

**The Young and the Restless:
Scientific Institutions in late 17th-century and early 18th-century Italy**

1. Introduction

In the second half of the seventeenth century, a generation after Galileo, Europe experienced the organization of science; the rise of scientific institutions. Historians generally agree that during this period, knowledge was gained through group collaboration rather than outstanding individual work of the type achieved by Galileo or Descartes. This is supposedly exemplified in the experimental programs conducted within the controlled and objective environments of the organizations formed inside royal and princely courts in many parts of Europe.¹ Additionally, traditional, as well as several recent writings, have asserted that the formation of scientific institutions also signaled the birth of a ‘new’ science, a modern and inductive method for acquiring factual knowledge free from theoretical speculation and contention.

This paper is an attempt to analyze the foundations and workings of some of these institutions in Italy that supposedly represent the birth of modern experimental science, focusing on the efforts of the Accademia degli Inquieti (1690-1714) to establish its reputation and to gain funding from the Bolognese Senate and the Papal Court. I will begin by examining the claims made by historians since the eighteenth century regarding the aims and interests of the first scientific institutions and their patrons. The subsequent case studies pertaining to the Accademia del Cimento, the Accademia della Traccia, and especially the Accademia degli Inquieti will aim to show the political and intellectual

¹ Recent publications to have examined these courtly environments for producing natural knowledge within an institutional setting, include: S. Shapin and S. Schaffer, *Leviathan and the air-pump* (New Jersey, 1985); R. Emerson, “The organization of science and its pursuit in early modern Europe”, in R.C. Olby et. al. (eds.), *Companion to the history of modern science* (London, 1990), 960-979; M. Biagioli, “Scientific Revolution, social bricolage and etiquette”, in R. Porter and M. Teich (eds), *The Scientific Revolution in national context* (Cambridge, 1992), 11-54; S. Shapin, *A social history of truth: civility and science in seventeenth-century England* (Chicago, 1994); P. Dear, *Discipline and experience: the mathematical way in the Scientific Revolution* (Chicago, 1995); M. Beretta, “At the source of western science: the organization of experimentalism at the Accademia del Cimento (1657-1667)”, *Notes and records of the Royal Society of London*, 54 (2000), 131-151.

complexities surrounding the activities of these organizations that historians have traditionally neglected to discuss.²

2. Historiography of the ‘organization of knowledge’

Traditional accounts of the birth of experimental science begin with, or at least feature, Galileo. Stories are often told in which Galileo was the first to use experiments to counter Aristotelian physics, the first scientist whose work was essentially empirical – further, as the man who inspired and grounded experimental science. In other words, Galileo was supposedly the first modern experimental scientist to produce inductive and factual knowledge of nature. This is the image of the great Pisan natural philosopher that ties in with today’s notions of reliable and trustworthy scientific enterprise.³

But the traditional experimentalist stories do not end with Galileo. His achievements in so-called experimental science supposedly served as an example for his students and followers, among them the members of the Accademia del Cimento. For example, eighteenth century historian, Giovanni Targioni Tozzetti discussed the progress of Tuscan science – the productive discoveries and diligent experiments carried out firstly by Galileo, then his disciples, and finally the Accademia del Cimento.⁴ Meanwhile, Giovanni Batista Clemente Nelli, also writing during the eighteenth century, believed that the Cimento belonged to a field of Galilean experimental science.⁵

² Some of the material on the historiographical survey in the first section of this paper, as well as the case study pertaining to the activities of the Accademia del Cimento in the second section, is based on my dissertation: L. Boschiero *Natural Philosophy Inside the Mid to Late 17th-Century Tuscan Court: the History of the Accademia del Cimento*, A thesis submitted in fulfillment of the requirements for the degree of Doctor of Philosophy, University of New South Wales, October 2003. The case studies on the Accademia della Traccia and the Accademia degli Inquieti, form the basis of my post-doctoral work at the Italian Academy.

³ The obvious exception to this type of historiography is, of course, the work by Alexandre Koyré, who argued that Galileo did not even perform experiments. See: *Galileo Studies* (tr. John Mepham), Hassocks, 1978. For some indication of the bibliographical richness of Galileo’s life and works, see M. Segre, *In the Wake of Galileo*, New Jersey, 1991, 36.

⁴ G. Targioni Tozzetti, *Notizie degli aggrandimenti delle scienze fisiche accaduti in Toscana nel corso di anni LX del secolo XVII*, 3 vols., Florence, 1780, i, 5.

⁵ G.B.C. Nelli, *Saggio di storia letteraria fiorentina del secolo XVII scritta in varie lettere*. Lucca, 1759, 111.

