The Life and Ideas of Evangelista Torricelli

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With an Edition of the Academic Discourses

By

Paolo Palmieri

Cambridge
Scholars
Publishing

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This book first published 2025

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-0364-4764-9
ISBN (Ebook): 978-1-0364-4765-6

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ACKNOWLEDGMENTS

This book is a testament to the power of collaboration and intellectual exchange. Throughout its development, I have been fortunate to receive invaluable support and inspiration from a diverse community of human beings. First and foremost, I want to express my deepest gratitude to the students in my historical and philosophical classes. Your inquisitive minds, your passion for learning, and your willingness to challenge assumptions have enriched my understanding of the subjects explored in this book. Your enthusiasm has been a constant source of motivation and encouragement in my experimental approach to teaching. To my dear friends, thank you for your unwavering belief in me and for providing a much-needed sounding board for my ideas. Your perspectives, both personal and professional, have helped me to refine my thoughts and to present my research in a clear and engaging manner. I extend my sincere appreciation to my current colleagues, and acknowledge my debt of gratitude to late Peter Machamer and Ted McGuire for fostering a warm environment for early modern studies in the Department of History and Philosophy of Science at the University of Pittsburgh. Your expertise, your insightful feedback, and your willingness to share your ideas have been instrumental in shaping this book. The vibrant intellectual community you have created at Pittsburgh has fostered a spirit of scholarly craftmanship that has been both stimulating and rewarding. The journey of researching and writing this book, almost four decades in the making, and after many detours around the themes of early modern science, has been transformative, and I am deeply grateful for the contributions of everyone who has played a part in its creation. Thanks to the Società Torricelliana di Scienze e Lettere di Faenza for providing me with rare documents. I am grateful to my former supervisors, Andrew Gregory and Hasok Chang, for accepting me as a graduate student at University College, London, many years ago and thus allowing me to start a career in academia. I have the fondest memories of your mentorship and intellectual hospitality. Finally, I am deeply grateful to my wife and life-long companion, Paola, for being the prime mover of my endeavors and aspirations for almost half a century.

ABBREVIATIONS

MS[+Roman Numeral] = Firenze - Biblioteca nazionale centrale - Galileo. Il fondo galileiano. Manoscritti. This collection of manuscripts is available online, I have quoted them by adding to the abbreviation MS the Roman numeral, by which they have been cataloged, for example, MS150, and with which they can be retrieved at the following url: https://www.internetculturale.it/it/950/codici-per-provenienza-e-segnatura

OPERA [Latin title of the section] = Torricelli, Evangelista. 1644. *Opera geometrica*. Florence: Typis Amatoris Massae, & Laurentii de Landis. The pagination of this book is not progressive but restarts with each new section. I will append to 'OPERA' the Latin title of the appropriate section, followed by the page numbers.

OET = Torricelli, Evangelista. 1919-1944. *Opere*. Four Volumes. Edited by Gino Loria e Giuseppe Vassura. Faenza: Stabilimento Tipolitografico G. Montanari (vols. 1-3), Stabilimento Grafico F. Lega (vol. 4).

TB = Torricelli, Evangelista. 1975. *Opere Scelte di Evangelista Torricelli*. Edited by Lanfranco Belloni. Turin: UTET.

NOTE. I have been unable to take into account the following edition of Torricelli's *Opera Geometrica*, as my manuscript was completed before this new contribution to scholarship was published. See *Homage to Evangelista Torricelli's Opera Geometrica 1644–2024 Text, Transcription, Commentaries and Selected Essays as New Historical Insights.* Springer Nature Switzerland AG: 2025. Edited by: Raffaele Pisano, Jean Dhombres, Patricia Radelet de Grave, Paolo Bussotti.

INTRODUCTION

The book is an invitation to encounter Evangelista Torricelli (1608-1647) through a philosophical and historiographical investigation in two stages. The first is my monographic essay presented in Part 1. The second is Torricelli's *Academic Discourses* in Part 2, a complete translation from the original Italian of his *Lezioni Accademiche*. But there is no suggested privileged order. The reader is of course free to make a decision as to how to read the book.

Torricelli was a pioneering Italian mathematician, philosopher and physicist who made significant contributions to geometry, early modern infinitesimal calculus, and the physics of solid bodies, fluids and gases. His *Academic Discourses*, presented here in English translation for the first time, offer a fascinating window into Torricelli's worldview and approach to knowledge. Spanning topics from geometry to mechanics, philosophy, engineering, architecture and politics, the discourses elucidate Torricelli's perspectives on diverse scientific subjects while showcasing his humanistic learning and rhetorical flair.

Delivered for the most part before Florence's prestigious *Accademia della Crusca*, these speeches highlight Torricelli's membership among Italy's academic elite. The Crusca Academy, renowned for safeguarding the purity of the Tuscan vernacular, cultivated eloquence and promoted the arts and sciences. Torricelli's discourses demonstrate his ability to artfully fuse technical concepts with rhetorical elegance befitting this distinguished forum. Through creative metaphor and stylized language, he aimed to entertain as much as edify his learned audience. Situating Torricelli's *Academic Discourses* within their socio-cultural and spiritual context reveals much about knowledge production, religious and scholarly networks in seventeenth century Italy. The flourishing of scientific circles and academies during this period fostered lively exchange and discussion among natural philosophers, engineers, and literati. Torricelli's own erudition drew on both traditional authorities and contemporary interlocutors. Throughout the speeches, Torricelli's dexterous synthesis of old and new

highlights his participation in an ongoing, collaborative quest to explicate the natural world.

