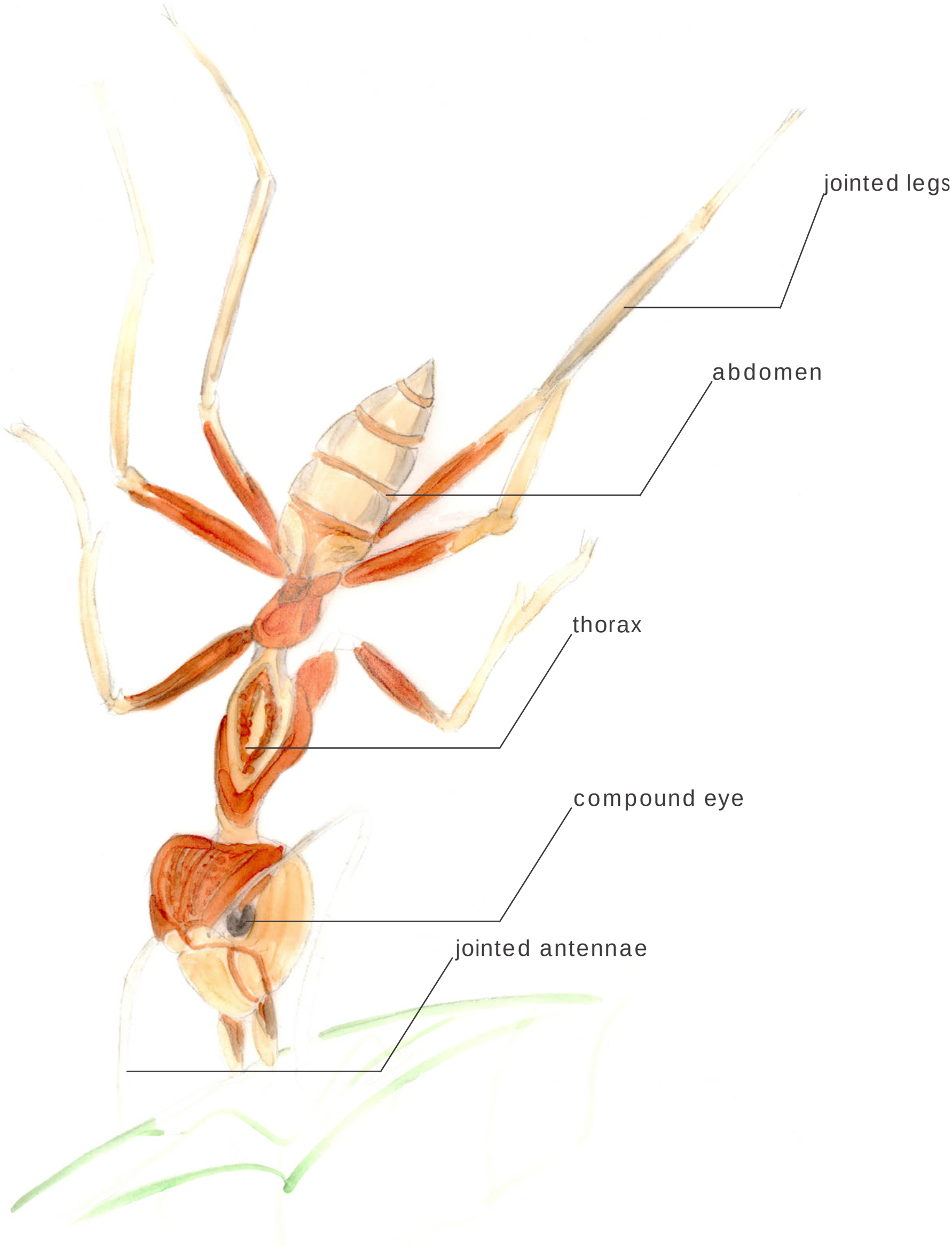


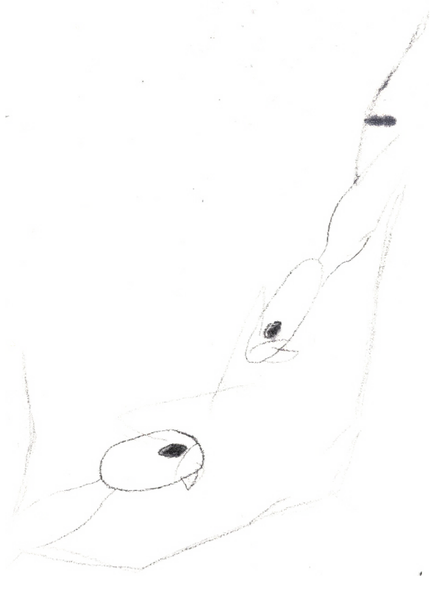
BRIDGING THE GAP

BONNIE JEAN DOMINGUEZ
NANCY CHENG & SAM CLAGETT

fire ant water raft

fire ant water raft in lab

successful weaver ant bridge



Ants. They are versatile and capable of much, not only as a unit, but especially as a collective. An individual **ant can carry 10-50 times its weight-- that would be like a 140 pound woman carrying 1400-7000 pounds.** According to ask a BIOLOGIST, this ability to **withstand so much pressure** comes from the **cross-sectional area of the muscles that is typically greater** than that of larger animals. With this ability little creatures are able to securely grasp not only objects to carry to their nests, but each other.

The ability of an ant to grasp take hold of another ant allows it the amazing ability to **create floating rafts and even bridges.**

In this project, the process of ant bridges is analyzed and an attempt to mimic the behavior is done with the use of the Rhino Grasshopper plug-in, called Kangaroo. The goal of the project is to be able to program small objects to **identify the shortest** distance between any gap, chasm, hole, canyon or other **depth related obstruction,** and then to **direct the buildings blocks to begin to build a bridge, by mimicking ant behavior.**

