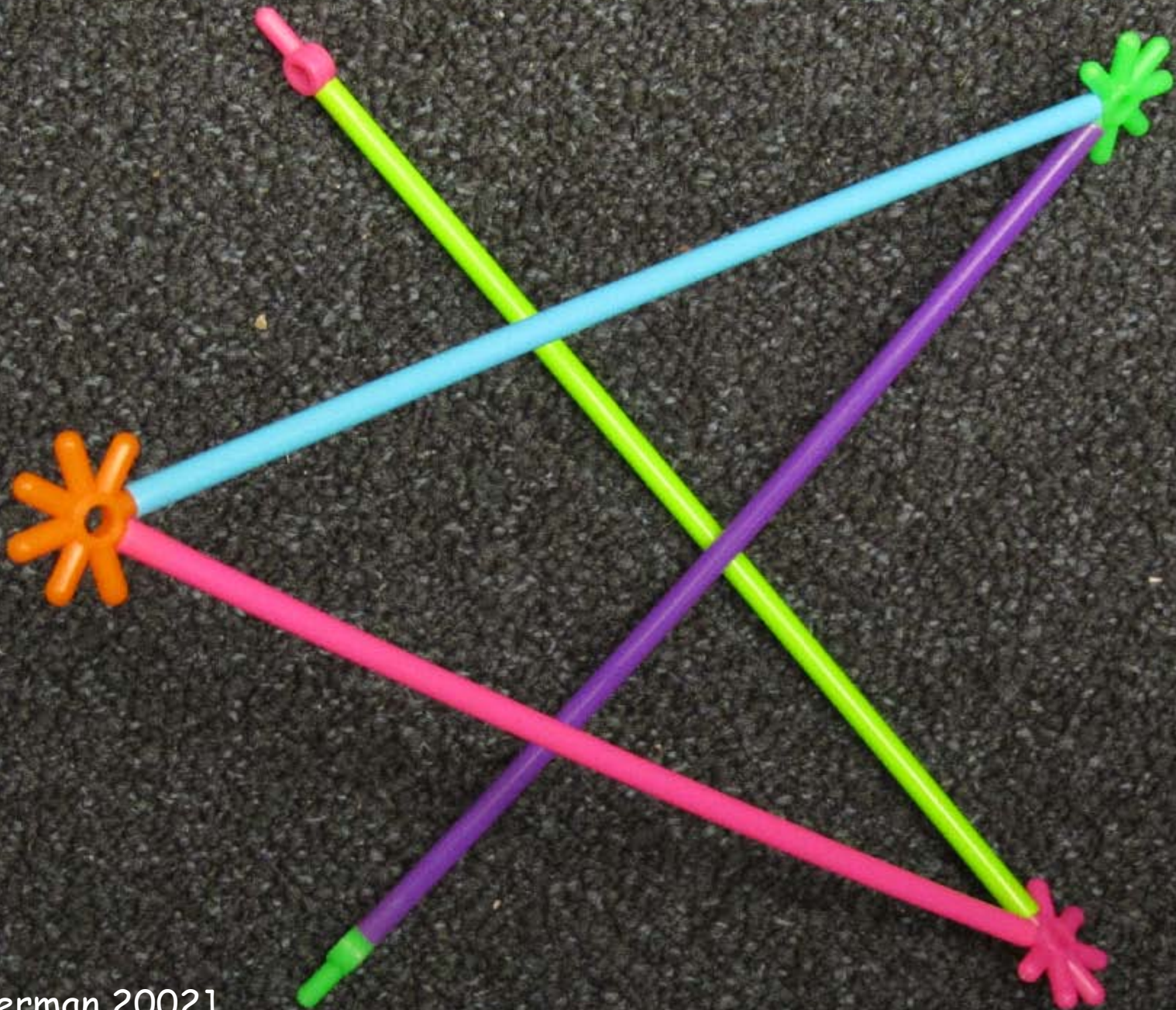
Subject: Re: Molecule machine: questions

[...]