During the early twentieth century, Stefano Fermi wrote about how Galileo's students freed themselves from traditional natural philosophy and adopted 'the spirit that pushed them to observation, to reckoning, to experience, to the inductive method'.⁶

It is presumably this so-called 'spirit' that Gustavo Barbensi also claimed to identify in the practices of the Cimento. According to Barbensi, the academicians were perfecting the 'experimental method of the Galilean School'.⁷ Martha Ornstein also asserts that early modern thinkers in Italy after Galileo gave prime importance to experimental science, 'the keynote, the charter of their existence, the motive underlying their every activity'.⁸ Finally, Rupert Hall, Roger Emerson, and Gaetano Pieraccini have also described the use of Galilean or Baconian experimental method as the sole impetus behind the Cimento's work.⁹

The Cimento was dissolved in 1667 after several of its members left Tuscany. However, several historians have claimed that this era marking the birth of modern science did not end there, since the Cimento's achievements inspired philosophers of nature from other parts of Italy to form their own experimentalist institutions. According to Giorgio Tabarroni, this was the motivation behind the foundation of the Accademia della Traccia in Bologna in 1666 by Geminiano Montanari (1633-1687).¹⁰ Michele Medici even claims that Montanari founded the Traccia with the specific aim of maintaining the Cimento's experimental program and pursuits of certain problems in physics.¹¹

⁶ S. Fermi, *Lorenzo Magalotti. Scienziato e Letterato (1637-1712)*, Piacenza, 1903, 87.

⁷ G. Barbensi, *Borelli*, Trieste, 1947, 19.

⁸ M. Ornstein, *The Role of Scientific Societies in the Seventeenth Century*, 3rd edn., Hamden, 1963, 259.

⁹ A.R. Hall, *The Scientific Revolution 1500-1800: The formation of the modern scientific attitude*, 2nd edn., Boston, 1966, 38; and Emerson, *op.cit.* (1), 964. G. Pieraccini, *La stirpe de' Medici di Cafaggiolo* 3 vols., Florence, 1925, ii, 603.

¹⁰ G. Tabarroni, "Montanari, Geminiano" in C.C. Gillispie, *Dictionary of Scientific Biography* (18 vols.), New York, 1974, Vol. IX, 484-7.

¹¹ According to most sources, including Mario Fanti in his survey of academies in early modern Bologna, the Traccia was founded by Montanari in 1666. Mario Fanti (ed.), *Notizie e Insegne delle Accademie di Bologna: da un manoscritto del secolo XVIII*, Bologna, Rotary Club di Bologna est., 1983, 54. However, Michele Medici suggests that it was established in 1667, the very same year the Cimento simultaneously closed its doors and published its only compilation of experiments, *Saggi*. Whatever the truth regarding the exact year of the Traccia's foundation, the year 1667 is certainly convenient for Medici's story, since he is quite eager to depict the Traccia as the successor to the Cimento's work, taking over where Leopoldo's

More importantly for the purposes of this paper, Martha Ornstein, Michele Maylander, Piero Longardi and Piero Galdi, all claim that in 1690 Eustachio Manfredi also established the Accademia degli Inquieti in order to emulate the Cimento's experimental practices.¹² Ornstein goes so far as to say that once the Inquieti became accepted as part of the University of Bologna, it was "one of the rare instances of the adoption of the experimental method by a university".¹³

Fortunately, during the second half of the twentieth century, many historians have broken away from these traditional positivist perspectives. Recently other writers have begun to suggest that the foundations and workings of the early scientific institutions are more complex than the pure adaptation of an experimental method. More specifically, cultural historians have linked early modern Tuscan experimentalism to certain rules of behaviour and etiquette for investigating nature. Thanks largely to Jay Tribby, Paula Findlen, and Mario Biagioli, we can identify how early seventeenth century Tuscan mathematicians such as Galileo and the Cimento academicians, legitimated their work within the region's princely court. Inversely we can examine how the Court also used these new representatives of elite culture to raise their own status as patrons of the latest intellectual activity.¹⁴ According to these authors, it was crucial that the natural philosophical work carried out by the Cimento project the political power and cultural identity of Florence and the Medici rulers. This has provided us with some valuable material regarding the social and political context of the Cimento's existence, and even begins to tell us about the political motivations behind the patronage of institutions in other parts of Italy later in the seventeenth century.

group ended. Michele Medici, *Memorie storiche intorno le accademie scientifiche e letterarie della città di Bologna*, Bologna, Tipi Sassi nelle spaderie, 1852, 11.

¹² P. Longardi & P. Galdi, *Le Accademie in Italia*, Torino, 1956, 90-93; M. Maylander, *Storia delle Accademie d'Italia* (5 vols.), Bologna, 1929, v, 300-301; M. Ornstein, *The Role of Scientific Societies in the Seventeenth Century* (3rd. ed.), Hamden, 1963, 219.

¹³ Ornstein, *op.cit.* (8), 219.