Intellectual currents from the Renaissance also permeated Torricelli's thought and writing. The discourses frequently allude to prominent humanist themes, including the dignity of mathematics, the divinity of geometric entities, and the harmony permeating creation. This blending of humanism with natural philosophy exemplified the eclectic, syncretistic approach to knowledge characteristic of the period. At the same time, Torricelli's pioneering work ushered in modern developments in mathematics and physics. For instance, *Discourse Nine*, which underscores the utility of mathematics for deciphering universal patterns, presages a more quantitative mindset regarding inquiry into nature's secrets. Meanwhile, the speech on projectile motion incorporates Torricelli's research on parabolic trajectories, a milestone in classical mechanics. Though couched in the polished prose required at the Crusca, such insights herald the emergence of mathematical physics as a powerful new paradigm.

Indeed, Torricelli's direct personal and intellectual ties with Galileo Galilei, one of the founding fathers of modern science, surface subtly throughout these lectures. Though avoiding overt controversy, Torricelli gently infused his speeches with traces of his mentor's innovative perspectives, which, however, tend to be presented in a fragmented style open to questions, anxieties, and flashing intuitions.

In addition to their scientific content, the *Academic Discourses* provide glimpses into Torricelli's broader Weltanschauung or worldview. His metaphysical assumptions, aesthetic sensibilities, and sentiments toward knowledge and life emerge through careful reading between the lines.

The playful wit demonstrated in the *Academic Discourses* reflects Torricelli's appreciation of polymathy and interconnectivity across disciplines. He envisions knowledge as an intricate web to be woven together by the academically adept. This holistic orientation aligned with humanism's celebration of rhetorical and poetic ingenuity alongside technical virtuosity. Science, in Torricelli's view, comprised both systematic analysis and creative artistry. Indeed, the literary artfulness of these speeches showcases Torricelli's humanistic learning and stylistic flair. Practiced integration of classical references and decorative metaphors catered to the Crusca's appreciation of eloquence. By honing an ornate, metaphor-rich prose style

well-suited to educated tastes, Torricelli cemented his reputation among Italy's intellectual elite. This mastery of rhetorical techniques was not mere artifice, but rather signaled his participation in particular linguistic practices and shared cultural heritage.

Although addressed to a seventeenth century audience, Torricelli's *Academic Discourses* offer much of interest to modern readers. Their window onto the scientific culture of Baroque Italy reveals an era captivated by new theories, religious fervor, and expanding knowledge horizons. Torricelli's ingenious inter-weaving of emerging mathematical methods with classical learning and spiritual contemplation epitomizes the voluptuous eclecticism of the age. Moreover, studying Torricelli's speeches underscores the collaborative, discursive construction of scientific knowledge within vibrant communities like Florence's learned circles. Appreciating how eloquence and metaphor shaped communication of natural philosophy provides historical perspective on ongoing scientific developments. Ultimately, Torricelli's creative blending of science and rhetoric models an integrated approach to knowledge that not only holds relevance today, but prefigures an overcoming of the mechanistic scientific worldview that persistently dominates our contemporary industrialized societies.

This scholarly English translation will, hopefully, open fresh pathways for assessing Torricelli's ideas and illuminating understudied facets of the Scientific Revolution. Scholarly annotations and excursuses explicate Torricelli's profuse references and clarify technical passages for non-specialist audiences, situating the discourses within Torricelli's oeuvre while exploring their wider historical and cultural significance. Supplemental materials furnish additional biographical, bibliographic, and linguistic context. Together, these resources aim to broaden access and spark new dialogues around Torricelli's valuable contributions as a transitional figure between old and new ways of knowing.

However, much about his life and work remains enigmatic, including facts surrounding his death and the disappearance of his remains. I have strived to offer a multilayered examination of Torricelli, providing insights into his scientific theories while also illuminating the mysterious dimensions of his personal life and intellectual character.

The book opens by foregrounding the many silences permeating the biographical record concerning Torricelli. These lacunae in fact represent a

surplus of signs pointing to deep complexities in Torricelli that resist straightforward historical reconstruction. I have attempted to flesh out the unknown facets of Torricelli's inner world and thought processes by exploring potential connections to esoteric contemporary cultural movements like libertinism and quietism. Libertines advocated individualism and free thinking, while quietists sought alignment of the human will with divine will. Torricelli likely navigated a nuanced middle path between these perspectives, embracing neither fully but exhibiting some resonances with both. Importantly, I have emphasized Torricelli's relationship to his teacher Galileo Galilei and how he both embraced yet transformed Galileo's approach to the science of motion. Unlike Galileo's linear, deductive model starting from a single foundational principle, Torricelli advanced in a more labyrinthine way, offering two alternative reductions of Galileo's starting point to more basic principles. This exhibited a daring and playful 'comportment' versus blind adherence to the master. I also examined Torricelli's enigmatic geometrical work on the spiral curve, which reveals a creative struggle with mathematical paradoxes and a desire to move beyond the prevailing logical strictures of his era. Here, I discerned fertile metaphors related to fertility and generation that capture the open-ended, non-logical nature of Torricelli's efforts.

I have delved into the mysterious circumstances surrounding Torricelli's death, including the unexplained disappearance of his burial site and remains. I have used this as an opportunity to reflect on the paradoxical quest to reconstruct a historical life coherently against the inevitable gaps and uncertainties of evidence. Thus, I suggested that just as scholars still struggle to make complete sense of Torricelli's perplexing mathematical fragments involving, for instance, the spiral curve, the irrational and poetic dimensions of Torricelli's mind and identity may ultimately transcend systematic analysis.