The hardware that would be programmed by this grasshopper definition appears to already exist at MIT. The hardware is called an M-Block and the hope is that using higher level language the blocks can be given a task that they will calculate the solution for.

For the tasks that they would be assigned by this grasshopper definition, they would have **ready access to topo**graphical analysis. The area they need to cross from and to would then be analyzed and the **shortest distance will be calculated**, as this definition is able to do. Once that is done the ants register an **attraction to two points** that are the shortest distance to cross, like ants attracted to sugar, and they then begin to **build** the crossing.

In the future the intention is that the most stable bridge be created. Using a visual analysis of the ants, we can see that for the future, a reverse ant bridge could be the better bridge to create for strength, rather than the flat design shown here . The three dimensional aspect of the bridging is the next step for this design.

WEAVER ANT ANALYSIS

0:00

0:20

0:34

0:38

0:41

1:20

1:36

1:41

1:50

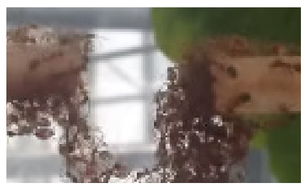
2:08

2:15

2:24

2:26

2:28



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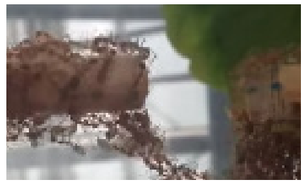

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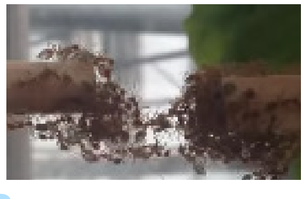