¹⁴ J. Tribby, 'Dante's Restaurant: the cultural work of experiment in early modern Tuscany', in *The Consumption of Culture: 1600 – 1800* (eds. A. Bermingham and J. Brewer), London, 1991, 319-337; M. Biagioli, 'Scientific revolution, social bricolage, and etiquette', in *The Scientific Revolution in National Context* (ed. R. Porter and M. Teich), New York, 1992, 11-54; P. Findlen, 'Controlling the experiment: rhetoric, court patronage and the experimental method of Francesco Redi', *History of Science* (1993), xxxi, 35-64.

However, it is easy to get carried away with such cultural historiographies. They can be used effectively to examine the courtly cultural context of early modern science, yet they often slip into the type of discussions typical of ‘traditional’ historiographies; that the birth of an experimental method occurred in Europe’s early scientific institutions.

For example, in recent years, Steven Shapin and Simon Schaffer have produced extensive studies of the experimental life of the early London Royal Society.¹⁵ Their works have particularly focused on the rise of “the new empirical science of seventeenth century England” in place of traditional natural philosophical interests.¹⁶ According to Shapin and Schaffer, Robert Boyle made it clear to his colleagues in England that the only certain way of acquiring knowledge was through a “program” of experimental fact-making. Furthermore, they claim that the success of this experimental science depended on the trustworthiness of the experimenters to produce “matters of fact”; that is because they reported their experimental findings to each other according to codes of civil and honest gentlemanly behaviour and discourse. All players in this gentlemanly, courtly game could trust and build on each other’s reports. So Shapin and Schaffer state that their investigations into the experimental life in seventeenth century England show “that the experimental production of matters of fact [...] depended upon the production of a special form of social organization”.¹⁷ This factual knowledge-making supposedly replaced natural philosophical concerns that were previously pursued in the early seventeenth century.

In the meantime, regarding early modern Italian institutions, Marco Beretta draws similar dramatic conclusions.¹⁸ Uninterested in discussing the links between Renaissance culture and politics and the ambitions of the early institutions, Beretta clings to the type of experimental science history that Findlen and Tribby allude to and that has evidently survived since the seventeenth century. With the assistance of Shapin and Schaffer, he

¹⁵ The best known of these works include: Shapin and Schaffer, *op.cit.*(1); S. Shapin, ‘The House of Experiment in Seventeenth Century England’. *Isis* (1988), **79**, 373-404; Shapin, *op.cit.*(1).

¹⁶ *Idem.*, *A Social History of Truth*, xxi.

¹⁷ Shapin and Schaffer, *op.cit.*(1), 22.

¹⁸ M. Beretta, ‘At the Source of Western Science: the Organisation of Experimentalism at the Accademia del Cimento (1657-1667)’, *Notes and Records of the Royal Society of London* (2000), **54** (2), 131-151.

comes to the conclusion that the Cimento academicians were indeed breaking away from natural philosophical theorizing in order to produce factual experimental knowledge. Beretta claims that the Cimento's emphasis on experimental science signaled the emergence of a society completely different to the Renaissance academies: "As a matter of fact", says Beretta, "the foundation of the Accademia del Cimento sanctions the birth of a new way of confronting science".¹⁹ Beretta does not go so far as to mention the role of the Tuscan Court's gentlemanly culture in maintaining a matter of fact investigation of nature. Nevertheless, he clearly insists that they broke away from traditional natural philosophy, including Galileo's emphasis on mechanics and mathematics, to be the first institution to practice experimental science, providing "the birth of a new form of scientific knowledge".²⁰

This historiography is thus reminiscent of the traditional twentieth century authors relying on the *Saggi* in order to reach the same conclusions about the origins of experimental science. In the following sections of this paper, looking at the activities of the Cimento, Traccia and Inquieti academies, we shall see that the actual workings of these institutions are not so simple. Rather than search for the origins of 'experimental science' in the courtly traditions of civility and gentlemanly behaviour when accumulating factual accounts of nature, we should understand that the use of an experimental program, and the gathering of so-called 'matters of fact', were not the central concerns of these early modern thinkers. Instead, they constructed and interpreted their experiments according to their theoretical and natural philosophical concerns, while maintaining a persuasive image of themselves as authoritative experimentalists that would please their patrons and gain them valuable funding.

3. Accademia del Cimento (1657-1667)

The Accademia del Cimento, established in 1657 under the patronage of Prince Leopoldo de' Medici, was reportedly committed to making experiments and observations.

¹⁹ *Ibid.*, 134.

²⁰ *Ibid.*, 148.

