

## Bacteriophage injector

**Robert William Whitby**

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<http://homepage.mac.com/whitby/>

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<http://web.me.com/whitby/Octahedron/Welcome.html>

### Reference

#### **1. Octahedron1stEd.pdf by Robert William Whitby**

The octahedral periodicity of the atomic elements and its implications, 500 pages

<http://homepage.mac.com/whitby/FileSharing103.html>

#### **2. Hinge-joined octahedra–rings, tubes, and hubs by Robert William Whitby**

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing75.html>

#### **3. Bacteriophage Ecology Group Phage Images by Stephen T. Abedon**

Electron micrographs, cartoons and animations showing bacteriophage and the function of the injector.

[http://www.mansfield.ohio-state.edu/~sabedon/beg\\_phage\\_images.htm](http://www.mansfield.ohio-state.edu/~sabedon/beg_phage_images.htm)

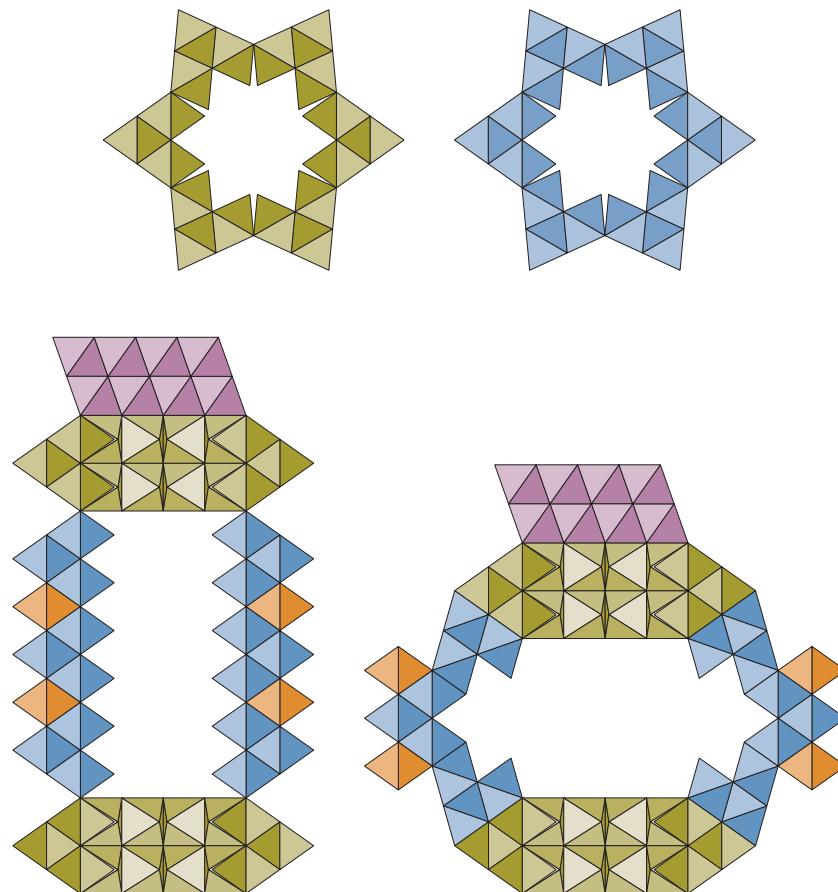
#### **4. Lecture notes on bacteriophage by Gene Mayer**

The general composition and structure of bacteriophage.

<http://www.med.sc.edu:85/mayer/phage.htm>

### Introduction

This paper shows how an octahedral assembly consisting of rings connected by hinged legs acts as a contractile sheath. When fitted with a tube, the assembly mimics the DNA/RNA injector of the bacteriophage.