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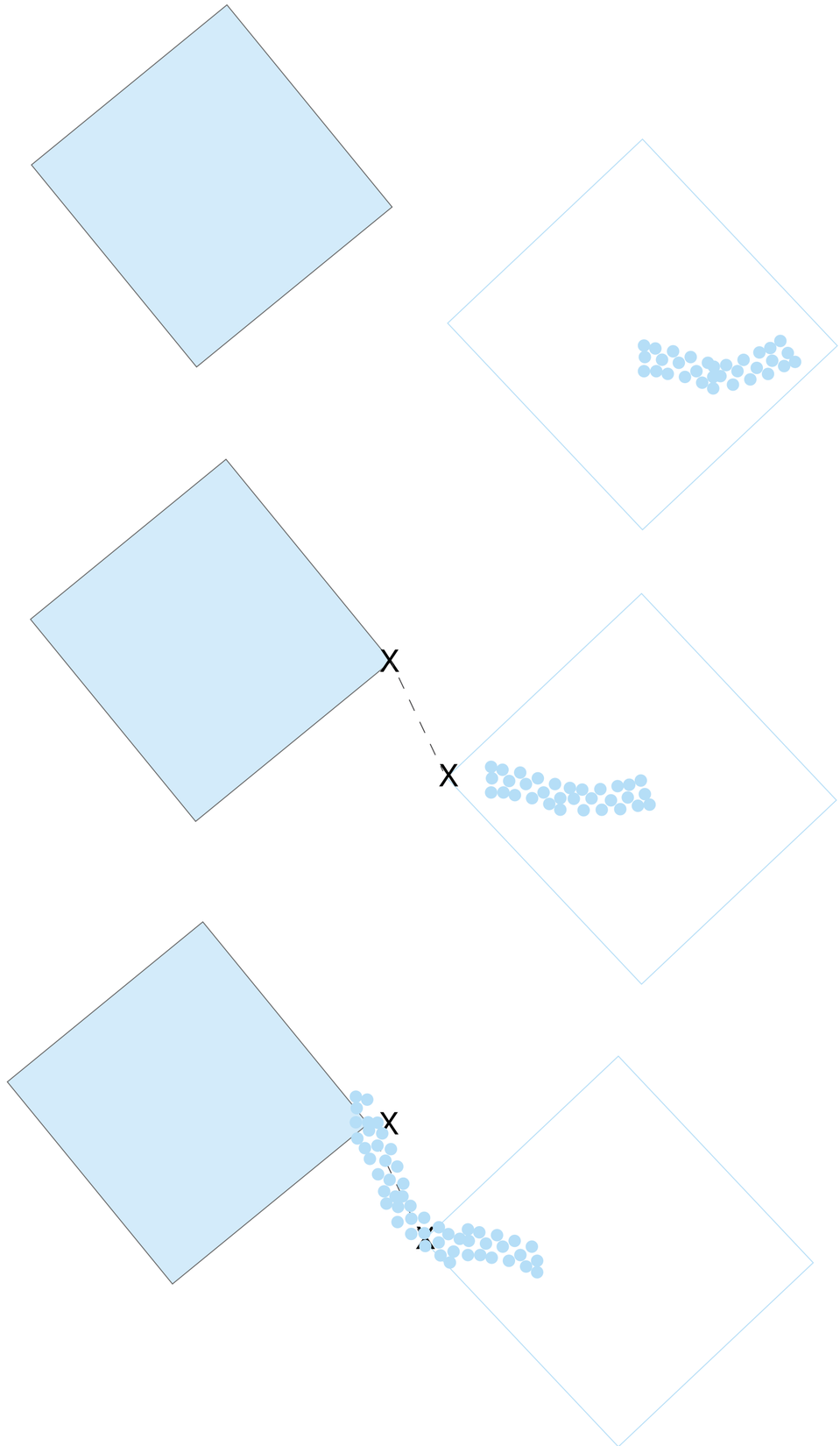