The academicians' dedication to experimentalism, it would seem, is typified in their motto, "Provando e riprovando", referring to the rigorous "testing and retesting" of their own experiments as well as those performed previously by other natural philosophers of the period.²¹ Yet the best testimony to their supposedly strict experimentalist approach to researching nature was their only publication, *Saggi di naturali esperienze* (1667). This text is devoted to the narration of the experiments performed in the Accademia del Cimento until its closure in 1667 and states the academicians' intentions never to stray into speculative arguments but simply to report the experiments they performed. At one point in the Preface, the author states,

Se talora per far passaggio da una ad un'altra esperienza, o per qualunque altro rispetto, si sarà dato qualche minimo cenno di cosa specolativa, ciò si pigli pur sempre come concetto o senso particolare di accademici, ma non mai dell'Accademia; della quale unico istituto si è di sperimentare e narrare.

This experimental rhetoric and the activities inside the Cimento have been a source of much interest for historians of Italian science. In fact, since the Cimento was established three years before the Royal Society of London and nine years before the Parisian Academie Royale des Sciences, several of the authors mentioned above have regarded the Cimento as truly "the first modern scientific institution", meaning that they were the first to adopt an experimental method free of speculative theoretical arguments and contentions.

However, despite the experimentalist rhetoric of the *Saggi*, the manuscript evidence provides valuable clues regarding the intellectual complexities that actually existed inside the Cimento. In other words, there is a significant difference between what the academicians actually did and how they reported their activities in the *Saggi*. In one of the most extensive accounts in recent years of the Cimento's activities, Paolo Galluzzi

²¹ This phrase is mentioned in the Preface to the Cimento's publication by their secretary Lorenzo Magalotti, *Saggi di naturali esperienze fatte nell'Accademia del Cimento sotto la protezione del serenissimo principe Leopoldo di Toscana*, Florence, 1667. Re-published in G. Abetti and P. Pagnini (eds.), *Le opere dei discepoli di Galileo Galilei. Edizione Nazionale. I. L'Accademia del Cimento. Parte Prima*, Florence, 1942, 84. See also: W.E.K. Middleton, *The Experimenters: a study of the Accademia del Cimento*, Baltimore, 1971.

states, “behind the Accademia’s serene façade, there unfolded a significant and lively confrontation based on ‘principles’.”²²

Those ‘principles’ pertained to the natural philosophical concerns and contentions in early modern thought. Questions regarding the structure, organization and movements of nature, including the causes of natural motion, dominated debates in the sixteenth century and early seventeenth century between scholastics (those devoted to ancient Aristotelian thought) and neo-Platonists (those with varying beliefs about the mathematical harmonies inherent in natural phenomena and the methods required to access those harmonies). During the second half of the seventeenth century, natural philosophers were also concerned with a Mechanistic understanding of nature, thanks to the work in this field by Isaac Beeckman (1588-1637), Marin Mersenne (1588-1648), René Descartes (1596-1650), Pierre Gassendi (1592-1655), and others. This philosophy was centered on the notion that the universe consisted of corpuscles, or atoms, and that the organization and movement of these atoms was as in a machine, requiring an understanding through the application of mathematics, geometry and mechanics.²³

In the case of the Cimento, the group’s diaries, as well as letters exchanged between members, reveal that, despite the public declarations that they were uncommitted to theoretical debates, the academicians actually constructed and interpreted their experiments according to the natural philosophical concerns and contentions of the period. Experiments did have an important role in the process of natural inquiry, but its role was simply more rhetorical than what some historians would be prepared to argue. Experiments were persuasive and authoritative, giving the impression to readers of the *Saggi*, including the Cimento’s princely patrons, that they were compiling reliable, non-

²² P. Galluzzi, ‘L’Accademia del Cimento: “gusti” del principe, filosofia e ideologia dell’esperienza’, *Quaderni Storici* (1981), **48**, 805.

²³ For more on natural philosophical inquiry in the seventeenth century see: J. Schuster and G. Watchirs, ‘Natural Philosophy, Experiment, and Discourse: Beyond the Kuhn/Bachelard Problematic’, in *Experimental Inquiries: Historical, Philosophical and Social Studies of Experimentation in Science* (ed. H.E. LeGrand), Dordrecht, 1990, 14; L. Boschiero, ‘Natural Philosophizing Inside the Late Seventeenth-Century Tuscan Court’, *British Journal for the History of Science* (2002), **35** (4), 383-410.

speculative and non-theoretical knowledge.²⁴ Indeed, as drafts of the *Saggi* were being prepared for print, Prince Leopoldo even insisted on a style of presentation that would not include the names of any of the individuals in the group and that would suppress any of the theoretical and natural philosophical convictions of the individual academicians.²⁵ That is the reason for the statements in the Preface to the text, cited above, that attempt to emphasize the Cimento's devotion to theory-free experiments.

