Playing God: Testing, Modeling, and Imitating Blood Miracles in Eighteenth-Century Europe

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SUMMARY: In the late Middle Ages, rumors began to spread throughout Europe regarding blood miracles associated with the relics of martyrs. Centuries-old blood, pulverized or solidified and black in color, was said to return to its original bright red color, or else to liquefy or bubble under certain circumstances or on certain dates in the liturgical calendar. With the Reformation, in Protestant countries most of these relics were either destroyed or forgotten. In Catholic countries, on the contrary, blood miracles multiplied, reaching a peak between the seventeenth and eighteenth centuries. This article reconstructs the debate that sprang up in eighteenth-century Europe over the blood of Saint Januarius and the attempts made to disprove its miraculous properties, often not in written works, but by staging highly theatrical demonstrations. It examines the way in which, with phenomena as complex as miracles, the activities of testing alleged facts, creating elucidative models, and staging imitations intertwined over the centuries, often overlapping and becoming confused.

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Joseph Addison advanced slowly astride his mule, carrying with him a satchel filled to the brim with books that struck the hindquarters of the poor beast with every jolt.¹ This description is clearly a parody, but it is true that the fellow of Magdalen College, Oxford, refused to be separated from his beloved Latin authors even when on the road. Mentally, if nothing else, they were always with him. It is not surprising therefore that during his long journey south he could not help but interpret everything he saw in the light of his beloved classics, to the point that, as he himself put it, he had “travelled though the poets, and not through Italy.”² In 1700 Addison reached Naples, a very different city from all the others that he had visited thus far, a place where—he opined—superstition reigned supreme, even more so than in the rest of Italy. He twice witnessed the procession of Saint Januarius during which, as was the custom, the solidified blood of the martyr contained in a “tabernacle” was placed next to the silver reliquary containing the head of the saint and only then did it liquefy, to the immense jubilation of all of those gathered there. How was it possible that the blood of a man who lived during the earliest period of Christianity remained congealed during the year, liquefying only on scheduled occasions and in accordance with a prescribed ritual? This was without a doubt “one of the most bungling tricks that I ever saw,” Addison commented, while admitting that he had not succeeded in penetrating its “secret.”³ An instance from the classics came to his mind, that of Horace who in his Satires (5.L.1) recounts an episode that took place in the ancient city of Gnatia, in present-day Puglia, which from the perspective of the Scottish visitor was just a stone’s throw away from Naples.

At Gnatia next arriv’d, we laugh’d to see
The superstitious croud’s simplicity,
That in the sacred temple needs would try
Without a fire th’unheated gums to fry;
Believe who will the solemn sham, not I
(credit Judaeus Apella, non ego).
The miracle of Saint Januarius was therefore nothing more than a primitive animistic fossil in which “the superstitious” might still believe, but which a scholar versed in Latin—the language of the poet Horace, not that of the Catholic liturgy—could only treat as a joke, even if the underlying dynamics of the fraud were not clear to him. Addison’s account of his travels in Italy was an immediate literary success and the phrase “Let Apella the Jew believe, not I” became a byword during the Settecento for travelers seeking to underline the gulf that separated them from the traditions and practices to be found in Naples. Voltaire adopted the same skeptical attitude, and his proposal that the miraculous liquefaction might be ascribed to “environmental” factors was shared by many enlightened persons for more than a century. As the French philosopher put it, “probably the ardent imaginations of warmer climes have need of visible signs to keep them in continual contact with the divine.” In short, Addison viewed the miracle through the eyes of the poets of antiquity, and others came to view it through his eyes.

But what are we in fact talking about here? Saint Januarius was a Christian martyr who, according to tradition, died in the fourth century. Beginning in the fifth century there are documents indicating that the city of Naples was in possession of his body, which in the ninth century was probably abducted by the Lombards, who left behind only the head and perhaps the samples of blood. The latter circumstance remains unclear because while testimony regarding the head of the saint is not lacking, the first reference to the blood that has come down to us dates to August 17, 1389, when it was found to have liquefied. The saint’s blood steps onto the stage of history therefore with its liquefaction; nothing is known of its whereabouts during the intervening one thousand years, nor exactly how it was officially identified as the blood of Saint Januarius, a point that has raised not a few doubts among historians as to the authenticity of the relic (Figure 1). How is it then that over the following two and a half centuries reports of various kinds furnished by prelates, travelers, chroniclers, and even jurists began to appear, declaring that the blood
spontaneously bubbled and melted, at first once, then twice, and finally three times a year.\textsuperscript{10} While the first report did not make explicit reference to the role played by the skull of the saint, within little more than a half century almost all witnesses were affirming that the liquefaction was activated by the second relic, as if the blood, recognizing a part of the body to which it belonged, “became impatient, while waiting for its resurrection.”\textsuperscript{11}

It was in part due to the unique nature of this “miracle on demand” that the event assumed such importance in the religious life of the city, to the point of creating a sort of Denkstil in which the blood of the saint could and indeed had to liquefy for the sake of its believers. Indeed, with the intense rivalry that existed between the many convents and monasteries in Naples, blood relics of various saints (such as St. John the Baptist, St. Stephen, St. Patricia, St. Pantaleon, and St. Lawrence) multiplied in the city between the sixteenth and seventeenth centuries, each capable of changing state under specific conditions. For this reason Naples came to be known as \textit{urbs sanguinum}—“the city of bloods” based on two passages from the Bible (Ezek. 22:2, 24:6; Nah. 3:1).\textsuperscript{12}