**Fig. 1 Two rings connected by hinged legs**

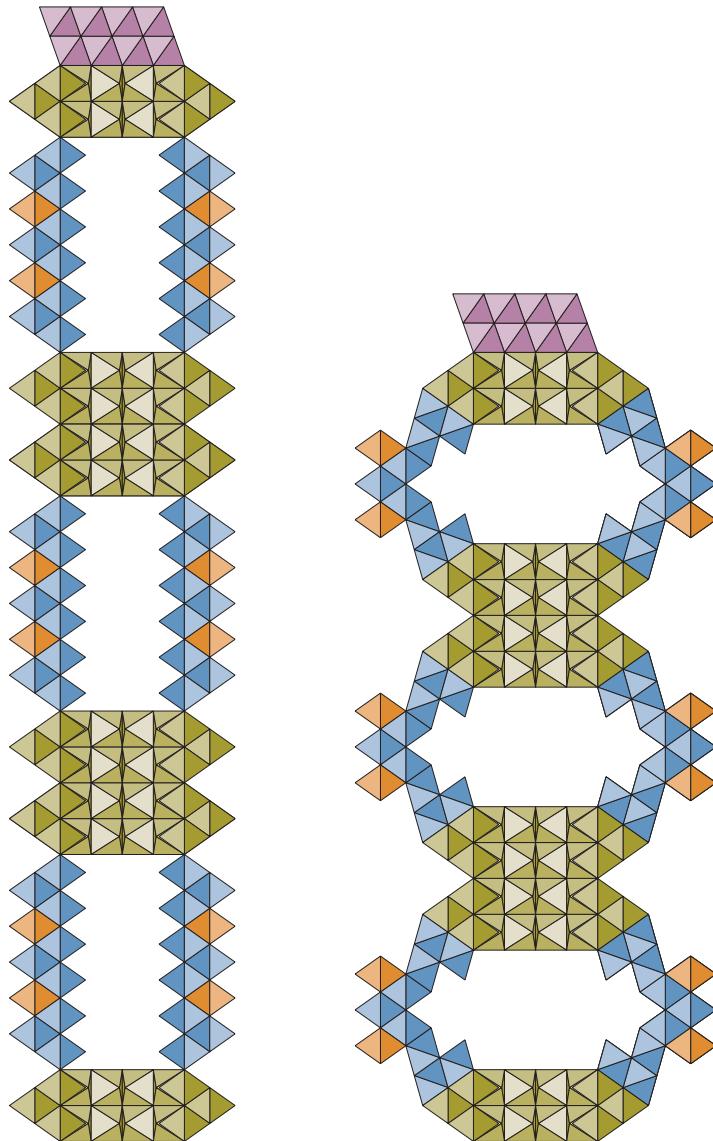
In the lower part of the figure, an assembly of two rings of six hinge-joined yellow truncated 2-octahedra connected by six hinged legs of blue truncated 2-octahedra is shown in two positions. On the left, the legs are fully extended; on the right, the legs are fully closed. The 2-octahedra have been truncated to enlarge the diameter of the opening.

Only four of the six truncated 2-octahedra of each ring and just two of the six legs are shown in order to reveal the functioning of the legs.

The two orange 1-octahedra are affixed to the middle blue truncated 2-octahedron of each leg to limit the range of each of the dual hinges. In the closed position, each of the terminal blue truncated 2-octahedra facially abut both the yellow truncated 2-octahedra of the ring and the central blue truncated 2-octahedron of the leg.