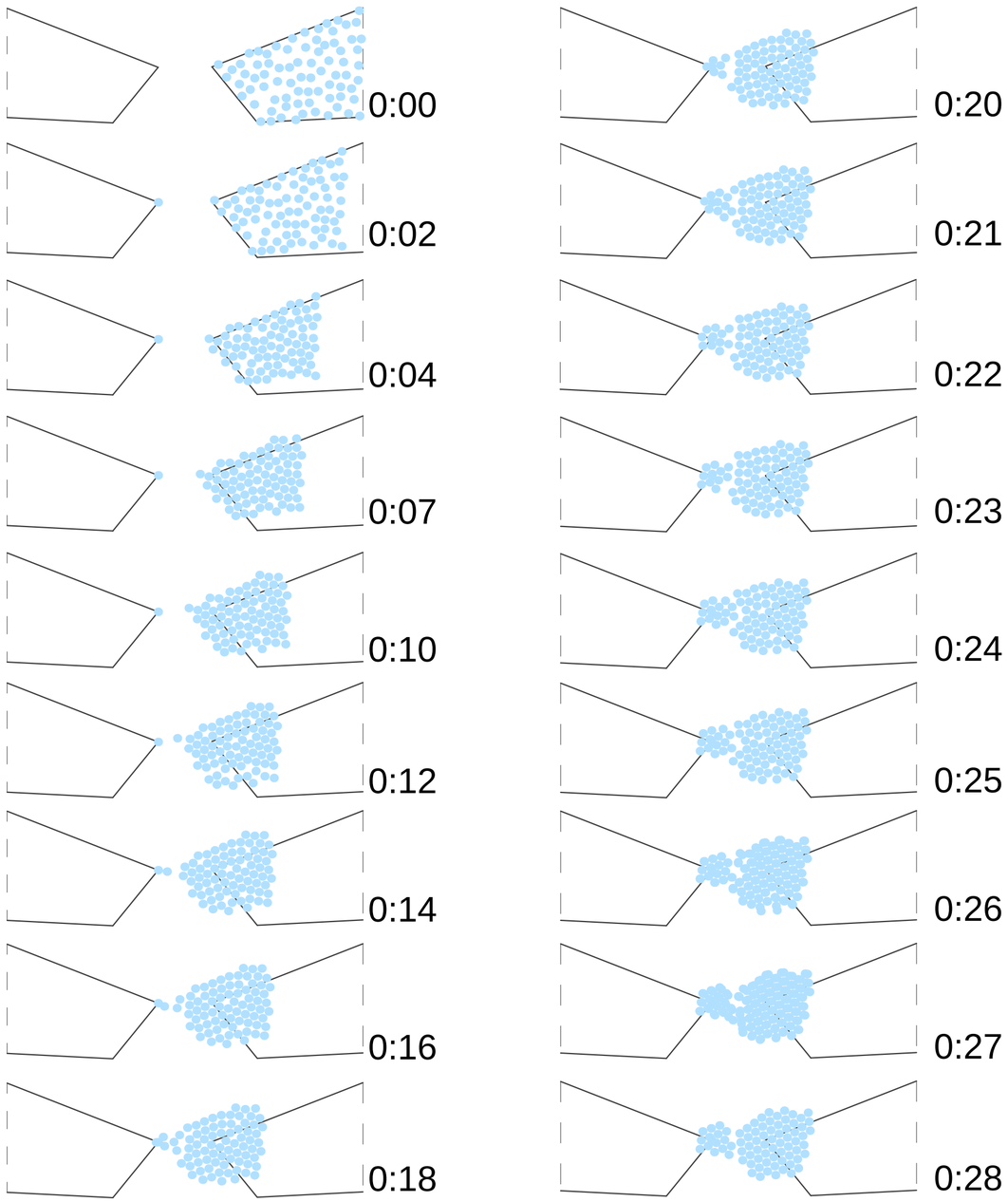
WEAVER ANT ANALYSIS