4. Accademia della Traccia (1666-c.1678)

The Cimento disbanded in 1667 after some of its most prominent members left Tuscany looking for work in their native towns in the south of Italy. Despite Prince Leopoldo's best efforts to recruit more philosophers from abroad, Florence was struggling to live up to the reputation it had enjoyed during the Renaissance as the centre of the arts and sciences. Instead, the Bolognese Senate was beginning to offer lucrative University positions to some of Italy's best mathematicians and philosophers. Bologna already had a distinguished history in astronomy, and towards the end of the seventeenth century, they were re-enforcing their academic credentials, especially due to the achievements of Bolognese astronomer Gian Domenico Cassini (1625-1712) and mathematics lecturer, Buonventura Cavalieri (1598-1647).²⁶

Geminiano Montanari (1633-1687) arrived in Bologna in 1664 after spending several years in the Court of the Duke Alfonso IV of Modena, and in the company of his mentor, Cornelio Malvasia (1603-1664), a Bolognese nobleman, soldier and amateur

²⁴ For a detailed analysis of the Cimento's natural philosophical concerns, see: L. Boschiero, "Natural Philosophical Contention Inside the Accademia del Cimento: the Properties and Effects of Heat and Cold", *Annals of Science* (2003), **60**, 329-349.

²⁵ Galluzzi, *op.cit.* (22), 807.

²⁶ M. Medici, *Memorie storiche intorno le accademie scientifiche e letterarie della città di Bologna*, Bologna, Tipi Sassi nelle spaderie, 1852, 8; S.A. Bedini, "Introduction: The Vatican's astronomical paintings and the Institute of the Sciences of Bologna" in *idem.*, *Science and Instruments in Seventeenth-Century Italy*, Aldershot and Brookfield, 1994. Reprinted from "Geochimica et Cosmochimica Acta 14. Proceedings of the Eleventh Lunar and Planetary Science Conference (Houston, Tex., March 1980), New York, Pergamon Press, xiii-xiv.

astronomer.²⁷ After Malvasia's death, Montanari obtained the chair of mathematics at the University of Bologna and, according to Tabarroni, was an eager participant in any natural philosophical discussions held amongst students and colleagues, whether at the university or in private gatherings.²⁸ It was this enthusiasm that led Montanari to establish his own academy in 1666. This was the Accademia della Traccia, also known as the Accademia dei Filosofi.

Since Michele Medici's brief introduction to the Traccia's activities, written in 1852, there have been very few accounts of the work undertaken by Montanari's group.²⁹ Those secondary sources that do exist, give a brief account of the Traccia's foundation and workings. As discussed above, according to Medici, the Traccia was founded in order to continue the experimental work begun by the Cimento. Brief histories of the Traccia and Montanari's career in Bologna have since echoed Medici's views. For example, McClellan and Tabarroni have discussed the Traccia's foundation as an attempt to emulate the Cimento. Tabarroni goes so far as to suggest that Montanari acquired his skills as a mathematician when he spent a few months in the Grand Ducal Court of Tuscany during the time when the Cimento was in operation.³⁰ Judging from his keen interest in astronomy, and his experience with astronomical instruments from his time with Malvasia from 1662 to 1664, it does not seem at all unlikely that Montanari may have discussed certain astronomical observations with some members of the Cimento. However, there is no evidence to support the notion that Montanari contributed to the Cimento's activities or even attended a single meeting, especially since he was only employed as a legal advisor to the Prince, a consequence of his experience practicing law in Vienna. Furthermore, this was still an early period in Montanari's career, before he cast his attention to astronomy: he had only just returned from his legal studies in

²⁷ G. Tiraboschi, *Biblioteca modenese* (5 vols.), Modena, 1783, iii, 260; G. Albenga and F. Porro, 'Montanari', in *Enciclopedia italiana*, Rome, 1934, xxiii, 720.

²⁸ Tabarroni, *op.cit.* (10), 485.

²⁹ There have been several biographies of Montanari himself, some lengthier than others, but they often fail to discuss his work with the Traccia. These include: Tiraboschi, *op.cit.* (27), 254-279; Albenga and Porro, *op.cit.* (27), 720; Carlo Bonacini, "Nel Terzo Centenario della Nascita di Geminiano Montanari" in *Atti e memorie. Accademia di scienze, lettere ed arti*, Modena, 1934, 4th series, vol. 4, 63-76.

³⁰ It is likely that Montanari started working for the Grand Duke in the early months of 1659 and left in 1661, when he was offered work at Modena. Albenga and Porro, *op.cit.* (27), 720.

Salzburg and Vienna.³¹ Nevertheless, the implication is clear: thanks to his contact with the Tuscan Court, Montanari was able to establish an institution in Bologna that attempted to echo the experimentalist example established by the Cimento.