Subsequent chapters are intended to provide a richer portrait of Torricelli's intellectual cosmos by considering facets like his home environment, library collection, imaginative tendencies, and hands-on scientific work. For example, I have analyzed the remarkable inventory of possessions found in Torricelli's household after his death, using everyday objects like scientific instruments, books, and cooking utensils to illuminate the interplay between domesticity, scholarly pursuits, and experimentation that characterized Torricelli's life. Examining Torricelli's extensive personal library similarly

reveals the diversity of his intellectual influences and how he inhabited literature as raw material for thought. Torricelli's immersion in creative realms like art, cartography, and poetry cultivated a freewheeling imaginative approach to geometry that sought to push past ingrained mental constraints. The history of Torricelli's optical workshop further grounds his identity in the materiality of early modern science, challenging perceived divides between theory and hands-on investigation.

In addition to unpacking Torricelli's multifaceted environs, I have explored salient themes in Torricelli's work like Christianity, esthetics, and utopian yearnings. I have positioned Torricelli as advancing a characteristically Baroque approach to geometry and physics, reflecting the artistic and spiritual sensibilities of seventeenth century Catholic Italy. This entailed a more embodied, passionate stance that blended reason and imagination. For example, Torricelli's theory of indivisibles in geometry echoed a Catholic incarnational view of spirit inhabiting flesh. His fascination with obscure phenomena like collision also resonated with Baroque mysticism. However, Torricelli diverged from modernizing trends in science, exhibiting more skeptical attitudes about controlling nature through technology. Ultimately, my cultural and textual analyses point to Torricelli as a complex figure who synthesized diverse, sometimes contradictory, strands of thought.

The monographic part of the book concludes by returning to the theme of silence as a metaphor encapsulating Torricelli's potent yet cryptic legacy. Despite his discretion and the enigmas surrounding his life, I have argued that Torricelli's scientific brilliance still resonates centuries later. This monograph aims to give fuller expression to Torricelli's genius by providing a multilayered portrait encompassing both his outward environment and innermost preoccupations. In doing so, it aims to offer an insightful case study in the intellectual microcosm of a fascinating but obscure early modern scientific mind. Specialists in Renaissance and Baroque science, art, philosophy, and religion will, I hope, find illuminating contextual analyses. General readers intrigued by enigmatic figures may appreciate the book's creative interdisciplinary approach to reconstructing a historical life. Ultimately, my intention has been to write a book that brings us closer to Torricelli and his era while respecting the irreducible mysteries that silence may signify.

PART 1

THE SILENCE OF TORRICELLI

1

ENCOUNTER

Torricelli has mysteriously eluded us for long.[1] Ezio Raimondi poetically spoke of the silences of Torricelli. "Scholars have occasionally underlined Torricelli's prudence, but perhaps we need to embolden ourselves and speak of his patterns of silence, renunciation, and disappointments, of that which cannot be articulated into discourse but must needs remain hidden in the depths of the soul".[2] As a student at the University of Bologna, decades ago, I had the fortune of getting to know Raimondi albeit indirectly. He was an evocative stylist, seducing the students to trace his eternal allusions to their historical sources, but also a learned philologist who dominated the literary and academic scene there. His perceptive assessment of Torricelli's recoiling from the anonymity of the public and the skirmishes of adversarial dialectics is inspiring. I have researched Torricelli for many years but never felt the urgency to write a book about him. Until I bumped into the essay by Raimondi. Before that episode my interests focused mainly on Torricelli's geometry, physics, and his philosophy of mathematics. I thought little of his *Academic Discourses*, which he never published. But the image of Torricelli's silence sparked a light in my imagination. It was as if Torricelli had renounced posterity. Indeed, this renunciation to posthumous fame is exactly what he advocates for in one of the *Discourses*. Suddenly, I thought that I could break my silence, and articulate a discourse on Torricelli by contributing, especially with the work of translation, to a posthumous maturity of his opus that might not be offensive to his choices in regard to life and existence.

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[1] A historiographically and philosophically sustained, scholarly monograph on Torricelli is still missing. Recently, two books on Torricelli have been published, the popular science biography by Fabio Toscano (Toscano 2008), which reproposes the hackneyed cliché of a Torricelli 'pupil' of Galileo, and Renato Acampora's more interesting anthology of Torricelli's works translated into German with some commentary and a biographical introduction (Acampora 2023, cf. especially pp. 1-52).

[2] Raimondi 2011, p. 285.

The following paragraph summarizes well my attitude towards translation. It is more of a paraphrase, if you like, than a literal translation of a text by Walter Benjamin, an author who wrote profoundly on the task of the translator, and who was dear to Raimondi. “There is a posthumous maturity of the words that appear to have been fixed such as in works of art or creative linguistic enterprises. A certain tendency that was the driving force of the poetic language of an author at a given point in time might exhaust itself at a later time, while novel tendencies may be born from the text during its after life. What was new and original may become old and worn out, or sound archaic. It is a mistake to look for the essence of these processes in the psychological attitudes of posterity, in other words, in human subjectivity. What must be scrutinized is the life of language and its works. Only thus is the error avoided of mistaking the essence of the historical process for the occasional motivations and circumstances of its temporal declension. Even if one assumes that the author’s signature on their work should be taken as their final word about its meaning, the received theory of translation (according to which, translation must strive for the literal transmission of the meaning as accurately as possible) cannot be accepted. For, as the tonality and meaning of great poetic works radically change over the centuries, so the target language in which a linguistic work will be rendered, namely, the mother tongue of the translator, undergoes dramatic changes over the course of time. Poetic words endure in their original language while even the best translations are destined to be metabolized in the life of the language of the translator, and thus finally to perish. Far from being the plain equation of two dead languages, the translation process carries the ultimate and delicate responsibility of remaining sensitive to the needs of the posthumous maturity of works in the foreign language, and of the foreign language as a totality, while at the same time caring for the suffering of its own mother tongue.”[3]

I must disclose that, however, English is not my mother tongue. So, my translation work proceeds from my native Italian towards the target language (English). But I believe that this does not affect the theoretical underpinnings of Benjamin’s intuition. Furthermore, Benjamin referred to poetic works, works of art, and literature, but I have argued elsewhere that

[3] Benjamin 1972, pp. 12-13. Paraphrase mine.

his insights can be extended to scientific and philosophical works.[4] This posthumous maturity of which Benjamin speaks rather obscurely, legitimates or excuses, I hope, my attempt to articulate what presumably Torricelli thought that should remain hidden in the depths of the soul. As Benjamin put it, one should not mistake the essence of historical processes for the occasional motivations and circumstances of their temporal declension, that is, in my case, the personal and academic circumstances that led to my incursion into territories that were first explored by Torricelli but which, so far as we know, he decided not to map out for the general public.

