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Borelli Reloaded: contexts and networks in Seventeenth Century Italy

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Even within the already multifaceted experience of post-Galilean theoreticians, Giovanni Alfonso Borelli (Naples 1608 - Rome 1679) stands out for his complexity. The extreme variety of his interests led him to be a prolific author in a variety of fields: from mathematics to anatomy, from physiology to astronomy. He had important teachers (e.g. Benedetto Castelli) and pupils (e.g. Marcello Malpighi), a life marked by ruptures, and a harsh temperament. Borelli maintained an important correspondence network and readings, and his life was intertwined with the most diverse contexts and roles. At once a physiologist, physicist, and mathematician, he was also a public lecturer and an active member of various courts and academies. His tortuous biography crossed important cultural and political centers of his time: he lived and worked in Messina, Pisa, Florence, Naples, and Rome but also traveled and stayed in Venice and Genoa. As many physiologists of his time, Borelli also performed a diplomatic service and spent considerable time in network-building.[1]

The bibliography on Borelli is considerable and not easy to delineate, due to the fragmentary nature of his life, the many facets of his multidisciplinary work and the different historiographical strands that oriented studies on his production. Between the 1970s and 1980s, seventeenth-century Tuscany was the subject of renewed interest, especially among Italian historians. Attention was paid particularly to the Galilean legacy and the development of experimental activity at the Grand Ducal court. From these years, for instance, date the first attempts to recast the main features of the *Accademia del Cimento* from a modern perspective.[2] This wave of studies, which brought to light an important body of previously unpublished documents,[3] also invested Borelli's work and life.[4] In the 1990s, besides the Tuscan and "Galilean" milieu,[5] the focus shifted also to the Sicilian context in which Borelli operated,[6] as well as to his research and interests in mathematics and anatomy.[7]

[1] See, among others: Andretta, and Visceglia, 2015.
[2] Middleton, 1971; Galluzzi 1981.
[3] Among them, some of Borelli's surviving letters have been published: those sent to his pupil and friend Marcello Malpighi were published among Malpighi's correspondence by Howard B. Adelman in 1975 (Adelman, 1975); the letters included in the Galileo collection at the *Biblioteca Nazionale Centrale* in Florence were partly published by Paolo Galluzzi and Maurizio Torrini in 1975 and 1984 (Galluzzi and Torrini, 1975, 1984).
[4] Baldini 1971, 1974, 1978, 1979; Galluzzi, 1977, 1987, Knowles Middleton, 1973; Nastasi, 1984.
[5] Galluzzi, 1995; Gómez Lopez, 1997; Bertoloni Meli, 1998.
[6] Dollo, 1996; Ingaliso and De Leo, 1997; Bertoloni Meli 1996a.
[7] Giusti, 1993; Guerrini 1999; In the anatomical field, special interest has been paid to Borelli's relationship with Marcello Malpighi (Bertoloni Meli, 1997).

It is especially in the last two decades, however, that the richness of Borelli's work has emerged as well as the complexity of the different contexts in which he carried out his work. In this setting, the relationship between Borelli and the *Accademia del Cimento* is of particular significance. A leading member of the Academy, he took part in nearly all the experiments performed there -- on sound propagation, air pressure, resistance of materials, hydraulics --, as well as in the astronomical observation campaigns launched by the academicians. Since Galluzzi's seminal 1981 essay,[8] the *Cimento* has frequently been regarded as the theater of sharp opposition between a "Galilean" component (represented primarily by Borelli) and an "Aristotelian" faction (represented by Carlo Rinaldini and Alessandro Marsili). The Florentine Academy was thus studied chiefly through the lens of Borelli and his controversies and dissatisfactions with the Academy's working methods.[9] At the same time, Borelli published much of his work during the Tuscan period and in later stages of his career he often referred to his participation in the *Cimento* by claiming priority for certain experiments. This led to an almost total identification between the *Accademia* and Borelli: in this view, it would be primarily through the experience of the *Cimento* that it would be possible to understand the work of the Italian scholar and only through Borelli's perspective that the true nature of the experimental activity within the Florentine group could be grasped. Some scholars have put forward different perspectives, highlighting mechanisms of internal collaboration between academicians, similarities with more famous and long-lasting institutions, and the complexity of certain theoretical positions within the Academy.[10] Besides, studies on Borelli have begun to consider more peripheral milieus,[11] works and interests than those usually attributed to him. To be put under investigation has been mainly Borelli's production in the medical, anatomical and physiological fields,[12] but attention has also been paid to his research in astronomy,[13] and his geological and chemical interests.[14] The edited volume *The Accademia del Cimento and its European Context* (Beretta, Clericuzio, and Principe, 2009) is the first coordinated attempt to capture new and various aspects of the Florentine Academy experience, placing it in the broader European context. In the book, attention is devoted to particular studies conducted by the Cimento (e.g. the experiments on light or the study of anatomy --in which Borelli took an active part), to the role of some of its members (especially Borelli and Oliva), to the relationship between the Cimento and other societies (especially the Royal Society, the Académie Royale des Sciences and the later scientific societies in Italy), and the significance of some correspondents such as Boulliau and Oldenburg. These essays, although understandably not exhaustive, are undoubtedly a first important step towards both a renewed understanding of the Cimento's activity within the broader European context, and a more multifaceted reexamination of the figure of Borelli.