PATTERN ANALYSIS

BLIP PATTERN ANALYSIS



GOAL: SHORTEST DISTANCE
THEN BRIDGE

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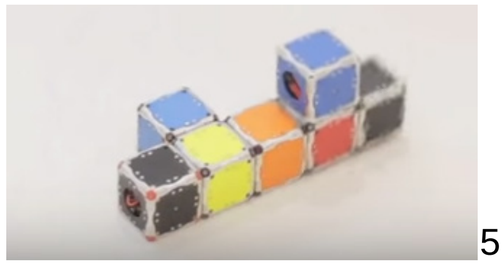
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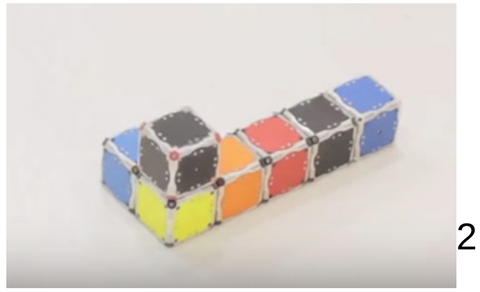
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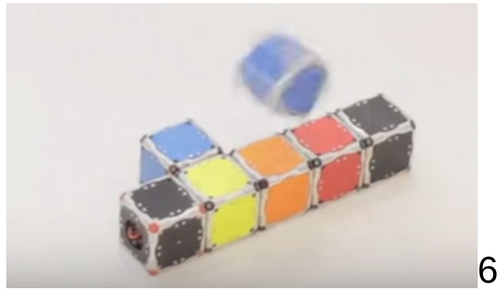
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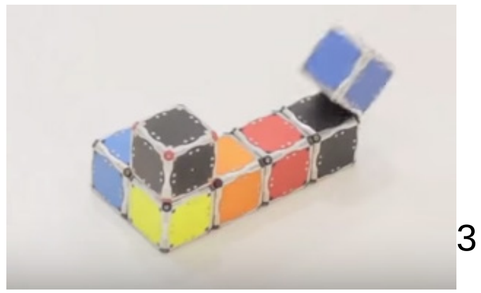
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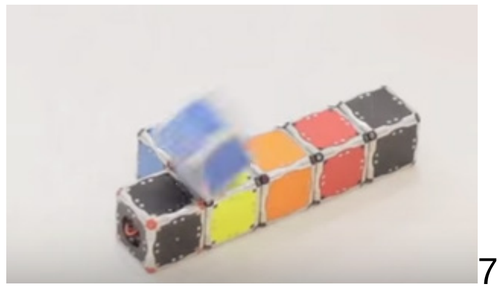
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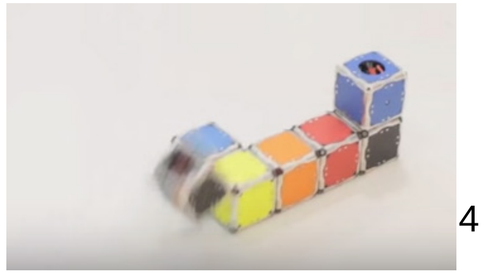
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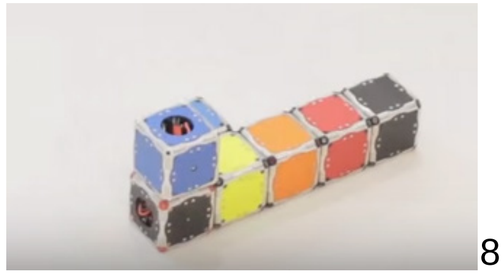
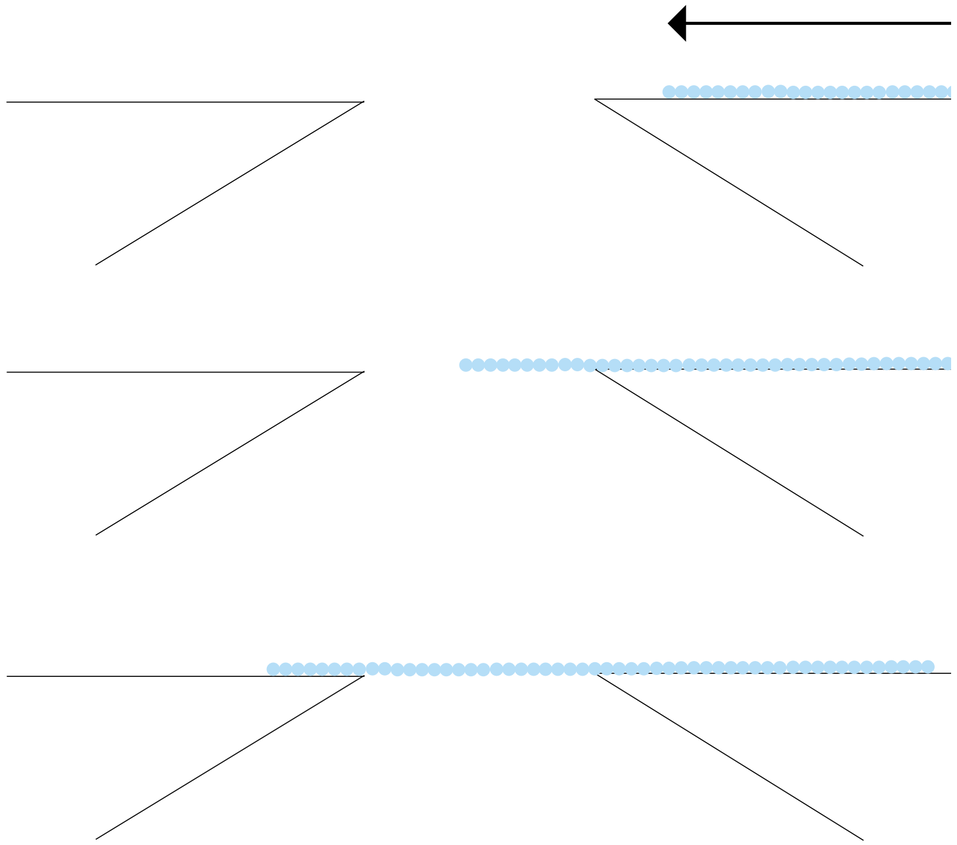
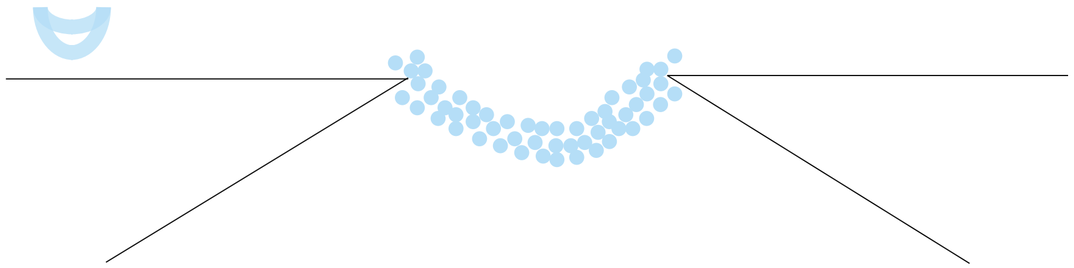

