

# Klein Concert

## Five Compositions on a Geometric Shape

**What happens when mathematics becomes a source of inspiration for composers? Preview of the première for mathematicians of the concert of May 31 at the Music Conservatory of Palermo, concluding the cycle of seminars “Sounds, Gestures, Diagram,” thought and taught by Maria Mannone**

Department of Mathematics and Informatics, University of Palermo  
room 7, May 17, 2019, 6:30pm

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*“Sounds, Gestures, Diagrams” is a cycle of seminars based on interdisciplinary thinking between arts and sciences, mathematics and visual forms. Seminars attempted to answer the following questions: a composer is doing mathematics without knowing it? Conducting gesture and performers’ gestures can have elements in common? Is it possible to derive sounds from the forms of a water lily, a ficus, or a terrestrial or marine creature?*

*The presented compositions are inspired by the geometric shape of the Klein bottle, thought by the German mathematician Felix Klein (1849-1925). The Klein bottle lives in the four-dimensional space and, if represented in three dimensions, it intersects itself. The reference to Klein also reminds us of one of the golden eras of Palermo, at the beginning of the Twentieth Century: the years of the Circolo Matematico di Palermo, that included world-renown mathematicians such as Hilbert, Poincaré, and Noether. A great thank you to M<sup>o</sup> Carmelo Caruso, who proposed seminars, to M<sup>o</sup> Marco Betta, who sustained it, to the Director of the Conservatory M<sup>o</sup> Gregorio Bertolino, who believed in this idea, and to M<sup>o</sup> Giuseppe Rapisarda for the technical collaboration. A special thank to Prof. Giuseppe Metere for his invitation to the Department of Mathematics and Informatics.*  
Maria Mannone

### Program

1. Mattia Camuti, “**Ouroboros Klein - I**”, for sound sequencer  
“**Ouroboros Klein - II**”, for strings orchestra

*The “Ouroboros” snake and the non-orientable Klein surface. Symbols of infinity and of an eternal return. As a continuous transformation in what we have always been. Concepts expressed by their changing form itself, that is reinterpreted into sounds: a drawing of the Klein bottle has been put in a sequencer and transformed in electronic music first (Ouroboros Klein I) and in a dramatic adagio for strings then (Ouroboros Klein II). Mattia Camuti*

2. Marco Barilà, “**Prima della calma**”, for piano and string orchestra

*Getting lost and then finding ourselves again, as a trip within the Klein bottle, that will bring us back to the same, initial point, a point that contains all the intensity of the journey. The steep climbs of the bottle’s neck, the vertiginous downhill along the body until to the base of the bottle, and the awareness of being back at the same point of departure. Maybe this makes us understand that,*

actually, each endpoint is a start point, and that, before the calm that is waiting for us at the finish line, we have to go through a trip dense of emotions. I composed “Prima della calma” [“Before the calm”] trying to translate such a journey through music, with a melody that changes during the musical composition and is trying to communicate emotions and evolutive phases of a path, such as the one within the Klein bottle. I tried to join the soul of the composition and the soul of the thought that the Klein bottle was able to rub off me. Marco Barilà

### 3. Massimiliano Vizzini, “**Invenzione sopra la forma di Klein**”, for string orchestra

*A mathematical sequence, a melodic trace. Cyclically repeating and returning, as in a loop — or, better, as in the Möbius strip — inverting, reversing, and outlining paths that are inspired to the infinity; getting back to ourselves without a direction, proceeding from the bottom to the top, from the right to the left, and vice versa. Once such a melodic and rhythmic path was traced, it has been fun to develop it for string orchestra, re-working in a counterpoint-imitative sense the “sonified” material obtained from the Klein bottle. Massimiliano Vizzini*

### 4. Biagio Genco, “**4D Kleinsche Flasche**”, for quadraphonic

*Sound experience of “4D Kleinsche Flasche” is built upon the idea to recreate the Klein bottle in its four dimensions, an impossible task for figurative arts. The listener has the opportunity to perceive the physical space that is occupied by the bottle and, at the same time, to undertake a path within it. The body of the bottle and the inner paths are drawn up by static melodies and mobile palindromes harmonies within the quadraphonic space. The fourth dimension is rendered via the beat manipulation, thought of as a temporal deformation. Biagio Genco*

### 5. Massimiliano Seggio, “**Eine kleine Kleinsche Flasche? Nein! Eine kleine Kleinsche Flasche – Musik**”, for piano and string orchestra

*“EINE KLEINE KLEINSCHER FLASCHE? NEIN, EINE KLEINE “KLEINSCHER FLASCHE” – MUSIK” is a word pun with multiple meanings. The most evident one reminds us of Mozart’s “A Little Night Music” (“Eine kleine Nachtmusik”). To understand other meanings we have to tell an anecdote. The geometric shape called “Klein bottle” is quite known — Kleinsche Flasche — whose name is associated with its unique form. However, this name is indeed the result of a misunderstanding. In fact, this figure belongs to the category one of “non-orientable surfaces” and, thus, it would be appropriate to define it as the Klein “surface,” that is, in German, the Klein “Fläche.” It turned out that, because of its shape or just for a translation error, this figure has been presented as a “Flasche,” that is, “bottle.” Since then, the figure is known with this name. For an ironic coincidence, “Klein” is, besides the family name of its father, also the German translation of “small,” and, for this reason, “Kleinsche Flasche” can also mean “small bottle.” In conclusion, while reading “Kleinsche Flasche” we can wonder: is it a small bottle or the Klein surface? The German answer is ambiguous, and it’s necessary to listen to the piece to figure it out. Klein bottle has the characteristic of not being orientable, that is, there isn’t an “inner” or an “external” surface, although we have this illusion. Well, in music we have something similar: it’s the “Shepard tone,” the illusion of a continuous movement towards high pitches — or low pitches — without this actually happening. We have the perception of a direction, an orientation, while everything is remaining static and still. Massimiliano Seggio*