This short and simple account of the Traccia's foundation by Medici, McClellan and Tabarroni gives very little indication of the group's own natural philosophical pursuits. What this means is that there exists a danger that the Traccia's foundations and workings could be simplified and purported as merely copying the experimentalist undertakings of the Cimento – a relatively uneventful stop on the road to the foundation of the Inquieti and the Academy of Sciences. In fact, quite predictably, Tabarroni not only labels the Traccia as an attempt to emulate the Cimento, but also as a 'precursor' to the Accademia degli Inquieti.³²

Given, therefore, that there are relatively few secondary sources that are prepared to examine Montanari's intellectual aims and interests in establishing the Traccia, it is important that we briefly look at some of the information we do have regarding the group's foundation and the work carried out by Montanari. This would prepare us for more thorough analyses of the Traccia in the future, and would assist the aim of this paper to examine the foundations and workings of the Accademia degli Inquieti.

There do not appear to be many published or manuscript records of the Traccia's activities, but Medici gives us an insight into the group's interests through the publication of the following schedule:

Avviso delle esperienze naturali per mezzo delle quali, oltre i soliti discorsi geografici, si rintraccerà la soluzione di vari problemi nel corso degli studi dell'anno presente nell'Accademia della Traccia, che si raguna in casa del signor Dottore Geminiano Montanari pubblico Matematico di questo studio, ed i problemi sono i seguenti:
 Se le esperienze che comunemente sogliono farsi per provare il vacuo, provino veramente darsi vacuo in natura.
 Se sia vero, che gli effetti di quelle esperienze dalla gravità dell'aria derivino.
 Se gli effetti della gravitazione de' fluidi siano veramente regolati dall'altezza, non dall'ampiezza del fluido medesimo.

³¹ Tabarroni, *op.cit.* (10), 484. Presumably, Tabarroni is relying here on the similar claims made earlier by Tiraboschi, who states that Prince Leopoldo must have recognized Montanari's talents in astronomy. Tiraboschi, *op.cit.* (27), 257.

³² Tabarroni, *op.cit.* (10), 485.

Se vi siano argomenti che provino non darsi fra noi leggerezza positiva.
 Se i corpi fluidi hanno veramente viscosità, contro l'opinione d'alcun moderno.
 E per servire agli studi particular d'un Accademico, si faranno talvolta esperienze intorno
 la luce, la vista, il suono ed altro; siccome se alcun altro richiederà di veder per proprio
 studio alter esperienze particular, si faranno ad ogni sua inchiesta. Inoltre si faranno dal
 medesimo signor Dottore Montanari di tempo in tempo discorsi fisico-matematici sopra
 varie materie, ed in particolare sopra qualche esperienza più importante.³³

Although Montanari did not begin to pursue his interests in natural philosophy until he was almost thirty, this did not stop him from investigating a wide range of issues, including mathematics, astronomy, instrumentation, physics, engineering and biology. The list above, compiled for the Traccia, also indicates that Montanari led his academicians in a series of experiments regarding pneumatics and hydrostatics, including the pressure of air, the vacuum, the weight and viscosity of liquids. These were all issues that had been discussed during the previous decades in Europe's main centres of learning, including the Accademia del Cimento. During that time, they were heavily laden with natural philosophical contention. In particular, discussions surrounding the pressure of air by corpuscularians and mechanists in the sixteenth and seventeenth centuries, opposed Aristotelian thoughts about the impossibility of creating a vacuum and the positive levity of air. It would seem that, according to Montanari and his academicians, those issues had not been satisfactorily resolved and so Montanari engaged in a variety of experiments with barometers and other measuring devices, including capillary tubes.³⁴ In other words, experiments were indeed high on the agenda of the Traccia's activities, but those experiments were surely constructed and interpreted according to the theoretical, natural philosophical concerns and contentions of the period. This was despite the rhetoric of the Traccia's predecessors in Tuscany, and despite also the traditional claims by several historians that the Traccia, like the Cimento, was an attempt to create inductive, theory-free knowledge of nature. So, if the Cimento inspired the Traccia, so far we can determine that this was only in the sense that it was a group led by an intellectual interested in natural philosophical inquiry, more so than any type of modern experimental method.

³³ V. Fantuzzi, *Notizie degli Scrittori Bolognesi*, vol. 1, 24. As cited by Medici, *op.cit.* (26), 10.

³⁴ Bonacini, *op.cit.* (29), 71.

5. Accademia degli Inquieti (1690-1714)

The University of Bologna underwent a financial crisis during the late 1670s, during which time Montanari left the chair of mathematics vacant and accepted a position at the University of Padova.³⁵ So Bologna did not see a great deal of natural philosophical activity until the Accademia degli Inquieti was established in 1690.³⁶ The Inquieti's founder was seventeen-year old Eustachio Manfredi (1674-1739), a self-taught astronomer and mathematician with a degree in law from the University of Bologna.³⁷ Manfredi invited his siblings (including two brothers and two sisters), as well as some of his fellow students, to meet on a regular basis at his home and carry out observations and experiments.