If there is an element of originality in my attitude towards translation in the light of Benjamin's insight into the posthumous maturity of literary works is my emphasis on harmonization. I strive to hear a harmony between the two languages. In practice, my work consists of repeated attempts to rewrite the first draft, which is made with the eyes glued to the original, while gradually forgetting the Italian in order to hear the English coming to life as if it were spoken or read by native speakers, perhaps idealized ones, with whom (or with whose incarnated counterparts) I interact on a daily basis. Although harmony is a complex concept, which should not be restricted to music and certainly not the harmonic theory permeating Western music before the advent of non-tonality in the early twentieth century, the harmonization process concerns, more modestly, the pragmatics of linguistics rather than its theoretical foundations. For, when it works, it is more the result of personal experience, acceptance of one's limitations, and of a sense of feeling at home, indeed of dwelling in both languages, which in my case has matured over the course of almost forty years of engagement with both Italian and English during a life straddling two countries and two radically different cultures. In this perspective, the hackneyed controversy about literalism in translation, a *Scheinproblem*, as Benjamin intuited, should be overcome. Harmonization does not rule out dissonance or even noise. In the case of languages, I suggest that dissonance takes the form of what I label *reconstructive imagination*. When it turns out to be impossible to render in the target language a passage in the original language that resists the efforts of the translator, reconstructive imagination takes the liberty of regenerating

[4] I take the liberty of referring the reader to Palmieri 2020, for a philosophical essay on the history of modern science as translation process in a phenomenological perspective. Cf. Walker 1973-74, for an illuminating historical context.

the obstinate words and their immediate surroundings within an expansive context that is suitable to engage the fruition of the readers creatively, often by actually challenging received wisdom and defamiliarizing them with the cliches of their cultural baggage, I mean, the ordinary vehicles of their thinking habits. An important tool in this cultural operation is the choice of pronouns. Unlike Italian, English has lost most of the grammar and morphology of gender in regard to nouns. But it is impossible, for any educated native speaker of Italian, not to hear sounding forth in their mind the concerto of the predominantly male authors' representations of the feminine, incorporating an eight-century heritage of love poetry, literature, and culture, when encountering an Italian word such as *natura*, or *scienza*, or *arte*. Whenever I thought that it might accord with the harmonization process I adopted the feminine pronoun (or more rarely the masculine one as the case might suggest) instead of the grammatically received neuter in order to allow the semantic spheres evoked by the Italian cognates to reverberate uncannily in English. Thus, Torricelli's *Academic Discourses* take on a posthumous life of their own, echoing surprisingly in contemporary English, and taking residence in an expansive domain of linguistic communication where they can be heard again by a culturally and ethnically diverse audience, ambassadors of the original speeches that he delivered centuries ago.

In 1908, on the third centennial of Torricelli's birth, a sequel of events led to a search for his remains in the crypt of the Church of San Lorenzo, in Florence, where it was thought that he had been buried after his death on October 25th, 1647. But Torricelli's remains have disappeared. Presumably they ended up being laid among those of nameless others in a common grave, and all was forgotten. His silence also concerns his body, then. Perhaps this outcome was more the result of fate than intention. For, complex historical, political and intellectual circumstances prevented his last will and testament concerning the form and the location of his final resting place (San Lorenzo) to be executed according to his wishes as we know from the surviving historical record.[5] Be that as it may, the fact is that for whatever reason we have lost the memory of his bodily remains. Fate and circumstances thus conspired with his being intimately drawn towards the silence of the soul, and since the body can speak volumes about the flesh, about the soul herself, and the cosmos, it is remarkable and a humbling

[5] Torricelli's will has been preserved. See OET, IV, pp. 90-94.

admonition that this possibility of speaking will most likely no longer be realized in the case of Torricelli. But in order to re-live the intimacy of the silences, silently and respectfully, in which Torricelli chose to live, we can perhaps read a disturbing document (a newspaper article, entitled *In search of Torricelli's bones*), which is the account that, in 1908, the literary critic and journalist Ugo Ojetti gave in writing of the investigative visitation that was undertaken, for celebratory and political purposes, on the presumed burial site of Torricelli's.

> With the permission of the authorities, I too have searched the bones of Torricelli for two hours today. However, let it be clearly understood, neither the authorities accompanying me have succeeded, nor have I. Actually, I had prepared myself for this event diligently, and in humble proportion to my ignorance of physics and mathematics. I had read the *Recollections* that the prodigious Torricelli, the disciple of the heroic Galileo, dedicated to his friend Lodovico Serenai, on October 14th, 1647, in the Medici Residence, when he had the lucid feeling that, at only thirty-nine, he was already cheating death.[6] Unfortunately, the Canons of San Lorenzo did not concede the burial place that Torricelli wanted. However, his body was laid in the Crypt of San Lorenzo where the Grand Duke Ferdinand intended to have a monument dedicated to him, and to this effect he indeed commissioned a piece of work to the sculptor Foggini. Disgracefully, the marble cracked during the process, and thus it came about that the memories of his resting place have long been forgotten after he had acquired fame all over Europe. On this third centennial, Guido Biagi, currently the president of the San Lorenzo Foundation, invited me and a few experts to go search for Torricelli's remains. The following are my recollections of the expedition.
>
> Outside, in the cloister garden of San Lorenzo, graced by blossoming lilies and roses, thunderstorms are approaching and the humidity makes us feel suffocating. Down, in the crypt, a cooler temperature gives us some respite, but after a while it turns chilling. The Canons have lit six candles. Masons are already working at the wall behind which an elderly man tells us that, in 1865 and 1866, in his presence, Torricelli's bones had been removed to a large wooden chest, together with other human remains, according to the orders of the then newly formed Italian government, which had decided to investigate the burial site in San Lorenzo.