8

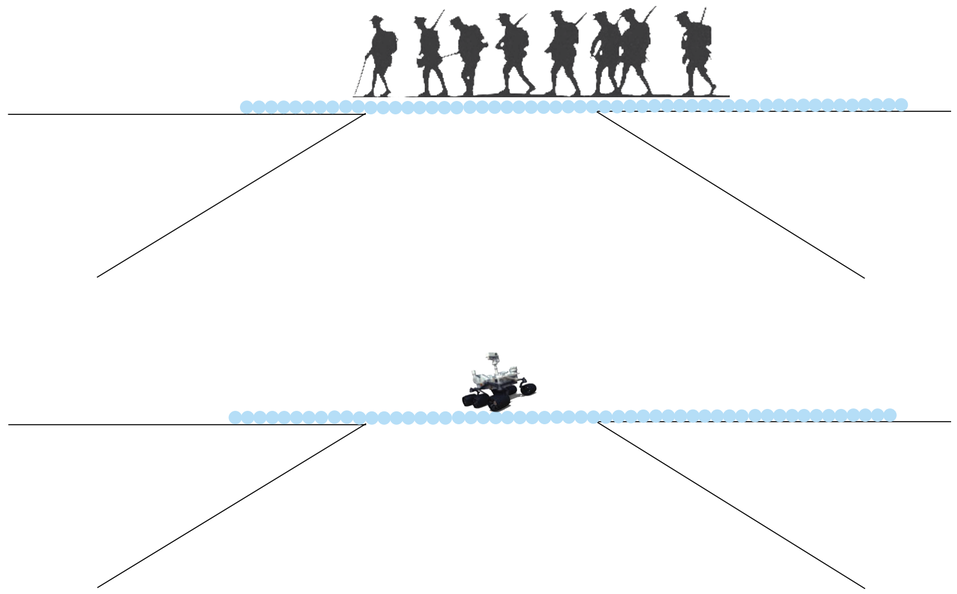
Using a flywheel that roates 20,000 times per minute and then stops to impart an angilar momentum, this internal heart breathes life into the movement of the blocks shown above. The blocks have magnets on the sides tha help center the cubes as they land after any movement. This technology could be used to be programmed to behave as the ants to create bridges, though the technology is still in it infancy.

