# GÖMBÖC 1466, COMPLEMENTING THE 2020 ERASMUS MEDAL OF SIR ROGER PENROSE

Academia Europeae decided to complement the 2020 Erasmus medal of Sir Roger Penrose by the individual Gömböc model 1466.

As several seminal contributions of Sir Roger are rooted in geometric intuition, a physical object highlighting the beauty of this type of intuition appeared to be an adequate idea. The work of Penrose shows how pure mathematics can bear fruits in a broad range of applications and the story of the Gömböc appears to evolve in the same spirit.

**Definition of the Gömböc**

The Gömböc is the first known example of a new class of shapes called mono-monostatic: convex, homogeneous bodies with just one stable and one unstable equilibrium point. The story and the people behind the Gömböc make it unique.

**Origin of the Gömböc**

In 1995, despite widespread common belief in the mathematical community that such shapes can not exist, Vladimir Igorevich Arnold offered a stunning conjecture to the contrary. Arnold's geometric intuition proved to be correct: in 2007, Gábor Domokos and Péter Várkonyi from the Budapest University of Technology and Economics proved the conjecture and created the first physical example which became known as the Gömböc.

**Gömböc in Nature**

Biological evolution developed a Gömböc-like shape: the shell of the Indian Star Tortoise, helping to self-right when turned upside down. Natural abrasion decreases the number of static balance points, approaching the Gömböc as an unattainable goal. As Sir Michael Berry put it: the Gömböc exists in Nature, but only as a dream. This theory not only helped an international team to prove ancient fluvial activity on Mars but also led to recognize a universal geometric frame to natural fragmentation, confirming Plato' postulate identifying the element Earth with the cube.

**Gömböc in Engineering**

The GRASP Labs at Penn used the Gömböc shape for their super-stable drones, enabling spontaneous recovery from collisions. An MIT-Harvard team used the Gömböc to build an insuline capsule self-righting in the stomach and thus replacing injections. An article describing the capsule, published in Nature Biotechnology 3 weeks ago, is citing the 2006 paper which announced the discovery of the Gömböc. The world's leading software to test and build the racing boats for America's Cup has been christened „Gömböc".

**Gömböc in Arts**

Works of conceptual artist Ryan Gander, painter Vivien Zhang, movie director Ulrike Vahl, choreographer Antonin Comestaz and novelist Dan Richards are testimonies how they were inspired by the Gömböc, which was on exhibit at the Shanghai World Expo in 2010 and also at Lisson Gallery, London in 2018.

**Individual Gömböc Pieces**

Individual Gömböc pieces carry a unique serial number between 1 and the current year, each number is produced only once. The manufacturing standards for individual Gömböc models are those of industrial art. As the shape has approximately 0.01% tolerance, individual engravings entail the production of individual manufacturing tools.

The first such model, Gömböc 001 was the inventor's gift to Arnold on his 70th birthday, who later on donated it to the Steklov Institute. Subsequently, many prominent institutions worldwide, including the University of Oxford, decided to put individual Gömböc pieces on permanent exhibit. (Gömböc 2013 commemorates the opening year of the Andrew Wiles Mathematical building while Gömböc 400, at New College commemorates the 400th anniversary of the Savilian Chair in Geometry.)
Gömböc 1466 carries the year of birth of Desiderius Erasmus Roterodamus and, as an additional engraving, a Penrose Triangle.

The production of Gömböc 1466 was sponsored by Mr. Ottó Albrecht.