But let us return to Addison. The date of his testimony is significant; penned at the beginning of the eighteenth century, it reflects the shift that was taking place in the commentary on the miracle of Saint Januarius. Previously criticism had been expressed on religious grounds, but they were now couched in the rational terms of the early Enlightenment. Although Addison was a member of the Anglican Church and, as his \textit{Remarks} reveal, a staunch Whig, when it came to the recurring miracle in Naples his observations were not dissimilar to those of Catholics (or, more exactly, enlightened thinkers with a Catholic background), including Charles de Brosses, Voltaire, Jean Claude Richard the abbot of Saint Non, and Montesquieu.\textsuperscript{13} Furthermore, it was with Addison that momentum was given to the hypothesis of fraud. Doubts had already been raised by Pierre du Moulin, a Huguenot author, but the predominant explanation ascribed the miracles to preternatural
agencies, in particular occult or diabolical forces that sought to deceive men into venerating the devil in the form of an object animated by him.\textsuperscript{14} It now seemed however that, fostered by the new faith in the powers of reason, the challenge arose for those of every religious denomination to debunk the miracle which foreign visitors continued to refer to as “superstitions” in their writings. Who therefore would step forward to explain the “secret” of the presumed miracle of Saint Januarius and the other blood miracles of the city?

The aim of the present article is to describe the attempts that were made in the eighteenth century to find natural explanations for this phenomenon, traditionally considered to be miraculous but already the subject of heated debate in the preceding century, and in particular to retrace the attempts to test, reproduce, or at least imitate it. However, we would stress that despite the very public dimension of these miracles (which were staged in the city’s squares and churches), over the centuries no one was ever allowed access to the relics in order to determine whether the substance that melted was actually blood (and nothing else). Moreover, the conditions under which the liquefaction occurred, as well as the variety of phenomena that accompanied it, were not systematically studied. Given these limitations, some enquirers were diverted into reproducing phenomena that were unlike the historically documented events, while others were spurred to experiment more freely with different substances and technical solutions. In the end, what was meant to be the testing of the behavior of a relic turned into the production of various theoretical models and practical demonstrations showing how a reddish material similar to blood could behave in a manner that was similar—or, to be more precise, analogous—to that of the miraculous substance under investigation.

But what is meant by “analogous”? It can be stated, for example, that one phenomenon is analogous to another if certain aspects of the two are impossible to distinguish. But it is difficult to provide a univocal answer because epistemologically the use of analogies in science is tenuous and
subject to negotiation, based not only on demonstration but also on persuasion and the sharing of similar views regarding the natural order and its relationship with the supernatural. Thus, the practice of testing, modeling, and imitating blood miracles—which presumes the acceptance of the notion of the analogy between phenomena—can provide a prism through which the ideology and arguments of both critical enquirers and Catholic apologists can be scrutinized.

Is the Blood Intelligent?

In the apologetics written in the sixteenth and seventeenth centuries, the behavior of the blood of Saint Januarius was relatively straightforward: it bubbled and then melted *quoties*, that is, “every time that,” on the designated day, it was placed in front of the reliquary containing the skull of the saint. Of course the local chronicles sometimes reported delays or the failure to liquefy, an occurrence that would throw the populace into a state of utter prostration. However the apologists, many of whom had never visited the city of Naples and were speculating on the basis of limited information, retained these *episodes manqués* to be, on balance, of little importance and certainly not sufficient to undermine the “sacramental” nature of the liquefaction, which appeared to take place *ex opere operato*, that is, “automatically” when a specific ritual was followed. The change in phase from a solid to a liquid was a miracle that took place “on cue,” to quote the Protestant critics, establishing a criterion of predictability that was the direct consequence of God’s “miraculous normativity” whereby he reserved the right to act only under certain, well-defined circumstances that were managed exclusively by Catholics.

It was the perfect predictability of the miracle, used by apologists as a *signum* of God’s predilection for the Church of Rome, that raised the doubts of many beginning in the mid-seventeenth century. Of course, among its critics the explanation for this phenomenon remained conjectural. Still, thinkers such as John Locke were beginning to reflect on questions of
epistemology and on the difficulties inherent in the act of knowing. Locke suggested that a seemingly prodigious event could be explained as “a sensible operation that, being beyond the comprehension of the spectator and in his opinion contrary to the established course of nature, is taken by him to be divine.”\(^{22}\) In other words, ignorance of the causes did not necessarily mean that a phenomenon was miraculous, and in the case of the blood relic the very regularity of its behavior suggested some natural explanation.

As Hume pointed out, “always” and “every time that” were characteristics that belonged more to nature than to the deliberate actions of a God desirous of revealing himself, and the Catholic apologists must have been aware of this.\(^{23}\) In the century that saw the birth of the science of chemistry, a recipe or mechanism that could perfectly imitate the behavior of the blood of Saint Januarius had not yet been discovered, but Catholics reasoned that if and when it was discovered, the resulting mixture or device would always follow the same natural laws, and hence exhibit an unvarying behavior.