[6] See the *Recollections*, in OET, IV, pp. 86-90. I have omitted the long quotation from this text, which does not preclude understanding the report by Ojetti, as I will have the opportunity to discuss the *Recollections* further on.

The Church is divided in two parts. On one side, the four arches of the vault rest on the central pillar, whose structure forms the tomb of Cosimo de Medici the Elder, made in the Brunelleschi style with serena stone. It has a powerful square-like shape elongating upwards and reaching very high, almost as if the tomb were the foundation of the entire Church that Cosimo had established for the first time with provisions for its becoming the perpetual burial site of the Medici dynasty. […] On the other side of the basement, there are the tombs of the Lorena. On the walls, marble plaques barely stand out with long inscriptions, rather unprepossessing and made with grey stone, and there are a few chairs and benches close to a small altar on which four chandeliers are placed. There is also a brass crucifix, and still nowadays, on every death anniversary, and there are many!, a priest celebrates mass. The entire trajectory of Tuscan history is epitomized in this sharp contrast. The elegant tomb of the 'founding father', Cosimo, embellishes and ennobles, sternly, all this squalor, and upholds on its classical, austere frame the lower interments of his feeble-minded, emaciated descendants, as if they had died twice. The giant and the pygmies.

Beyond Cosimo's tomb, the hammering pace accelerates relentlessly. The bricks of the wall eventually give way crushingly, and an enormous wooden chest appears before our eyes, it looks like an abnormal shipping container from the past. The mortal remains of Torricelli should be there, the inventor of the barometer, the genius whom, posthumously, the Grand Duke Ferdinand the Second, made use of as a token of celebration *ad maiorem Dei gloriam*, and to whom Galileo confided on his deathbed that Evangelista, then thirty years old, was the only person in a position to collate Galileo's pile of draft papers on mathematical physics, so that they might be polished and delivered to the press for public consumption.

Dust, dirt, and soil, mixed up with femurs, vertebrae, skulls, feet and other bones, fill the gaps between two cadavers. One is wrapped in a shroud, it is that of an old man, his arms aligned along the skeleton, the mouth wide open and teethless, twisted towards the feet of the second cadaver, whose skin looks like metamorphosed into parchment. The arms are folded in regal dignity. But it appears to be decapitated.

We have no accurate portraits or precise anthropometric data of Torricelli. All we know is that he was tall and slender. Our hope was to identify his remains by means of a lead plaque, if we could find it, that it is believed to have been placed on his coffin, and on which it was engraved a script addressing him as the mathematician of the Grand Duke and naming his birthplace, Faenza, and indicating the date of his death at age thirty-nine.

With little torches we bend over that pile of misery and death to look for details. Three doctors, who are assisting us, slowly examine the two skeletons. The decapitated one is stiff, and can be turned easily on his side. It jumps at us like a Dantesque vision, fierce, a head-less bust eerily coming forward […]. Who knows? Perhaps he was just a poor simpleton, who never said no to anybody, not even to sacrilegious spoilers like us, and to whom his loved ones folded the arms in sign of peace. One of us is busy searching among the skulls without bodies, in case there is one that might be adjusted to this decapitated skeleton. He is doing this out of a sense of respect, I believe, but we immediately feel that in the presence of death an apparently innocuous gesture means at the same time both reverence and irreverence according to circumstances. He gives up timidly. Meantime, we spot two feet still wearing boots made of black leather with exotically thick soles. But the legs have disappeared.

All of a sudden, I see something shining in the dark. Perhaps the lead plaque we were confident we could find? No, it is the stripes of a silk cloak of small size. I draw the cloth towards me, stiffened by centuries of putrefaction, scales fall off and the remains of a child take shape, with the thoracic cage very prominent. The doctors continue their painstaking search sweating but stubbornly. In total there might be a dozen skeletons or so. But to reassemble them all much more time is needed. Obviously, Torricelli is not among them. A foul-smelling atmosphere has invaded the entire crypt. The dust raised by the hustle and bustle forms halos in the vicinity of the candles. The President of the San Lorenzo Foundation eventually breaks the silence, and invites us to salute these remains and reseal the chest. To prolong the search would be useless and inappropriate.

We all step back reverently without speaking. A priest kneels down. The workers nail the lid back on the wooden chest.

When we get out in the cloister again, the storm has subsided, we are all breathing in the sunshine. The doctors wash their hands. Experts discuss with the Mayor of Florence whether Torricelli was really born in Faenza. What a perfume the lilies and the roses emanate after a storm! But I cannot forget the spectacle of the decapitated skeleton, and the words resonate in my mind that Torricelli said on his deathbed, “as for my final resting place, as long as it will be in a consecrated church, I would be pleased, for, as you know, for us Christians, the body does not really matter, but if at all possible I would prefer an honorable sepulcher”.