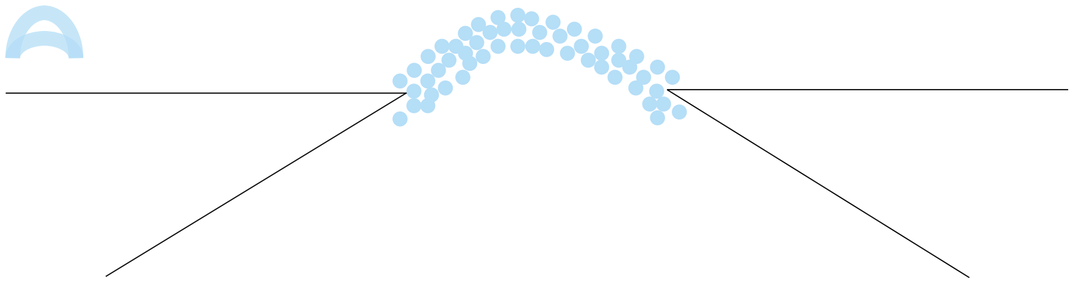
GRASSHOPPER ANT ANALYSIS

MIT M- BLOCKS



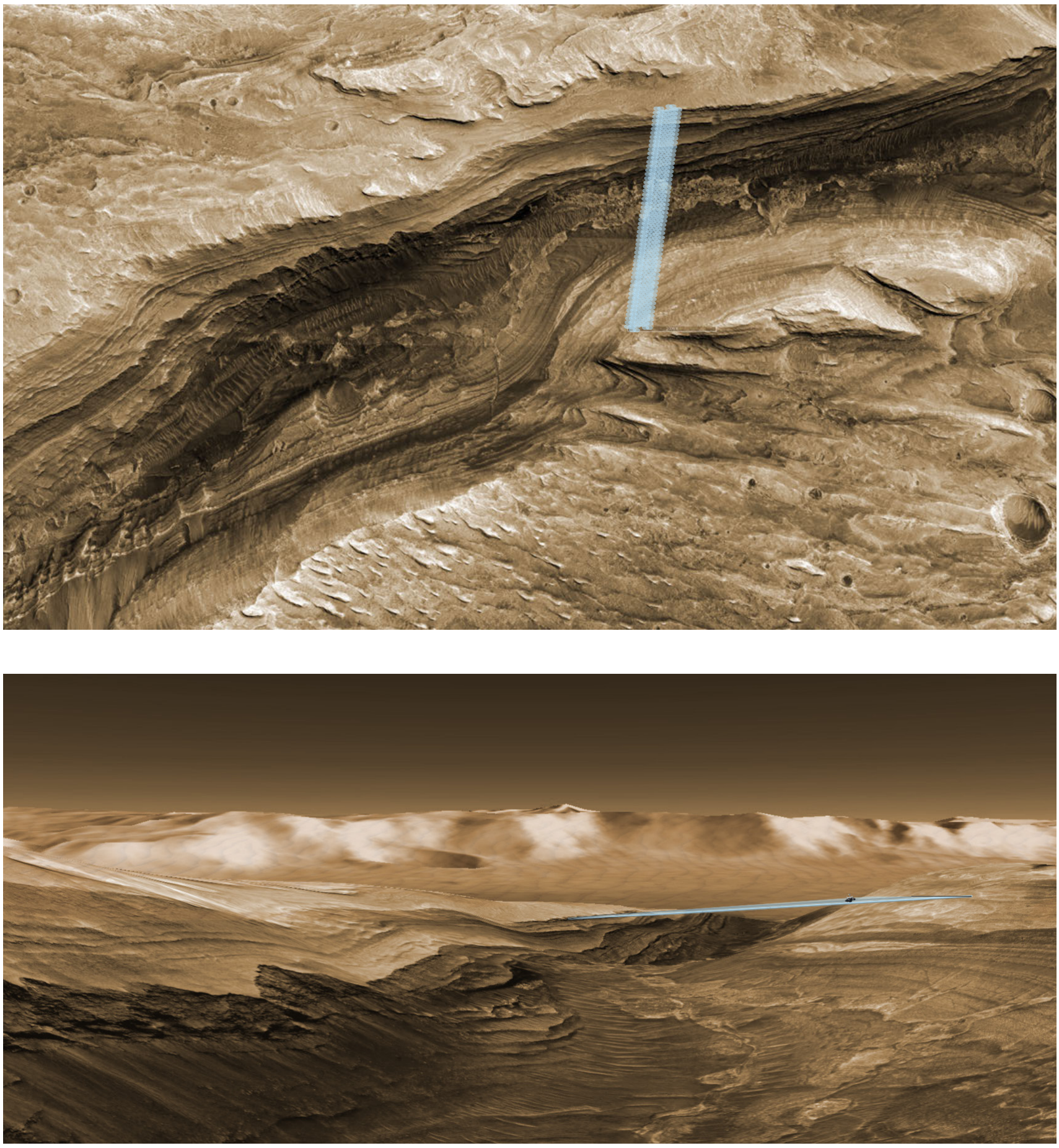