It thus became necessary for believers to demonstrate that the miracle did not behave in such a mechanical manner, and that the intelligent hand of God operating through the intercession of Januarius could be clearly distinguished from the purely normative actions of nature. As a consequence, apologists who up to then had emphasized that the bubbling and dissolution of the blood occurred each time that the latter was placed in front of the reliquary with skull, now claimed that the regularity of the miracle was constantly broken by the vagaries of a “capricious” blood that might sometimes choose not to liquefy, or was already liquid when it was taken from the niche in which it was safely locked away, or became liquid instantly, before it was placed next to the skull, and so on.\(^{24}\) Above all, the blood often failed to melt until all infidels and heretics—that is, non-Catholics—had been made to leave the cathedral.
Numerous episodes of exceptions have been recorded; perusing the manuscript diaries of the masters of ceremonies of the Chapel of the Treasury of Saint Januarius, it is possible to find occasions where the blood liquefied “off schedule,” that is, not on one of the saint’s days in the Church calendar:

September 28, 1669. Since he was in Naples, the Marquis of Piancart expressed in writing to the illustrious Messrs. Deputies of the Treasury of Saint Januarius his devotion and desire to see the miracle of the glorious saint together with other knights. . . . The niche of the glorious blood of Saint Januarius our Protector was opened and [it] was found to be hard . . . and so was hard when placed on the high altar of the Treasury. Then the head of the glorious Saint Januarius was exposed on that altar, and was placed before the blood for about a quarter of an hour, but the blood would not liquefy. So it was said to the aforementioned visiting gentlemen knights that if there was a non-Catholic among them, he would have to go out, because the saint would not liquefy the blood. . . . Many people went out. The blood was taken from the altar to see if it was liquefied, but it was found to be still hard. All the people were very sorry and mortified about this, so it was decided that a Mass should be celebrated on that altar. After the Mass, said blood was again examined, but it was not found to be liquefied. In the end, another Mass was begun, during which some other members of the visiting group went out. During the reading of the Gospel for this second Mass, the glorious blood was examined and found to be liquefied. . . . The Duke della Mirandola . . . said that there had been many Huguenots.25

In short, the holy blood was animated by an almost capricious “intelligence” that no natural substance possessed.26 This was a shift in behavior dictated by the need of Catholics to attribute to the recurring event an anormative identity that would distinguish it from natural phenomena, which were increasingly understood to be regulated by constant and inflexible laws.27

But it would be engaging in an excess of intellectualism not to consider yet another element of natural history. According to tradition Saint Januarius also protected the city from the eruptions of Vesuvius. This belief was dramatically confirmed in 1631 when, “in bringing out for a procession . . . the venerable skull and the precious blood of Saint Januarius . . . , they [the Neapolitans] all saw a fiery and dense cloud, that came out from that [Vesuvius] and headed toward the city, threatening oncoming ruin, but turned suddenly away, taking the path to the sea.”28 During
the next hundred years Vesuvius repeatedly threatened to destroy the city (according to the local
chronicles there were eleven “major” eruptions between 1631 and 1698 alone), and the Neapolitans
organized supplementary expositions of the relic in the belief that their salvation truly depended on
its liquefaction. Thus, the increase in volcanic activity was accompanied by the increasing
conviction that Saint Januarius was “heaven’s spy”—to quote the Jesuit priest Francesco De
Geronimo—and that God would warn the Neapolitans of impending danger by not allowing the
blood to liquefy. 29 Hence the emphasis on the oracular dimension of the liquefaction. Indeed,
various accounts testify to scenes of mass hysteria following occasions on which the miracle was
delayed or failed to materialize.

At times the blood could be ironical or teasing in its behavior. It might happen that two
events whose symbolic meaning could be interpreted in diametrically opposite ways took place in
the same period. In 1710, for example, the year in which Leibniz published his optimistic Theodicy:
Essays on the Goodness of God, the Freedom of Man and the Origin of Evil, which he hoped would
consign to the past the notion of a vengeful God who threatened punishment and natural
catastrophes in order to impose obedience, in Naples the same God apparently decided to mock
Leibniz’s claim that this was “the best of all possible worlds.” 30 When the safe-cum-niche was
unlocked on the Saturday preceding the first Sunday in the month of May, the blood of Saint
Januarius was found to be in its usual solidified state. However, it liquefied in just a few minutes,
before it had been placed next to the relic of the head of the saint, an event that was immediately
interpreted to be inauspicious. But it was the blood’s antics in the following days that made the
populace fear the worst. As if animated by an irrepressible force, the humor in the ampoule swelled
in volume, filling it so completely that it was impossible to determine whether it was still liquefied
or had spitefully solidified once again. What was even more alarming was its “black and ashen”
color, which could only be a sign of impending catastrophe. Panic gripped the believers, who began to implore the saint for mercy. But nothing changed,

Despite the tears, the weeping and the sighs of persons of every social class in this city, [who were] by this time overwhelmed with grief, crushed by torment, mortified by a variety of penitences, indeed exhausted by many long marches barefoot in processions, both on the part of women—be they virgins or married or widowed—with dishevelled hair and wreaths of spines on their heads, and on the part of men. . . . [These] walked in processions by night and by day, some striking themselves so violently with scourges that they bled, others wailing bitterly and miserably, also wearing wreaths of thorns on their heads, with heavy stones hanging from their necks, with massive crosses on their shoulders, with skulls in their hands, with thick ropes bound tightly round their hips, dragging long iron chains attached to their ankles, with their faces and clothing covered in ashes.