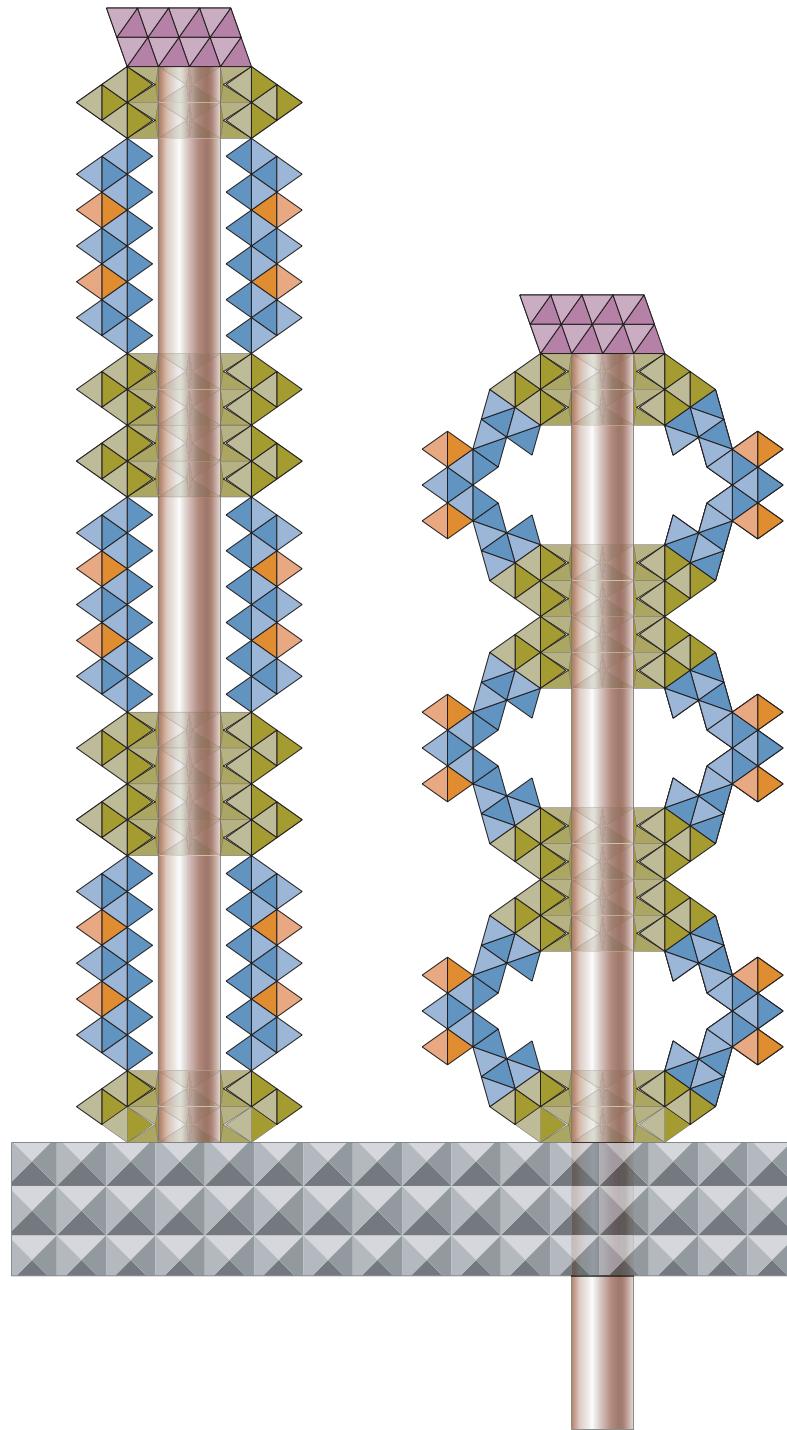
The violet octahedra at the top represent a triplet of violet 2-octahedra which stabilizes the hinges of the ring to which it is attached as well as the rest of the assembly.

The two rings in the upper part of the figure are an axial view of a yellow ring and an axial view of the extended legs.



**Fig. 2 Assembly of three pairs of leg-joined rings**

The figure shows how the length of the previous assembly can be extended by subunits identical to the pair of leg-joined rings. The assembly is fully extended on the left and fully contracted on the right. The amount of contraction is three times that of the one subunit assembly. The total length of contraction is equal to the number of subunits multiplied by the contraction per subunit.



**Fig. 3 Assembly of three pairs of leg-joined rings as bacteriophage injector sheath**

On the left, the sheath-like assembly of the previous figure is fitted with a tube which is affixed to the violet stabilizer and extends to the bottom edges of the lowest yellow ring. The assembly is fixed to a gray octahedral assembly representing a bacterial membrane.

On the right, the sheath in contracting has driven the tube through the membrane.