Since then, with a few individual exceptions, that promising scholarly workshop has essentially come to a standstill.

This focus wants to reopen a thematic and focused workshop that brings into dialogue studies on Borelli and those on the different institutional realities that shaped his path. It collects a series of contributions related to Borelli's work and cultural references in various disciplinary fields as well as to the different contexts in which he worked. The papers are organized into two sections that focus on the two main research axes that guided this work: contexts and alleged rivalries that shaped Borelli's scientific journey and his polyhedral scholarly work. Certainly, it is not possible to draw a clear line between the two axes of research, and contributions from one section often address themes and issues

[8] GALLUZZI, 1981.

[9] The emphasis on theoretical clashes between academicians led Boschiero (BOSCHIERO, 2007) to reinterpret the activity of the *Cimento* by arguing that experiments were not the main purpose of the Academy, but a mere tool of persuasion to support the particular philosophical-naturalistic beliefs of its members.

[10] See especially: FEINGOLD, 2009, 2016; BALDINI, 2011; BERTOLONI MELI, 2001.

[11] PEPE, 2011; MONTACUTELLI, 2009; NOVARESE, 2015.

[12] CONFORTI, 2001, 2009; INGALISO, 2007; MARCIALIS, 2002; TRABUCCO, 2000, 2000a.

[13] BOSCHIERO, 2009; BRUNO-CHOMIN, 2017; ELAZAR, 2013.

[14] BORELLI, 2001; CLERICUZIO, 2009.

at least partially related to the other. However, we believe that the present division offers an effective transversal reading of the contributions in this focus.

The first session "Borelli scholarly work: Mathesis, Natural Philosophy, and Antiquarianism" offers an in-depth look at three very different aspects of Borelli's scientific work. Vincenzo De Risi analyzes the impressive work of dialogue with Greek mathematical texts carried out by Borelli in his *Euclides Restitutus* (1658). He shows how a revolutionary approach and hyper-classicist demonstrative ideals coexist in the Italian mathematician. Analyzing Borelli's mathematical masterpiece, De Risi sheds light not only on his important contribution in this field, but also on his more general relationship with the classics of Greek mathematics by bringing out significant new insights into Borelli's innovative classicism and his activity as a reader. Instead, Carla Rita Palmerino addresses the question of Borelli as a mechanical philosopher. Beginning with Borelli's accounts of gravity, magnetism and the elasticity of air published in *De vi percussionis* (1667) and *De motionibus naturalibus a gravitate pendentibus* (1670), she examines the relationship between the Italian scholar and Gassendi. In analyzing Borelli's work in the field of natural philosophy, Palmerino pays attention to Borelli's various polemical goals and the relationship between these goals and the use of conceptual instrumentation that ranges from teleologism to a certain necessitarian neutrality. Federica Favino considers more eccentric interests in Borelli's work, that is his digression into practical mathematics. Favino undertakes a detailed examination of his project for the alleged structure of the ancient triremes (unknown at the time) that Borelli exposed in one of the discourses he gave at the Royal Academy of Queen Christina of Sweden in 1675. Read in light of the entwined scenario of late 17th century Rome, the speech looks like a clear epistemological stance to be asserted also in the field of antiquarianism, while it also speaks for Borelli's standing commitment – even as a political exile – with his fellow Malvizzi in Messina, who were then in a heated fight against the Spaniards.