In contrast to the preceding century and the reassuring quoties of the blood relic, observers now remarked on the unpredictability of its behavior, whose variants—color, volume, frothiness, and so forth—allowed Saint Januarius to communicate with the faithful using something more than the simple binary code: liquid blood/solidified blood. The patron saint seemed to have come into possession of a much more articulate language. A Latin elegy (loosely translated here) listed its store of expressions:

Often, turning in my hand the [vial of] blood, I see my destiny
When it turns red, it announces to me Mars [war] untamed
If fervent, Vesuvius, gushing from the viscera of the earth, erupts
If it is black, death will immediately prepare its arrows against me
If it ripples, I am horrified of the torrential rain that will fall from heaven
If it hardens, the earth will deny us its fruits
When in the midst of the liquefied blood a solid globe appears, woe betide me!
How many problems, like mountains, there are to surmount
If it has a light colour, there will be a terrible plague against livestock and men
But when it froths, I am delighted at it because it sings to me of positive events.

Could this not be the language of an “intelligent” and prescient blood? In all events, the city and kingdom of Naples in that period were struck by so many misfortunes that, whatever the blood foretold, it was easy to find ex post facto an event that confirmed the oracle. It is no coincidence
that the Jesuit Domenico Antonio Putignani wrote a three-volume work on the miracle, devoting the second volume to the divinatory powers of the (non)miracle, which he considered to be sufficient to distinguish it from natural phenomena governed by strict causal relationships.\(^{35}\)

Outside the kingdom even Catholics viewed with embarrassment the supposedly divinatory character of the liquefaction, but in Naples Saint Januarius seemed disposed to express himself and even to intervene in its political affairs.\(^{36}\) The holy blood thus became a factor in the institutional life of Naples, to the extent that on May 10, 1734, the day that the new king, Charles of Bourbon, arrived in Naples, he visited the cathedral in order to render homage to Saint Januarius and subject himself to what was beginning to resemble a divine ordeal. Most auspiciously, on this occasion the blood liquefied.\(^{37}\) Examples of similar episodes abound. Other men might fear losing not their crown, but their life if the blood did not liquefy. For example, in 1723 Pietro Giannone published his *Civil History of the Kingdom of Naples*, in which, among other things, he questioned whether the blood relic was actually an oracle.\(^{38}\) The crowd was stirred up against him by his enemies in the clergy, who were in reality worried about his political opinions and used his critique as a pretext to spread the rumor that the saint was angry with the entire city and would punish it. The author feared that if the next liquefaction failed to take place he would be lynched and he fled the city, never to return.\(^{39}\)

These are only a couple of examples. One can guess, however, that it was the blatant political use of the miracle that, over time, lent strength to the idea that the causes of the melting were not miraculous, or even natural, as increasing numbers of people, even in Catholic countries, were now willing to believe, but fraudulent. And while in the seventeenth century critics had speculated that the blood was being manipulated to cause it to behave the way it did, now attention shifted to the contents of the ampoules and sceptics were beginning to ask: was the substance blood or a substance resembling blood? In the past it was assumed that any reddish material found in the
tombs of the early Christians was blood and therefore proof of martyrdom, but a much more cautious approach was now being taken because, as archaeologists and chemists pointed out, such stains could be the residues of organic substances such as agave wine or scented oils. The question was now posed in these terms: ordinary blood, as the Aristotelian physician Fortunio Liceti had demonstrated a century earlier, would never behave like the blood relic of Saint Januarius, but if the ampoule contained a different substance, could the liquefaction and its associated phenomena be completely natural events?

The doubt lingered. Apparently it was not until the beginning of the nineteenth century that a scientist—Sir Humphry Davy—asked if he could analyze the blood relic in Naples (permission was denied). This information was included in almost every one of the apologetic texts, although no mention of it can be found in Davy’s published works or his correspondence, nor in the Archives of the Deputation of the Chapel of the Treasury of Saint Januarius. Whether true or not, it must be kept in mind that, given the knowledge and instruments available at the time, and the impossibility of opening the ampoules which had been sealed for centuries, even if Davy had been allowed to handle the relic, the technical means to draw useful information from it were not yet available. At the same time, the doubt regarding the true nature of the substance in the ampoules was leading some scientists to devise the most unlikely theories regarding the relic, without taking into account the timing and modality of the miracle.

The Imitation Game

Berlin, Tuesday, January 26, 1734. At the conclusion of the “philosophical banquet” to which the famous chemist and court apothecary Caspar Neumann had invited the president, the section directors and numerous members of the Berlin Royal Academy of Sciences, it seemed that those present could ask for nothing more. Suddenly Neumann extracted “from his tabernacle, I mean the
actual treasure of his chemical and apothecary laboratory” three vials of crystal or transparent glass, in which a small quantity of a black substance was clearly visible. This matter was so hard that it made a noise when he shook the containers, rattling against the glass. At a sign from him, a skull was brought into the room. When the first vial was placed near the skull, its contents turned vermilion, then bubbled and became liquid: “Here is the miracle that ensures the goodwill of this patron!” he exclaimed. When the second vial was placed close to the skull, the substance within bubbled only slightly, a sign of the limited favor of the protector. Finally, when it was the third vial’s turn, nothing happened, probably because in the room, “there were heretics, as we all were in the style of the Romans, which caused the indignation of the patron.”