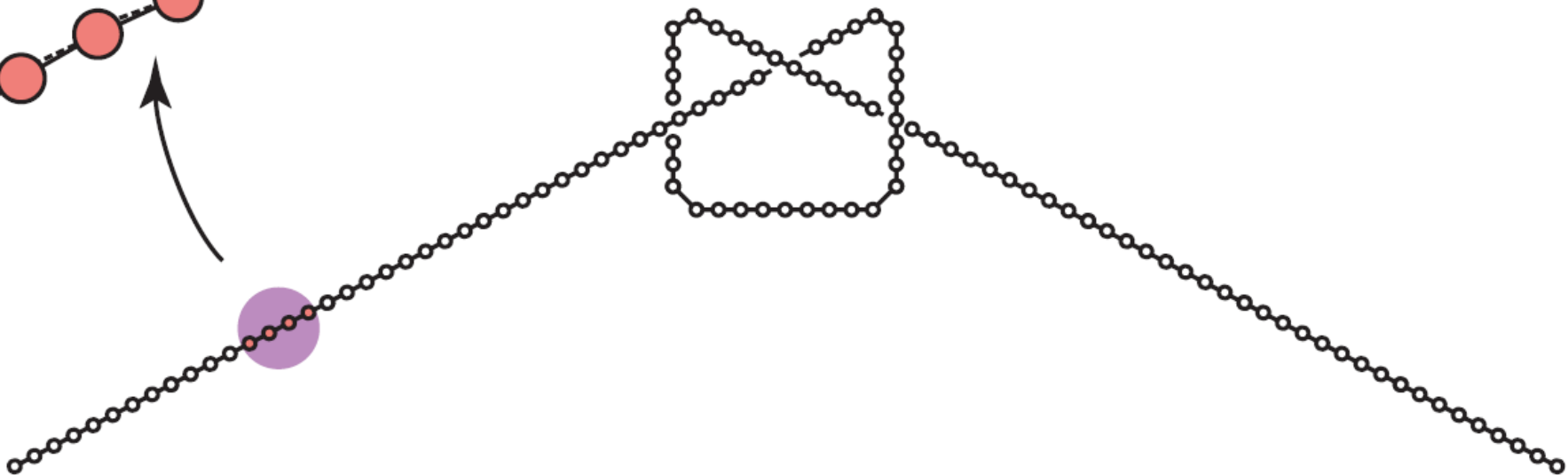
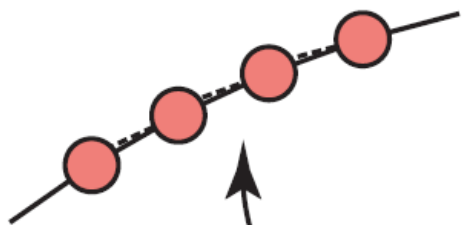
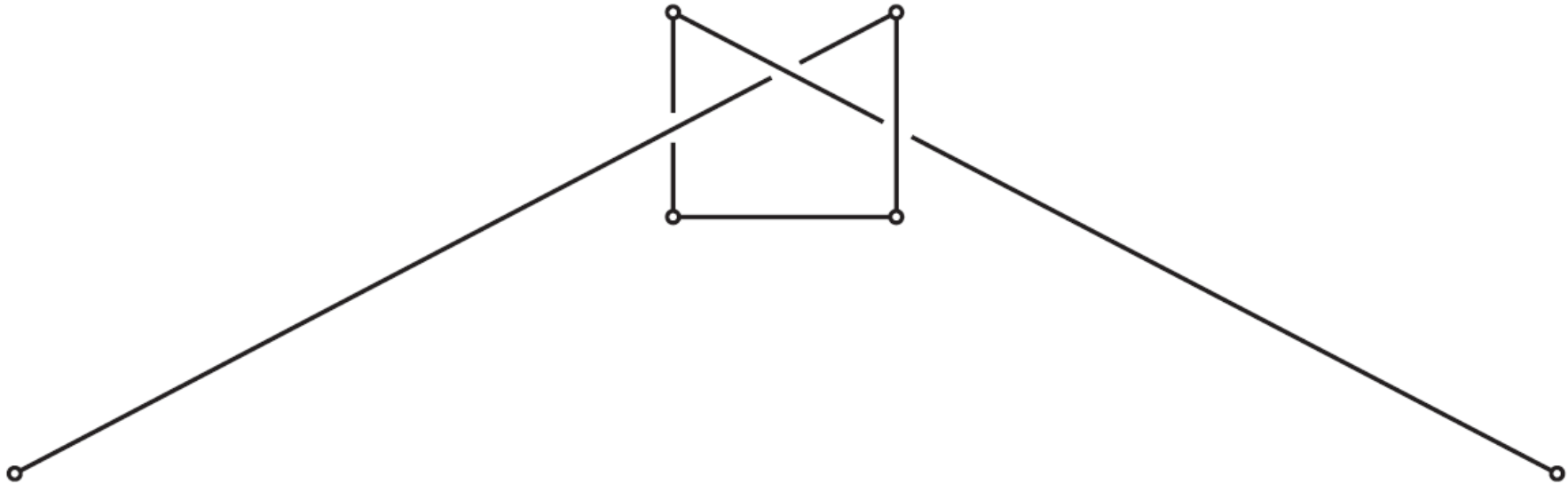