Poorly misguided soul that he was, Torricelli thought that it was enough to do good for the people in order to receive some in return from them after

> one's death. In fact, the truth is that we should keep our heart in a coffer, and put the coffer in safe.[7]

Torricelli inspires 'poverty', a sort of self-discipline of existence, a longing for withdrawal, a *reductio ad silentium*, a passing over in silence, a saying nothing about, when words, in their morphological exhibitionism, in their covering-up of a disturbing underground, of an origin infinitely remote and destined to remain inaccessible, fail to afford us any insights. Poverty pierces through the surface of things that have been rendered opaque by the comforts of wealth. Poverty has negative connotations, especially in contemporary economies, which, however, should be avoided. We speak of the poverty line, and we label the poor, the indigent as those who are not rich, who do not partake of wealth measured in terms of luxury goods, consumerisms, and career making. Rather, the cessation, the rest, the quieting of the dynamism issuing from the origin of things, affording themselves in poverty, must be emphasized as source of insight. Further on in the book, I will explore Torricelli in the flesh, so to speak, by puzzling together pieces of daily living in his house. We are fortunate to have records of the household layout, furniture, some accessories, and other anonymous belongings that reveal a style of being in the world conforming to quietness, colloquialism physiological needs and affection towards oneself.

But Torricelli's poverty was not asceticism. I concur with Nietzsche's analysis that asceticism is a degenerative phenomenon to which also Western science has succumbed. As the German philosopher put it, "No! Do not come to me with science when I am looking for the natural antagonist to the ascetic ideal, when I ask: 'Where is the opposing will in which its opposing ideal expresses itself?' Science is not nearly independent enough for that, in every respect it first needs a value-ideal, a value creating power, in whose service it can believe in itself, – science itself never creates values. Its relationship to the ascetic ideal is certainly not yet inherently antagonistic; indeed, it is much more the case, in general, that it still represents the driving force in the inner evolution of that ideal."[8] Despite all the nationalistic rhetoric that has flourished around academic research on Torricelli, the disciple of the 'heroic Galileo', a closer reading of the documents and of his oeuvre reveals, I suggest, that he was not such a naïve disciple, and that in fact his work led him to explore uncharted territories,

[7] OET, IV, pp. 114-118.
[8] Nietzsche 2006, p. 113.

in both mathematics and natural philosophy, which questioned the Galilean ideal of the book of nature written in mathematics. A book which was supposedly the scientist's obligation to decipher, in accord with God's plan, by following the guidance of experimentation. Although over the course of the last four centuries (Galilean) mathematical physics embraced the ascetic ideal that Nietzsche decried, Torricelli was more of the antagonist to that Galilean ideal, who revered geometry as the queen of all sciences, reigning supreme beyond and above the Galilean reconciliatory conception of truth as the accord between mathematics and experiment, and a despotic queen to boot, to which physics should be humbly subordinated, in sharp contrast to the metaphor of the book of nature balancing the exigencies of theory and experiment.

In the end, however, Nietzsche was unable to reimagine (at least in my mind) the figure of the antagonist to the ideal of asceticism. Perhaps because he himself was ultimately a great ascetic, and this may have been the reason why he clothed himself in the robes of the antichrist. But deeper currents of heretical spirituality at the crossroads of philosophy and life pervade the seventeenth century, which escaped the acute analysis offered by Nietzsche. I am referring to the movements known to historians as Italian libertinism and quietism. Despite the subtly shifting grounds that challenge our rigid interpretative categories, these currents have been appreciatively investigated in the twentieth century with surprising results. As we will see, Torricelli's lifeworld should be reenacted meditatively in the larger context of these heretical movements, which in today's parlance, might be approximately labeled as the underground culture of the Italian baroque. In sum, poverty, silence, far from being a form of regressive asceticism, can be illuminated by having recourse to the obscure literature and archival finds that cast an oblique light on the underground antagonists shadowing the emergence of Roman Catholicism on the Italian peninsula in the aftermath of the Council of Trent.

I will conclude with a phenomenological meditation on Torricelli's silence, letting it reverberate when I approach the body of geometrical work that Torricelli left unfinished on his death. More specifically, I will focus my meditation on what he called geometric spiral, traces of which survive in tantalizingly tortuous and yet fascinating, fragmentary manuscript notes that have resisted more than one attempt at rationalization by the ascetic workers

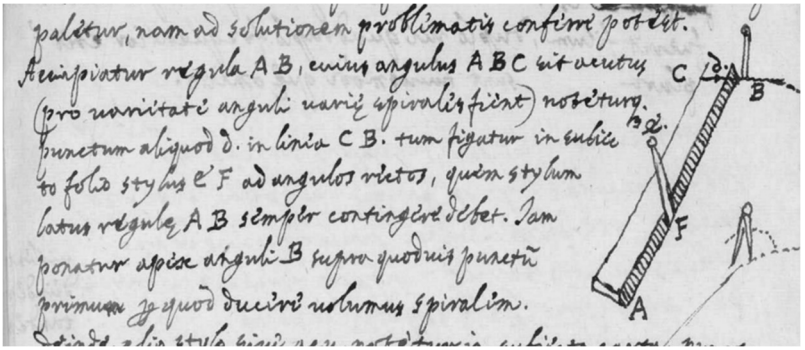

Fig. 1-1 The ruler invented by Torricelli for drawing tangents to his spiral. Cf. MS150, folio 53, recto. This folio is not an autograph by Torricelli, but the drawing is genuine, since the original folios of the letter survived at least until the nineteenth century, when the letter was first published, in Boncompagni 1875, pp. 390-393. The editors of OET, Gino Loria and Giuseppe Vassura, reported that at the time of publication, in 1919, the manuscript first published by Boncompagni, then in the private collection of Count Giacomo Manzoni da Lugo, was in the possession of Mr. Warocqué Morlanweiz-Mariemont. However, the editors republished the letter from the Boncompagni edition without specifying if they had been able to track down again and examine the original.