One can imagine the laughter and expressions of approval made by those present, none of whom were Catholic, when they realized that Neumann had succeeded in reproducing the miracle of Saint Januarius, even its apparent intelligence.

Was Neumann’s demonstration a reproduction of the miracle? No, it was an imitation, and indeed a rather approximate one. This is because Neumann chose to focus on the external aspects of the phenomenon, in order to create the illusion of an analogy between the miracle of Saint Januarius and his own exhibition (for example, it seems that the skull was introduced merely for dramatic effect or at most to hide a candle or some other source of heat). Descartes had already asked himself whether a machine—a concocted affair, as Neumann would have put it—could be intelligent, and concluded that this was not possible: “for, whereas reason is a universal instrument which can serve on any kind of occasion, these organs need a particular disposition for each particular action; whence it is that it is morally impossible to have enough different organs in a machine to make it act in all the occurrences of life in the same way as our reason makes us act.” But Neumann’s ambition was not to concoct a substance with the quality of intelligence that would behave differently when in the presence of believers or nonbelievers. He simply wanted to find a substance
that uniquely appeared to be intelligent when manipulated in a certain manner, liquefying or remaining solid on command, so to speak.

In 1950 Alan Turing proposed a test based on what he called “the imitation game”: if an observer is not able to distinguish a machine from a person on the basis of the responses received, it must be acknowledged that the machine is intelligent. Neumann’s performance was clearly a world away from the lucid theoretical experiments of Turing but, like the English computer scientist, the German apothecary retained that the fundamental notion was that of indistinguishability. By tradition the blood of Saint Januarius was supposed to be animated by supernatural virtues. If there was another material thing that behaved in a manner indistinguishable from the relic, it had to be concluded that they were both intelligent. Or else—and this was the conclusion that Neumann wanted to demonstrate—neither was animated by the quality of intelligence, for in both cases a hidden trick was involved. In the end, indistinguishability made machines intelligent according to Turing, whereas for Neumann indistinguishability revealed the nonintelligent nature of blood. This substance was, to adopt a term that gained wide currency in the eighteenth century, a “fetish,” that is, an inanimate object in which men recognized a divine praesentia (presence) and potentia (power) and to which they attributed the quality of being able to predict the future.

But what was the trick used by the royal apothecary, or rather, what were the contents of the three vials exhibited with such a flourish by Neumann? According to some, they may have been different mixtures containing spermaceti, a waxy material produced by whales that melts at forty-four to forty-five degrees Celsius and was used at the time to make candles, but we have no certainty of this. And other sources suggest alternative gimmicks that might have triggered the desired effect. Because Neumann never publicly revealed his secret, a multitude of hypotheses were produced by Catholics, Protestants, and those interested in curious phenomena.
had personal reasons for not revealing the details (according to one witness, he was piqued at having won neither fame nor fortune for exposing the falsity of “one of the greatest and most famous miracles that the Roman Church had ever had”).\textsuperscript{50} And in making his claim he drew down upon himself the wrath of opponents, who sought to discredit him by accusing him of being nothing more than a mountebank.\textsuperscript{51} However, since he did not seem to know much about the relic itself and refused to expose the secret of his own demonstration, Neumann’s claim required a leap of faith as great as that demanded by Catholics of others when urging them to believe in the miracle.

Neumann did not reveal his secret; the Relation that was published on his performance—\textit{in French, to make it more accessible to a Catholic audience}—was by the court preacher Johann Arnold Noltenius (Nolten), who wished to create a public sensation. Parodying the theatricality of the Catholic liturgy, Neumann preferred instead to stage scientific performances in front of witnesses who shared his conviction that the miracle was a swindle but who, like him, were unaware of the complexity of the liquefaction phenomenon in Naples. To begin with, in its solid phase the substance in Neumann’s vials was free to move about, rattling every time the ampoule was shaken, whereas in the reliquary the solidified blood adhered to the glass so firmly that it remained suspended even when the ampoule was turned upside down. Thus it was their shared perspective that induced the learned spectators in Berlin to interpret as “indistinguishable” the analogy between what they had seen and the Neapolitan miracle. If the two phenomena were indeed indistinguishable and in Berlin a stratagem had been used (which none of the witnesses present could identify), then what took place every year in Naples could or must have been a trick!

What is more, the audience that had gathered to witness Neumann’s demonstration was made up of highly qualified men of science. Able to discuss and write about the event among a broader circle of colleagues, they guaranteed that the news would spread and made it unnecessary for the protagonist himself to explain the details of his experiment. In short, the theatricality of the
exhibition allowed the court apothecary to keep the scientific aspects of his demonstration secret. It was claimed that nature, controlled by art, could exhibit such behavior, but how this might happen was not explained.

Such a scenario was intolerable for the Catholic apologists. In their view Neumann had performed nothing more than a slightly grim but childish trick that mimicked the behavior of the Neapolitan blood relic through an illusion that was not even explained. Even if we grant for the sake of argument that he had succeeded in creating something similar to the phenomenon in question, was it enough to imitate the appearance of a miracle to refute its supernatural origin? After all, Catholics themselves, especially in the theatrical-scientific Jesuit tradition, were fascinated by devices able to imitate the most famous miracles in the Bible, but they laid bare their tricks to the faithful in order to show that they were mere imitations, the simulacra of reality. To imitate did not mean to reproduce, however, and so there was a fundamental difference between the Neapolitan miracle and the demonstration staged in Berlin. In the first case the substance that changed state was blood while in the second it presumably was not. If Neumann was truly convinced that in Naples a fraud was being perpetrated, he should have demonstrated that blood and no other substance could liquefy and solidify, and also exhibit a whole range of complex phenomena that he chose to ignore.