The second session "Context and rivalries in Borelli's scientific journey" offers a fresh look at Borelli's relationship with the contexts in which he operated and his alleged rivalries with them or parts of them. Renée Raphael examines Borelli's relationship with printed texts. In particular, she compares reading practices applied to texts describing experimental results as they emerge from Borelli's *De motionibus naturalibus* and the *Saggi di Naturali Esperienze* (1667) by the *Accademia del Cimento*. Through comparison also with the reading practices employed by Borelli's predecessors at Pisa, members of the Royal Society and the Society of Jesus, Raphael offers a fresh look at the differences between Borelli's personal production and the official production of the *Accademia del Cimento*. Nuno Castelbranco analyzes the *De moto animalium* paying attention to Borelli's relationship with Nicolaus Steno and proposing a more attenuated view of his contrast with the Danish scholar. In his analysis, Castelbranco also addresses the problem of authorship and the importance of an audience in shaping authors' scientific claims. He shows how, in spite of the apparent contrast between Steno and Borelli with respect to the explanation of the mechanism of muscle contraction, their ideas were not so far apart and their oppositions are rather traceable to the different purposes for which they wrote each book. Simon Dumas Primbault takes stock of the famous rivalry between Viviani and Borelli. He gathers the sources bearing traces in the archive of some tension between the two scholars, generated mainly by priority disputes. By also stressing common interests and accounts of a mutual and beneficial collaboration, Primbault shows how the rivalry between the two scholars can basically be traced back to an a-posteriori historiographical reconstruction. Giulia Giannini considers Borelli's relationship with other people's books by reconstructing his library. Giving voice to the increasingly evident need to clarify Borelli's relationship with his sources and, more generally, the relationship between reading practices and those of experimentation in the early modern age, she identifies a nucleus of some 240 books that originally belonged to Borelli and are now preserved at the *Biblioteca Nazionale Centrale* in Rome, significantly expanding the work already undertaken by Baldini in 1996.

Overall, the essays presented here show a very varied and multifaceted picture of Borelli's work and a more contextualized and nuanced view of the heated contrasts that characterized his work and life. The

wealth of unexplored documentary sources related to Borelli and the various contexts in which his work took place offer inexhaustible research paths. The present focus is only the first step of a larger research endeavor on Borelli, the Accademia del Cimento and the development of science in the peninsula in the early modern age.

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The present focus collects part of the papers presented at the international workshop "Borelli reloaded: contexts and networks in Seventeenth Century Italy" held at Sapienza University of Rome on Sept. 30-Oct. 1, 2021. The workshop is the result of a combination of efforts of two research endeavors.

The first - *Borelli Galaxy. Visualizing Galileo's Heritage* - is a project designed and coordinated by Federica Favino, in collaboration with Stanford Center for Spatial and textual Analysis (CESTA) and with the technical assistance of Lab1100 (www.borgal.eu). Institutionally located at the Department of History Anthropology Religion Arts and Performing Arts of Sapienza University of Rome, it received funds by the European Union's Horizon 2020 research and innovation programme (under the Marie Skłodowska-Curie GA No 799769). BorGal aims at emphasizing Borelli's role in the making of European scientific thought and community, by taking advantage of his hitherto scattered correspondence. Assuming a relational perspective and taking advantage of digital tools, its aim is to edit a unified electronic catalogue of this correspondence and to use its letters as a source of data suitable to visualize Borelli's overlapping intellectual, social and political networks, as well as the multi-layered and spatial dimensions of his world (places, people, works, instruments, objects, information…).

The second concerns the history of early modern scientific academies and in particular the historical process of establishment of scientific societies in Europe. Specifically, this project analyses for the first time in its entirety the extensive corpus of unpublished documents (ca. 15,000 papers), descriptions of experiments and thousands of epistolary exchanges between members of the Cimento and scholars throughout Europe. By looking at the sources in their entirety, it aims at systematically connecting the strictly experimental, theoretical and philosophical aspects of the Accademia with its intellectual history. The project is institutionally located at the Department of Historical Studies of the Università degli Studi di Milano in the frame of the ERC-2018-COG "TACITROOTS- The Accademia del Cimento in Florence: Tracing the roots of the European scientific enterprise" (GA n. 818098, PI: Giulia Giannini, https://sites.unimi.it/tacitroots).

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