dedicated to the history of early modern mathematics.[9] Like the doctors trying to reconstruct the tangled mass of bones in the crypt of San Lorenzo,

[9] Cf. Agostini 1949, Carruccio 1955, TB, pp. 509-548. According to Agostini, the importance of Torricelli's work consists in the historical priority of discovery of the rectification of a curve. Agostini's attempt was absolutely heroic, and the result is a fascinating geometrical narrative, a historicized fiction, which takes the reader into the impervious manuscript materials, and goes so far as to supply or, as the early modern mathematicians who unearthed the remnants of the classical texts of the Greek geometers would have said 'divine', what, according to him, were the missing parts that Torricelli was unable or unwilling to complete. Carruccio 1955 furnished both the Latin text and an elegant Italian translation (which Agostini had not provided). The latter was also reprinted by Lanfranco Belloni (in TB). The intellectual force of these attempts lies in the productive tension towards balancing philology and fiction, although the valiant effort to fictionalize, masquerading as rational reconstruction, was thwarted by underlying ideological commitments to Italian nationalism, rooted in the colonialist ideologies at the turn of the twentieth century and later on appropriated by Fascism. It was an historiography that valued almost exclusively priority of discovery, that is, who discovered what first, and which saw history as geared towards the establishment of Western supremacy and

I invite the readers to follow me in this surreal exhumation, with the caveat that instead of insisting on recomposing the sparse remnants into anatomically, i.e., rationally, consistent skeletons, we will reinvent the baroque, flamboyant, fleshy figures that the faded graffiti on paper evoke. This reckless, surreal operation will afford us a glimpse of the elusive antagonist that labored in silence behind the facade of orthodoxy.

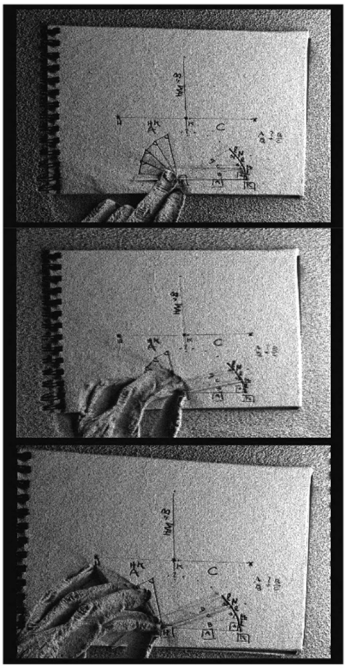

Fig. 1-2 Constructing a figure for large angles with Torricelli's spiral ruler.

In 1645, in a letter to Marine Mersenne, Torricelli sketched a beautiful instrument and described the exact procedure to operate it. With the help of that remarkable tool he had been able to study a mysterious figure, composed of short rectilinear segments, which were, as he asserted, the tangents to a spiral that was completely different than the well-known

the primacy of Italy in the processes of the scientific revolution of the seventeenth century.

Archimedean spiral, and which he claimed he knew how to rectify.[10] In essence, he claimed that he knew how to demonstrate that the length of a finite portion of the spiral was equal to a given finite straight line.

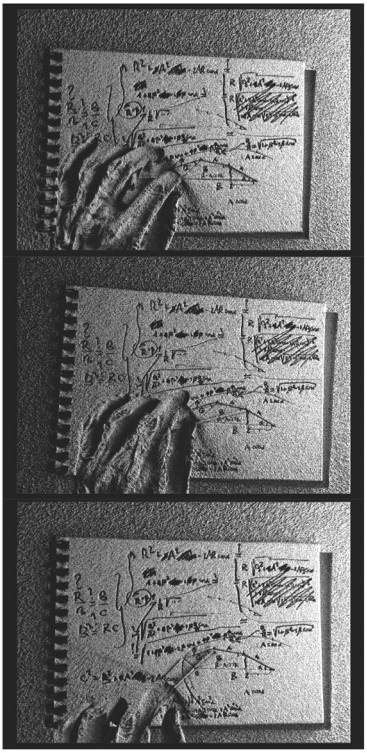

Fig. 1-3 Constructing a figure for small angles with Torricelli's spiral ruler.

The instrument consists of a ruler, Torricelli calls it a *regula*, namely, an elongated, relatively thin prism, with one edge, BC, much shorter than the other, AB, and forming an angle with the longer edge less than ninety degrees. The ruler must initially be made to touch a fixed point on paper, F, and subsequently moved repeatedly, step by step, always bringing the extreme, B, to coincide with the point marked previously at C, while tracing the segments by joining the subsequent points. The operation needs to be

[10] OET, III, pp. 273-277.

carried out while paying attention to always positioning the longer edge so that it touches the fixed pivot (F). The description is rather verbose, but in reality operating the instrument is quite straightforward. Figures 2,3 show my reconstruction of the ruler and procedure. I made the instrument with a thin piece of transparent acrylic sheet in order to let the underlining paper remain visible. Each figure shows three subsequent positions of the ruler, the first figure with a large angle, ABC, and the second with a small angle, ABC.

My reenactment approach begins with the handwork I did on the paper while learning how to operate the instrument. The trigonometric operations, sketches, and the erasures that can be spotted on my sketchbook are the result of my excruciating attempts at solving the puzzle of the ruler described by Torricelli. I will come back to them in a moment. First of all, Torricelli confesses openly to Mersenne that the instrument does not actually draw the true spiral but only tangents to it at different points. Moreover, he is adamant that he does not really have an instrument capable of drawing the true spiral. It takes a while before realizing that the difficulty stems from the fact that it is the length of the edge BC that governs the construction of the figure. The angle ABC at which the ruler's edges have been cut determines the morphologically striking aspect of the figure, namely, how rapidly the figure progresses from one point to the subsequent and consequently converges towards the presumed center. It was not until it dawned on me that, by cutting the ruler with a second, much smaller angle, ABC, as shown in Fig. 1-3, the effect could be exaggerated and thus made more extravagant, that I was able to see how the angle controlled the construction of the figure. In essence, the angle gives the mysterious spiral her morphological semblance. The length BC is also important but for another reason. It becomes clear after practicing the instrument that the shorter the length BC, the more convincing the approximation becomes, in the sense that one forms the impression that the shorter and shorter segments tend to merge better and better in the field of vision and thus the figure loses its jagged appearance.