Q3a. Is every unit-length embedded chain flattenable?

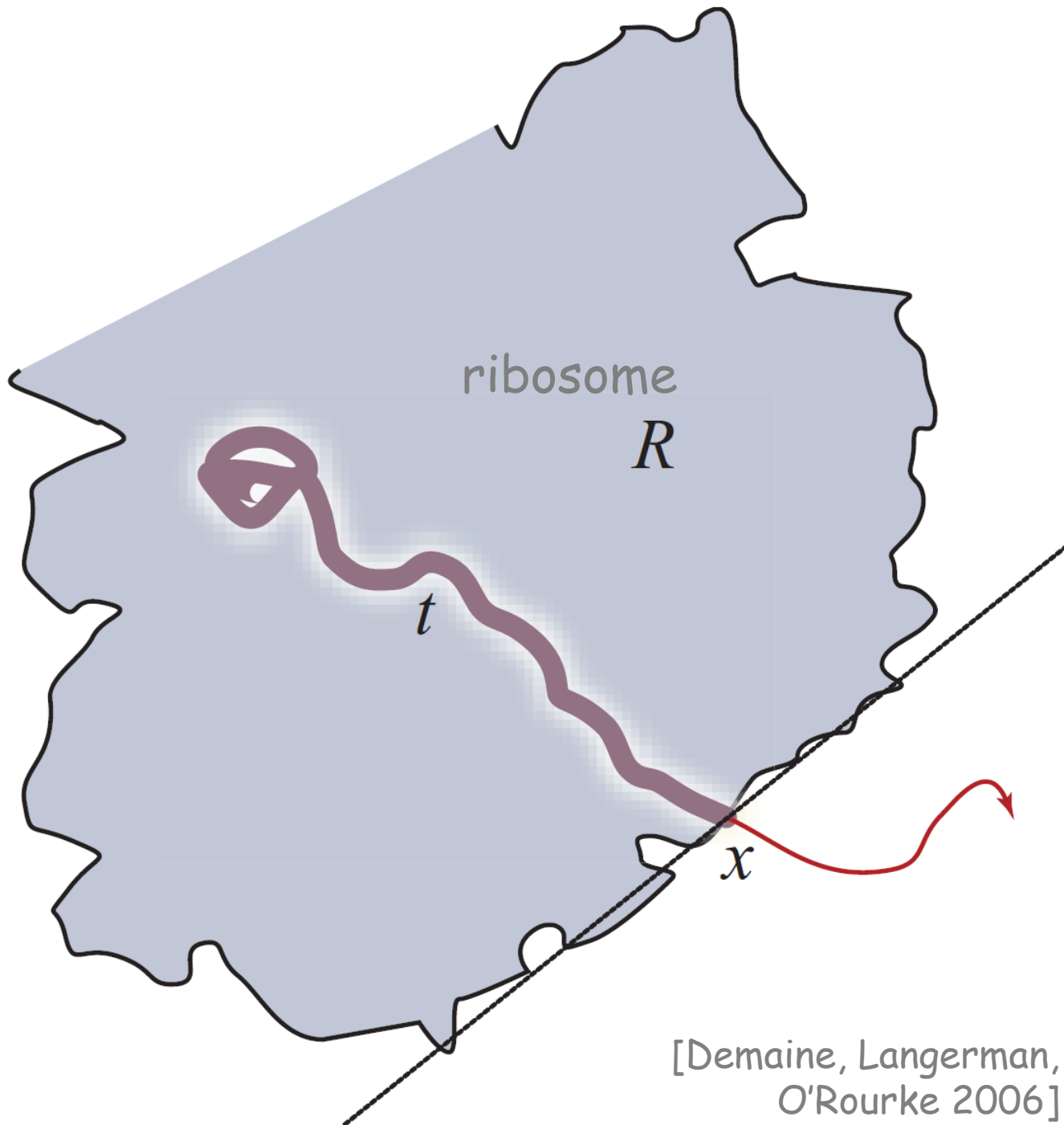
I think the answer is no because the crossed leg config can