The Test as a Show

Neumann’s demonstration was an amazing success in Protestant Europe. Sources inform us that he was summoned by Francis Stephen of Hohenzollern, Grand Duke of Tuscany and later Holy Roman Emperor, to give an exhibition. On at least one other occasion Neumann’s son-in-law and successor Johann Caspar Conradi—apparently the sole person to whom he revealed his secret—carried out the demonstration before the Hohenzollern court and a handful of Catholic witnesses. In the
following decades others began to perform similar exhibitions here and there in the German territories, although it is not clear whether they used the same mixture as Neumann or devised their own formulae. By this time the liquefaction of the blood of Saint Januarius had come to be regarded in much the same way as the newly discovered phenomenon of electricity, falling into the category of the curious or the spectacular—scientific experiments that respectable professors might conduct to draw students away from their colleagues. Teaching kits were prepared for this purpose.

As far as scholars have been able to reconstruct it, in Protestant Germany such demonstrations were conducted for the most part in exclusive settings: royal courts, the homes of local notables, schools, and academies. It is possible that exhibitions for the general public were also staged in these regions, but it is in the British Isles that one finds clear evidence of the sciences developing into a form of popular entertainment. A new breed of proto-entrepreneurs sprang up, specialized in the production of illusionistic-scientific spectacles that included demonstrations, experiments, wax anatomical models, dwarves, giant animals, exotic objects and curiosities of natural history, indeed anything that might tempt the working classes to part with a few pence for the entrance fee. And the miracle of Saint Januarius in faraway Naples was one of the marvels cited by the hawkers at these shows.

A poster recently discovered at Marsh’s Library in Dublin (Figure 2) shows that traveling shows inspired by Neumann’s performance were organized; emblazoned across the placard are the words: “The famous experiment, performed before the King of Prussia, and the present Grand Duke of Tuscany, by Professor Neumann of Berlin, of causing coagulated, or hard human blood, in a crystal glass, to run liquid, without any visible art or means used to it.” Less than ten years after the “philosophical banquet” held for the members of the Academy of Sciences in Berlin, the test that belied the miraculous liquefaction of the blood of Saint Januarius—and even, some went so far as to
say, refuted Catholicism as a whole and in particular its faith in miracles—became a trick for “chemical illusionists.” After all, magic tricks with fake blood that bubbled or swelled in volume had long been performed in public squares throughout Europe.\(^5^9\) The scientific ambitions of the demonstrators on the one hand, and the social and intellectual level of the public on the other, had fallen markedly within a few years.

It Seems Much Too Simple, Professor Neumann

Was this type of performance conceivable in Italy as well? The period between the end of the seventeenth century and the early part of the eighteenth century witnessed a shift in the geographical distribution of the two groups composing the believers in miracles and the nonbelievers. The influence of the latter began to spread even to the traditional bastions of Catholicism such as France and Italy, and finally down to Naples itself, where some held dissenting opinions, albeit not openly due to fear of the lower classes, the lazzari or idle poor, which all of Europe had come to dread following the revolt in 1647 against the Habsburg ruler led by the fisherman Masaniello. The local clergy, particularly the Jesuits, encouraged them to attack anyone who dared to express a heterodox opinion.\(^6^0\) There was a brief golden age of “free thought” in Naples, but—unable to overcome the Church’s resistance and its own internal contradictions—it had largely run its course by the middle of the eighteenth century.\(^6^1\) It was not of course possible to express an openly critical view of the miracle of Saint Januarius, but in more sophisticated intellectual circles whose members were in constant contact with colleagues and visitors from other countries, a handful of intellectuals dared to voice cautious criticism.

Consider the tour of Italy made in 1755 by the mathematician and geographer Charles Marie de La Condamine, whose report was published a few years later:
Being gone one evening to pay my court to her Royal Highness, the Margravine of Bareith, a phial was brought to that princess, set in a circle of brass, or silver gilt and mounted on a pedestal very richly ornamented, which was surmounted again with a caduceus, in order to distinguish the mounting of this from that of the phial kept in the cathedral. . . . The phial appeared to be half filled with a grey colored fixed mass or paste, and its sides tarnished with dust. On inclining it alternately several ways, and shaking it for about half a minute, more or less, the paste became liquid and melted: sometimes only partially; at other times it grew fixed again; and on shaking it anew, it was either a shorter or longer time in liquefying. All this was done before our eyes; and what was still more deserving of notice, in such a manner that neither the will nor desire of the person who shook the phial could promote or produce either the one or the other at his discretion.62