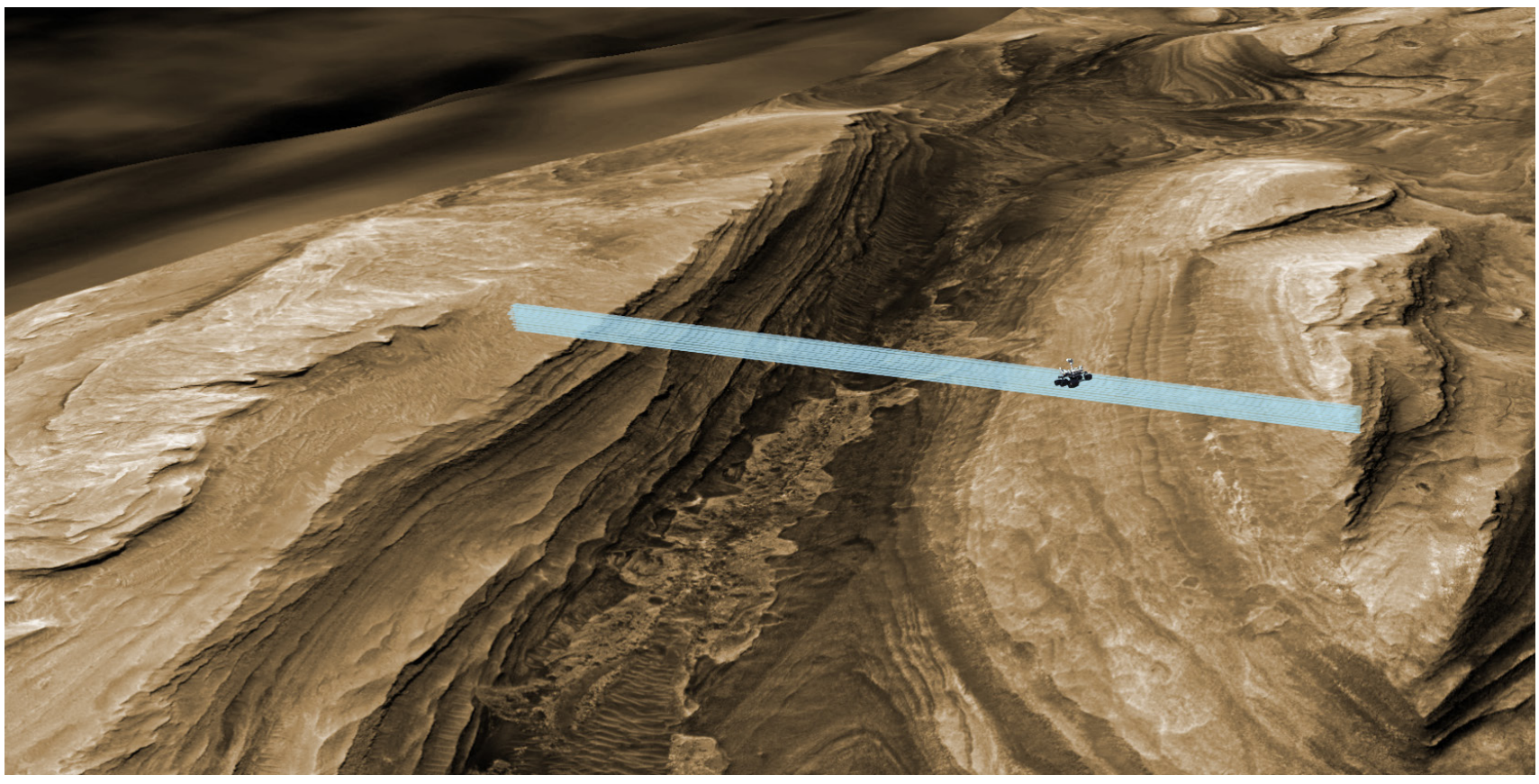




APPLICATION

GOING FORWARD 3D





DIAGRAMATIC RENDERINGS