be made unit length:





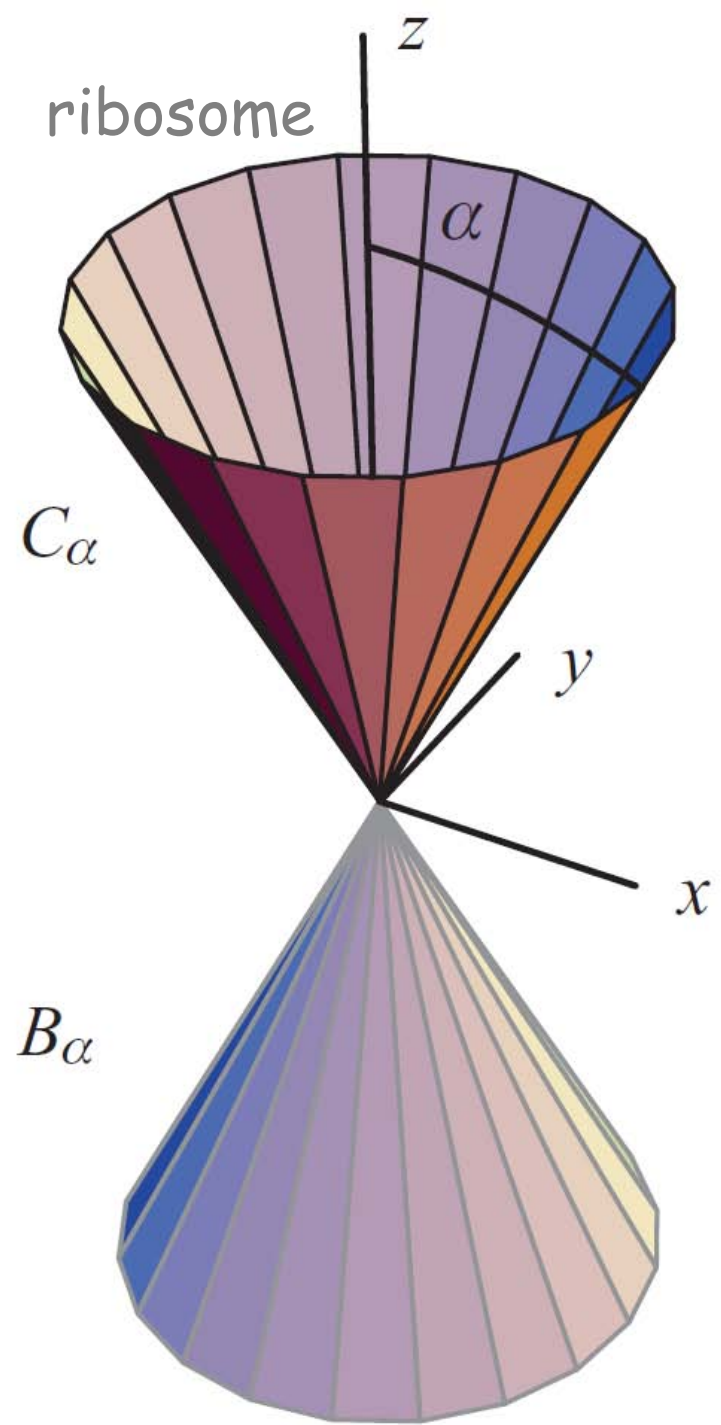
[Langerman 2002]





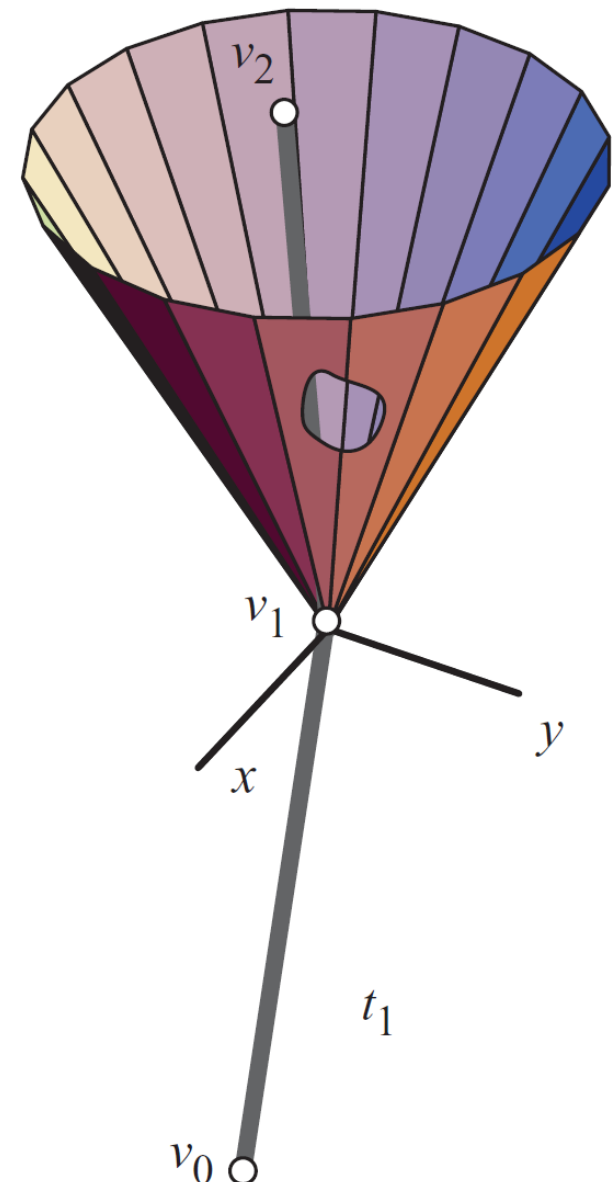