According to Longardi and Galdi, Manfredi gathered those around him who could discuss the experimental verifications of physical laws and astronomical observations.³⁸ Indeed, it would seem that at this early stage of the Inquieti's existence, Manfredi directed the group's interests mainly towards astronomy. He and his closest friend, Vittorio Francesco Stancari, studied astronomical publications, and set up an observatory in Manfredi's home. Lacking the funds to purchase instruments, they even constructed their own rudimentary sextants and telescopes.³⁹

Within four years, the Inquieti's membership swelled as they attracted philosophers, mathematicians, and anatomists from Bologna and its surrounding towns. As a result, the group's interests began to stretch beyond Manfredi's and Stancari's pursuits in astronomy. Indeed, Manfredi could no longer host the Inquieti's meetings, which were

³⁵ Tabarroni, *op.cit.* (10), 485.

³⁶ Some contention also exists over the foundation year of the Inquieti. Mario Fanti claims the Inquieti's first meeting was in 1691, while Maylander, Ornstein, as well as Longardi and Galdi, suggest that the group began in 1690. Fanti, *op.cit.* (11), 83; Longardi & Galdi, *op.cit.* (12), 90-93; Maylander, *op.cit.* (12), 300; Ornstein, *op.cit.* (8), 219.

³⁷ G. Tabarroni, "Manfredi, Eustachio" in C.C. Gillispie, *Dictionary of Scientific Biography* (18 vols.), New York, 1974, Vol. IX, 77.

³⁸ Longardi & Galdi, *op.cit.* (12), 91.

³⁹ S.A. Bedini, "Introduction: The Vatican's astronomical paintings and the Institute of the Sciences of Bologna" in *idem.*, *Science and Instruments in Seventeenth-Century Italy*, Aldershot and Brookfield, 1994. Reprinted from "Geochimica et Cosmochimica Acta 14. Proceedings of the Eleventh Lunar and Planetary Science Conference (Houston, Tex., March 1980), New York, Pergamon Press, xiv.

subsequently held in the home of Jacopo Sandri, a professor of anatomy and medicine at the University of Bologna.⁴⁰ The Inquieti remained there for the next ten years as it continued to attract new members, still mostly students, and began to gain a reputation as a worthy institute of learning.

In 1704 the academy's structure and meetings were formalized. Giambattista Morgagni (1682-1771), a student of medicine was appointed the group's leader, or 'Principe', and Stancari was appointed secretary to annotate the discussions and experiments held at the meetings.⁴¹ Soon afterwards, one of the Inquieti's most ardent and wealthy supporters, Ferdinando Marsigli (1658-1730), proposed further changes and grander ambitions. Marsigli had been a mercenary for the army of Emperor Leopoldo I, and held an interest in natural philosophy from an early age. During his travels, he collected books, scientific instruments and natural minerals and fossils. When he completed his service to the Austrian army and returned to Bologna in 1702, Marsigli made his collections available for the members of the Inquieti and in 1705, proposed that the group hold its meetings nightly in his palace.⁴²

In 1709, Marsigli submitted a proposal to the Bolognese Senate that requested funding for the establishment of an Institute. In exchange, Marsigli promised to donate his vast collections of books, instruments and natural artifacts, to the city, to be housed in the proposed Institute. Although they supported the plan, the Bolognese Senate lacked the funds to execute it, and suggested to Marsigli that he put forward his proposal to the Holy See, since Bologna was still under the control of the Vatican.⁴³

In 1712, Marsigli finally won the approval of Pope Clement XI, and a project was undertaken to prepare Palazzo Poggi for the Inquieti, soon to be re-named, the

⁴⁰ Medici, *op.cit.* (11), 15.

⁴¹ Maylander, *op.cit.* (12), 300.

⁴² Luigi Cervellati (et. al.), *La città del sapere: i laboratori storici e i musei dell'università di Bologna*, Milano, Silvana, 1987, 60.

⁴³ Bedini, *op.cit.* (39), xvii.

‘Accademia delle Scienze dell’Istituto Bolognese’.⁴⁴ Since then, throughout the Institute’s long history during the eighteenth and nineteenth centuries, historians have referred to the Inquieti in the manner described earlier in this paper: as an informal institution established to carry out the experimental program first established by the Accademia del Cimento. Historians may be forgiven for making such a generalization in their brief accounts of the Inquieti’s history, especially since Marsigli himself even referred to the Cimento as an inspiration.⁴⁵ However, as was the case with the Tuscan academy, as well as the Accademia della Traccia, this does not account for the intellectual and political complexities behind the Inquieti’s workings.