If ABC is a right angle, the instrument draws subsequent tangents to a figure that resembles a polygon striving towards a circle. So it looks as if the circle is somehow related to the mysterious spiral. What is crucial is that while the distance, FB, can be thought of as the radius of the figure, in analogy with the circle, the effect of the angle ABC on the morphology of the figure does

not have a correlate in the analogy of the circle. By reducing the size of the shorter edge of the ruler, BC, progressively, the ruler itself becomes closer and closer to a radius in the ideal sense of a straight line with no thickness. But what happens to angle ABC, then? Does it disappear or does it persist somehow? And if it persists, does it mean that point B itself preserves the nature of an angle? It seems so, and in this case when point B forms a right angle with radius FB, a circle should emerge out of the construction process, while a spiral would be born only when the angle is less than ninety degrees. But while we can actually draw the circle in the first case, with an ordinary compass, center F and radius FB, we cannot do the same for the mysterious spiral, as we have no simple mechanical instrument (at least, as far I know) that can draw a curve with center on a fixed point, F, distance FB from center F, radius equal to FB, but such that it allows us to control angle ABC at point B, be it ninety or less than ninety degrees. It all seems paradoxical. But it is not absurd when we conjure the thought that an indivisible line may have a thickness, which is exactly what Torricelli tells us in one if his manuscript notes. Or, if we make a leap of the imagination, we can conjure the thought that an indivisible point may form any angle, as Torricelli's ideas suggest. He wrote to himself the following note, as if to challenge his own imagination, by placing this memorandum among the sparse folios on which free associations were being evoked by the encounter with radically heterodox geometrical objects.

> That the indivisibles are all equal to one another, that is, points to points, lines in breath to lines in breath, and surfaces in depth to surfaces in depth, is an opinion which, I think, can hardly be demonstrated, indeed I claim that it is false. Consider two concentric circles, and imagine all the lines drawn from the center to the larger circumference. There is no doubt that the number of transits across the smaller circumference is the same, and that the points intercepted on the smaller circumference will be smaller than those on the larger one, according to the proportion of the diameters…[11]

Even more astoundingly, consider a point, *ac*, in the following figure. But wait…Shouldn't you already have raised your eyebrows at what I just said? A point is a point, why name it with two letters like a segment? The two lines *ad* and *ae* will occupy the point, argues Torricelli, exhaustively, as long as the thickness of *ad* is proportionally greater than the thickness of *ae*, according to the ratio of *ae* to *ad*. Notice the bold consideration that a point

[11] OET I, Part 2, pp. 320-323.

is referenced not by a single letter but by two. Torricelli's reasoning starts by looking at a point as having a bidimensional thickness, and therefore as requiring two letters for its identification.[12]

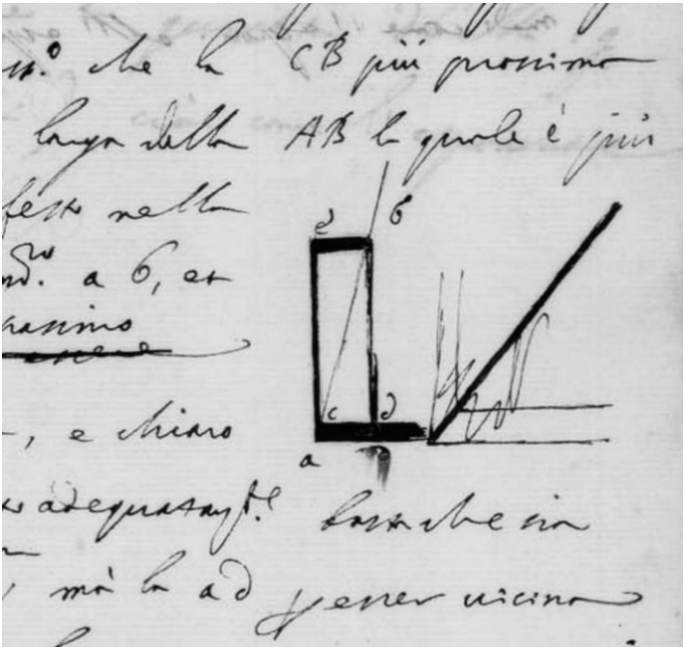

Fig. 1-4 The thickness of lines and points (MS141, folio 296). Notice the boldly inked diagram, jumping at the viewer as if to silently remark the struggle of the mind to see the paradox of the thickness of the lines and the extension of point *ac*.

As we look deep into the contours of indivisibility and consider its relationship to thickness, mind wanders into other realms - realms brimming with curvaceous geometric shapes infused with dazzling energy. This is the life of the manuscript. Look at the erasures. What do they tell us? A thick diagonal takes center stage for a fleeting moment, then perhaps it sinks into

[12] The editors of OET (I, Part 2, p. 323) completely miss the point of the bold argument as well as the point marked by Torricelli in the manuscript. The reprinted the diagram changing the lettering since, I guess, it couldn't make any sense to them to talk of a point as *ac*. The use of two letters is the standard lettering technique of a line or segment which has the two points as extremes. So that they removed the letter *c* to the right confusing everything.