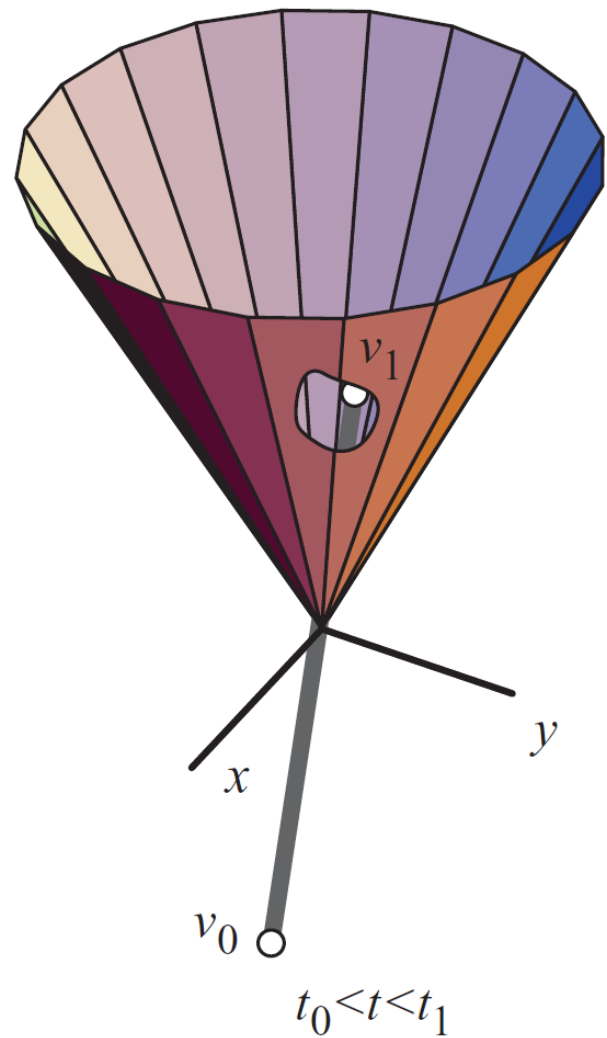
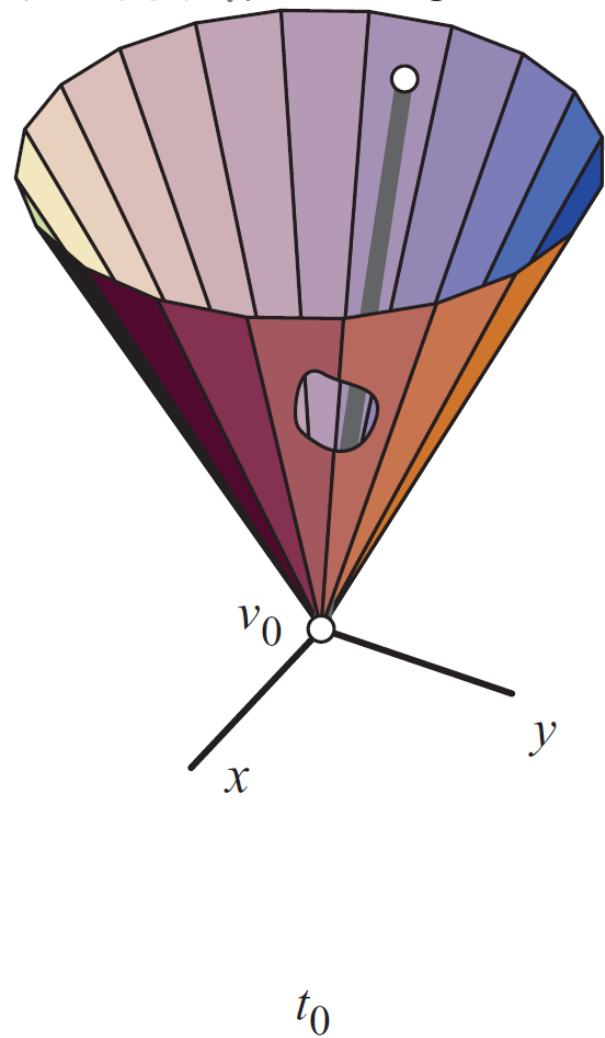
[Demaine, Langerman,  
O'Rourke 2006]



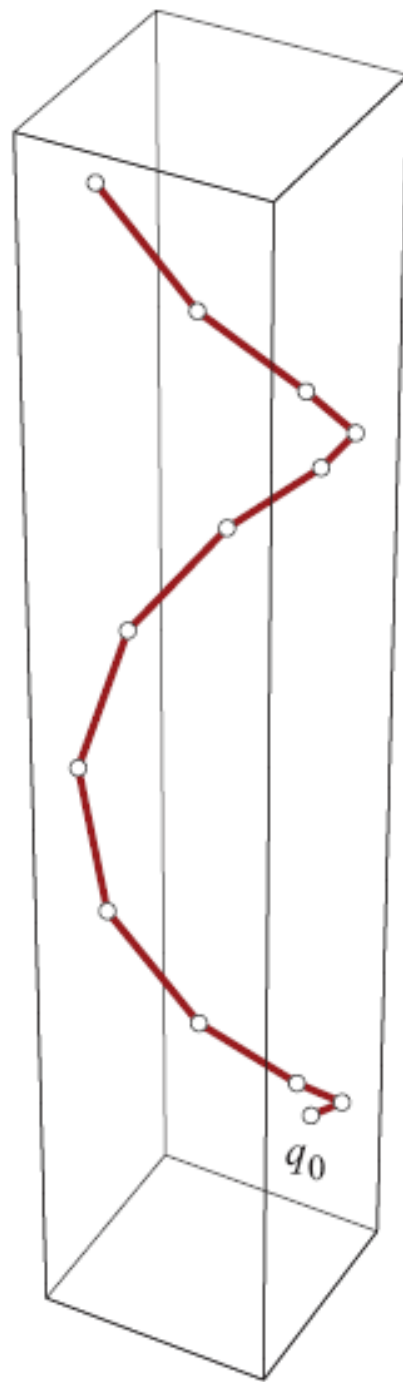