One example of the natural philosophical issues that continued to play a part in the experimental work of these Bolognese thinkers in the early eighteenth century, was Manfredi’s work in astronomy. As a student at Bologna, Manfredi had worked closely under Domenico Cassini, and adopted many of the geometrical and mathematical approaches to astronomy that had dominated the field since the early seventeenth century. Interestingly, Manfredi also seemed to adopt Cassini’s geocentric and geostatic beliefs regarding the movements of the Earth and Sun, an immensely contentious topic in universities, even after the distribution of Isaac Newton’s persuasive support for a sun-centred system.⁴⁶

It is beyond the limits of this paper to offer a comprehensive analysis of Manfredi’s astronomical works, but there are further issues regarding the Inquieti’s appeal to the Bolognese Senate and the Vatican that are worth briefly mentioning here.⁴⁷ This pertains to the experimentalist image Marsigli, Morgagni and Manfredi attempted to project of the Inquieti and the benefits they saw from establishing such an image.

⁴⁴ This title was adopted upon the Institute’s official opening on March 13, 1714. Maylander, *op.cit.* (12), 301; Longardi & Galdi, *op.cit.* (12), 90-93; Medici, *op.cit.* (11), 17.

⁴⁵ Marsigli apparently arrived at the notion of establishing an institution “che rimettesse in Italia quel buon gusto che prima vi fu posto dall’Accademia del Cimento, stata madre di tutte le accademie ultramontane”. F. Marsigli, *Parallelo dello stato moderno della Università di Bologna conl’altre di là de’Monti*, Bologna, 1709. As cited by Cervellati, *op.cit.* (42), 59.

⁴⁶ Tabarroni, “Manfredi, Eustachio”, *op.cit.* (37), 77.

⁴⁷ Further analysis is required here of Manfredi’s published works in astronomy, as well as his manuscripts during the period in which the Inquieti was in operation.

In order to provide the Pope with evidence of the Inquieti's benefits, Marsigli initiated two extraordinary plans. The first step was to commission a series of paintings by a popular Bolognese artist, Donato Creti. These paintings were to depict the academicians hard at work using Marsigli's astronomical instruments to observe the planets. One painting was commissioned for each planet, including the Sun and the Moon, with careful, detailed inclusion of the details of these celestial objects. This part of the process was performed under Manfredi's supervision. The paintings also illustrate the instruments used for observation.⁴⁸

The second step taken by Marsigli in his appeal to the Pope, was the promise that the experimental and observational abilities of the Inquieti would provide a much needed map of northern Italy, advancing the practical discipline of cartography.⁴⁹ This suggestion did not seem to fit into the Inquieti's regular interests in anatomy, astronomy and physics. In fact, although this was a deciding factor in Clement's decision to fund the new Institute, the project of surveying the land for the drafting of new maps was never undertaken. Nevertheless, Marsigli must have seen this suggestion as another possibility of displaying the Inquieti's practical benefits and emphasizing its interest in empiricism. Clearly, for the sake of attaining, funding the Inquieti's public façade did not necessarily have to bear much resemblance to their actual activities. More specifically, the group's instruments and observational skills needed to be advertised in whatever manner possible so that it could continue producing natural knowledge.

6. Conclusion

This research project is still very much in its early stages, and many issues are yet to be explored. Some of the questions that must be addressed regard: the scheduling of meetings and experiments undertaken by both the Inquieti and the Traccia; the criteria for including or excluding potential contributors; the natural philosophical positions of the

⁴⁸ Bedini, *op.cit.* (39), xvii-xxxiii.

⁴⁹ *Ibid.*, xx.

Inquieti's members on a range of topics, including Newtonian physics and astronomy; the devotion of the leading members of these institutions to a 'physico-mathematical' approach to investigating nature; the representation of Aristotelian concerns; the publication of the works of the individuals involved in these academies; the ambitions of the Inquieti when they began to take on a more formal approach under Morgagni; the communication between the Italian institutions and the other major European centres of learning.

In the secondary literature mentioned in this paper, very little space is devoted to these issues when examining the Traccia and the Inquieti. Certainly, it is not always easy to discuss the foundations and workings of academies with informal beginnings. Unlike the Cimento, the Inquieti and the Traccia did not publish a compilation of their work, nor were their actions constantly under the scrutiny of their princely patrons. Additionally, there are still other secondary sources that must be addressed if we were to conduct a comprehensive study of the historiography of Italy's early modern scientific institutions.

In any case, there is little doubt that most of the sources that have been addressed thus far, simplify the activities of the Traccia and the Inquieti and present an historiographical approach that does not live up to the standards of modern scholarship. Appealing stories about an early modern experimental method and the beginnings of modern science ignore the complexities behind the intellectual and political aims and interests of the institutions. What this means is that while some historians choose to discuss the experimental practices that were supposedly being consolidated during the end of the seventeenth century and beginning of the eighteenth century, the actual activities within these institutions were far more complicated. Experiments and observations were indeed used for making natural knowledge, but their dominant use was as a rhetorical tool, persuading audiences of the practical and authoritative claims being made inside these institutions. In the meantime, those experiments were still laden with theoretical and natural philosophical concerns.