La Condamine recounted that the actual owner demonstrated the transformation to him a second time in broad daylight and finally revealed how the device operated. The substance in the vial was a mixture of mercury, lead, tin, and bismuth. The bismuth prevented the paste from binding too tightly and becoming permanently solidified. The metal frame hid a circular channel through which the mercury flowed. Below the ampoule were two small cones, one of which could move freely. Depending on how the vial was shaken, the cones would or would not touch. When they came into contact, a hole opened and the mercury in the hidden channel entered the mixture, making it liquefy. Then the hole closed. When stirring the whole, the random motion of the lower cone allowed the hole to open again so the mercury could ebb and the amalgam ceased being fluid. The timing of the melting and solidification could vary greatly, giving an appearance of “intelligence” to the behavior of the fake blood, which seemed to modify its reaction depending on the person who was handling the device. La Condamine did not name its owner, who might have incurred serious risks if he became known. Some years later the astronomer Joseph-Jérôme Lefrançois de Lalande identified the inventor as Raimondo de Sangro, Prince of Sansevero, a prominent figure in political and intellectual circles in Naples, who had since died and passed beyond the reach of his enemies.63

De Sangro’s ingenious device, although inspired by Neumann’s demonstration, had a very different visibility and social function. First of all, the Prince of Sansevero lived in the heart of
Catholic Naples and was a member of the Deputation of the Chapel of the Treasury of Saint Januarius. His demonstration was therefore never intended to be made public. He was, it is true, the Grand Master of the Freemasons of Naples and, inspired by the English “radical philosophy,” was beginning to introduce a pantheistic vision that was not compatible with the existence of miracles as such. This was a difficult period for the Freemasons, however; in 1751 their order was condemned for a second time by the Church of Rome. The decision of Benedict XIV was influenced by the complex political situation in Naples and by the publication of de Sangro’s *Lettera apologetica* (1750), which was almost immediately placed on the *Index librorum prohibitorum* (1752). Hence, the prince chose to hold his tongue out of necessity rather than choice.

De Sangro possessed far more technical experience than Neumann, whom he criticized for his inability to explain the various phenomena connected with the miracle of Saint Januarius and the supposed “intelligence” of the blood. Those who had never seen the miraculous liquefaction with their own eyes or who had witnessed the event only once or twice as tourists think that the entire marvel consists only in the simple and always uniform liquefaction of the blood. And therefore it happens that, perhaps being taken up with counterfeiting it in an approximate manner, they believe that they are justified in laughing at it. But they are very much mistaken and do not know that what stirred the amazement of observers was not the simple liquefaction of the said blood, but the different circumstances that accompanied it. As, for example, the fact that, being brought out in solidified form, in some cases [the blood] liquefied in a short time, in others after many hours . . . ; that after the liquefaction, sometimes the volume grew, almost multiplying itself, until it filled the entire ampoule, sometimes it diminished and its level greatly decreased and then, in an instant, while the populace was watching, it became hard again, as has happened many times; and sometimes it was more frothy and sometimes less.

Hence, there was no link between the demonstration in Berlin and the liquefaction that took place in Naples and as a consequence the miracle was not discredited. And this conclusion was not based on religious preconceptions, but on the fact that Neumann’s experiment did nothing to counter the point raised by Catholic apologists for a century in defense of the supernatural nature of the event:
its inconstancy and unpredictability, or in other words its failure to behave in a way that was consistent with the laws of nature. Not even de Sangro could explain why the blood remained solidified in the presence of “heretics,” but he knew that there were always plenty of foreigners stopping in Naples during their grand tour. These would have included some nonbelievers and so, without overtly claiming a cause-and-effect relationship, there was always the excuse of their presence in the crowd to justify the failure of the miracle to take place.

In his demonstration Neumann used three different ampoules, lending further weight to the idea that the liquefaction was a deliberate fraud carried out by priests who used a different mixture depending on the result they wished to obtain. With his device de Sangro instead succeeded in demonstrating that “the intelligence of priests,” as he put it, was not necessary, because a concoction of mercury and other ingredients was or at least appeared to be more “intelligent” than the prestidigitations of all the prelates of Naples, and could liquefy, solidify, or increase in volume on its own, independently of any intervention on the part of a human agent.67

Raimondo de Sangro’s demonstration was a “parlor test” or, better, a “parlor show,” not only because of the setting in which it usually took place and the noble audience to which it was addressed. In fact, it seems that the primary objective of the performance was not to deny the miracle, although of course it somewhat undermined the notion of an explicit divine intervention. In the same way as the demonstrations in fashionable salons of Jacques de Vaucanson’s automatons, de Sangro sought to create a form of “rational recreation” through an explicit illusion whose aim was not to be indistinguishable from the miracle in question, particularly in the eyes of Neapolitans who knew exactly what the liquefying blood was supposed to look like.68 His device had features not to be found in the original reliquary: the gray color of the paste, the presence of a powdery substance, and the use of quicksilver, which was quite unlike blood but was linked to the bodily humor in the symbolism of alchemy.69 Furthermore the prince, who was himself an alchemist, must
have known that up until the sixteenth century—by which time the miracle was firmly established—scientists did not make a distinction between bismuth, lead, and tin; it might only be by chance that bismuth ended up in a recipe. In other words, de Sangro was aware that the identification of a similarity in behavior did not mean that one had discovered the “secret” of Saint Januarius, only that one could re-create irregular, apparently “intelligent” behavior without having to fall back on the supernatural for an explanation.