[Demaine, Langerman,  
O'Rourke 2006]

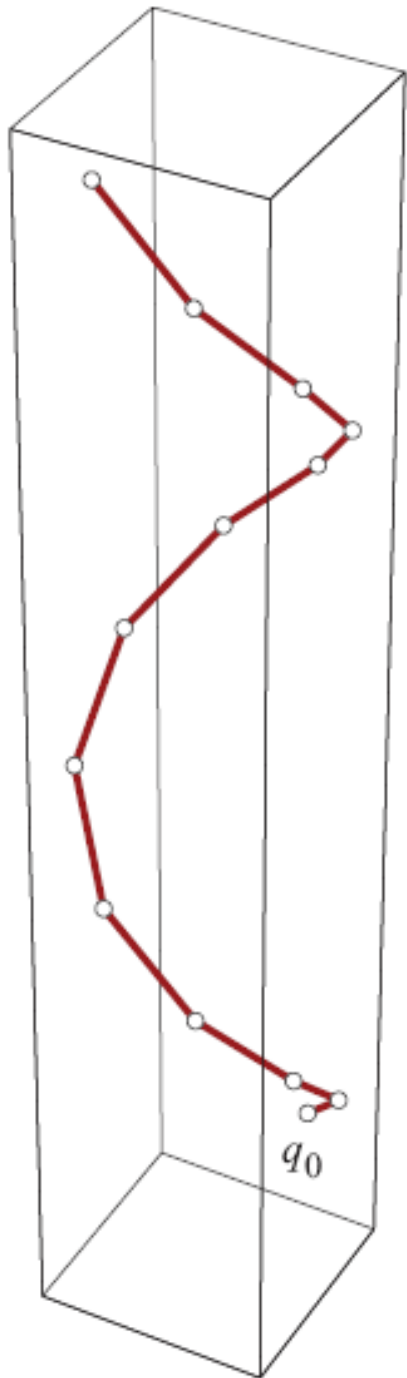
ribosome



[Demaine, Langerman, O'Rourke 2006]



[Demaine, Langerman,  
O'Rourke 2006]

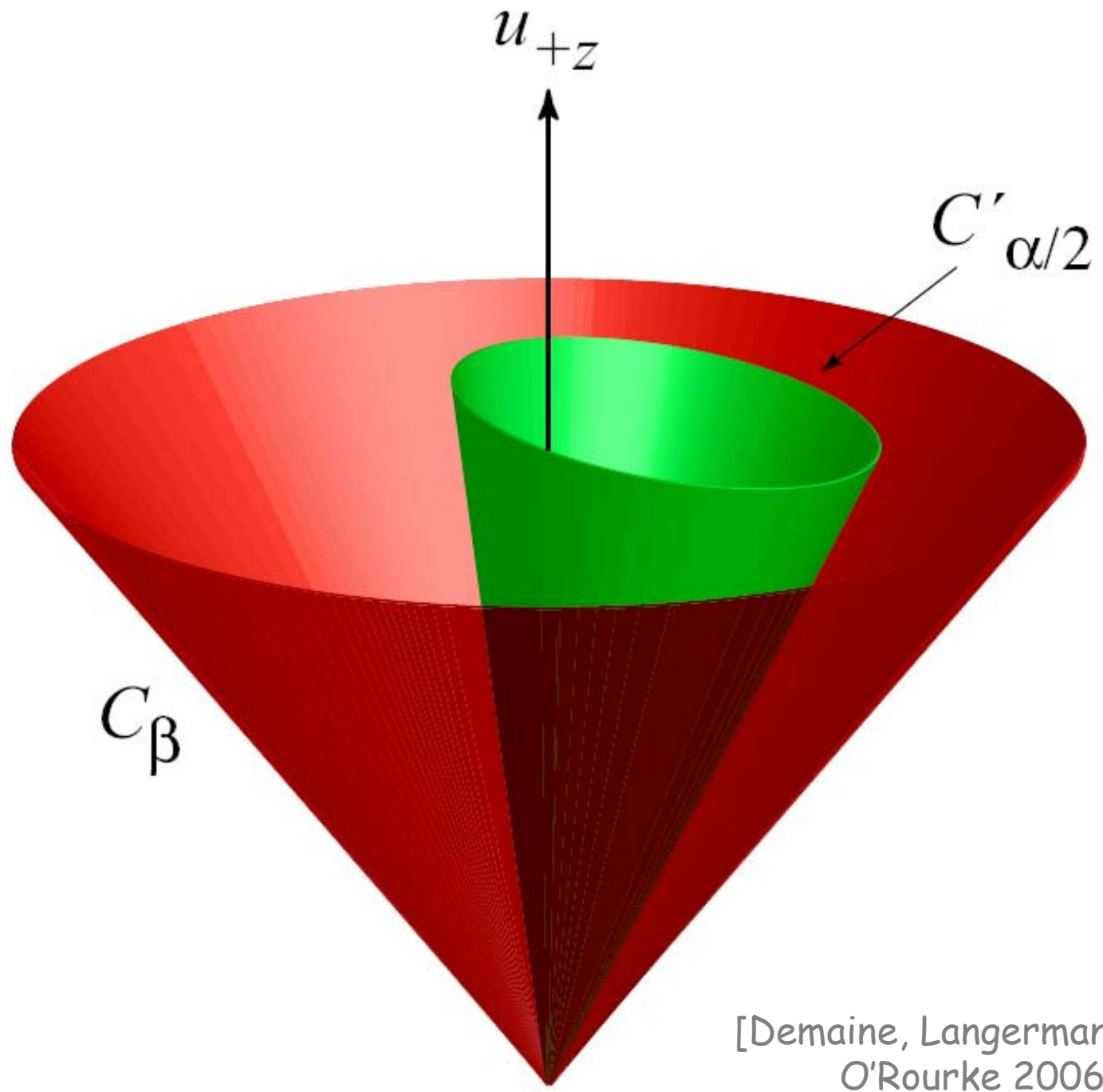


[Demaine,  
Langerman,  
O'Rourke  
2006]



climber plant  
in Costa Rica

photo by Dirk van der Made  
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[Demaine, Langerman,  
O'Rourke 2006]