The miracle of Saint Januarius was such a complex application of stagecraft that it was impossible to imagine it had been devised by some fraudulent priest in a previous century. And de Sangro’s intention was not to devise a perfect imitation of the miracle in order to discredit it as Neumann sought to do, but to create a symbolic representation, a model in which science, or rather the skill of the artist-craftsman-scientist, could “compete” with God without denying his power to perform miracles. This is the reason why the caduceus (symbol of the element mercury, and of alchemy, science, medicine, and transformations) took the place of the cross on the shrine. In short, his was a form of recreational and scientific narcissism (albeit with consequences that the Church of Rome considered dangerous) motivated by the desire that he shared with noblemen, scientists, and the Masonic confraternity to assert their intellectual self-patronage. His model was not an instrument invented to challenge the miraculous: it was a pretty device that sought to re-create reality in a fantastic and imaginative way. And de Sangro, the collector of ingenious inventions whose sole purpose was to cause surprise and delight, was a master of this art of the meraviglia. The “illusionary shift” now seemed unstoppable.

Conclusion: The Insidiousness of the Spectacle

If credence is lent to the hypothesis of spermaceti, the liquefaction in Berlin must have occurred with the application of heat. In short, Neumann offered a theatrical declination of the “thermal
The hypothesis according to which the liquefaction phenomena in Naples could have been triggered by the variation in temperature between the safe niche in which the relic was stored and the warmer area where the miracle unfolded; by the heat produced by the hands of the priests; or by the fact that candles were repeatedly held up close to the relic to ascertain whether the liquefaction had occurred. Neumann had probably been led to reflect on the possible role of heat by the words of the Dominican Jean-Baptiste Labat, who in his famous *Travels in Spain and Italy* mentioned (but then rejected) the hypothesis. The court apothecary was nevertheless in good company: thermal hypotheses had indeed emerged at the beginning of the eighteenth century, albeit without the support of experimental testing—based on writings by Gabriel d’Émilliane, a Catholic priest who converted to Anglicanism, and the Calvinist polemicist Giacomo Picenino—and would gain further ground up to the first decade of the twentieth century when, following the controversy raised by some Italian newspapers, it was decided that candles should be kept as far away as possible from the relic during the liturgy of the miracle so as to eliminate one source of criticism by “unbelievers.”

The fact is that proof showing that the liquefaction could not be attributed to temperature alone would be produced only some time later. An innovative movement that began in France reached Naples during the second half of the eighteenth century, led by thinkers who supported the doctrine of Sensualism, which promoted not only a new republican order in politics (eventually leading to the Jacobin revolution of 1799), but also the use of analytical-algebraic methods in mathematics and quantitative-analytical methods in chemistry. These radical thinkers were opposed by a restricted but powerful coterie of traditionalists in science as well as in politics that Massimo Mazzotti with great aptness dubbed the “geometers of God.”

The scientific-cum-spiritual perspective of the geometers of God was embodied in the person of the mathematician Nicola Fergola, who was the first to be allowed, between 1794 and
1795, to measure the ambient temperature in the vicinity of the glass ampoule on the days of the miracle. His findings, published posthumously in the 1830s, would temporarily award the palm of victory to those who believed in the miracle. Fergola in fact showed that there was no (close) correlation between temperature and the time required for liquefaction. I have examined the Registers of the Miracle preserved in the Historical Archives of the Deputation of the Chapel of the Treasury of Saint Januarius and found (except on one date) negligible differences with the liquefaction times reported by Fergola.

Must we conclude that heat plays no role in the process of liquefaction? Yes and no, because the data furnished by Fergola are accurate but tantalizingly incomplete. At the end of the eighteenth century (and still today) the ceremony of the liquefaction took place at three different times of the year: (1) for nine days beginning on the Saturday before the first Sunday in May (liquefying twice a day); (2) on September 19 and for the next seven days; and (3) on December 16. Fergola did not, however, consider the data for the saint’s day in the month of December; liturgically, this festival was less important, but it was a colder time of the year than the other two and a study of the phenomenon could have provided significant evidence. As transpires from the Registers of the Miracle themselves, when the blood failed to liquefy it was always in the month of December. During the course of the eighteenth century, it remained solid on no fewer than twelve occasions, whereas this never occurred in the first days of the feasts of May and September. In addition, when the liquefaction did take place it was much slower, requiring an average of five to six hours in December, but only one hour in May and less than thirty minutes in September. Finally the liquefaction, unlike in the spring and summer, was almost never complete, a solid “globe” remaining in the center of the ampoule. Did Fergola deliberately suppress the data for December? It is not easy to say, but all of this leads to the supposition that temperature could play a role in the liquefaction process, especially when associated with the mechanical action of shaking, another
factor that could vary considerably during the ritual. The phial might be upturned a few times by the 
archbishop, or be shaken as it was carried during the procession, the duration of which could vary 
from one festival to another.

It is necessary to stress the fact that the miracle occurs regularly during three specific 
periods of the year and at no other time, as this miraculous periodicity is not something that can be 
explained by any law of nature. Nevertheless it must be recalled that during the rest of the year the 
relic is stored in a niche-safe located behind the main altar of the Chapel of the Treasury. In this 
location the blood is not visible, and it is traditionally assumed that it remains solid, although there 
have been occasions when the relic was brought out in a period other than those set by tradition and 
found to be already liquid at the time of its extraction.\footnote{80}

Finally, it has been established with a certain degree of reliability that the substance in the 
ampoules is indeed blood, even if this does not mean that the contents consist solely of blood, nor 
does it rule out the possibility that they were subjected to some kind of chemical procedure. This 
conclusion was drawn on the basis of spectroscopic studies conducted in 1902 by Gennaro 
Sperindeo and Raffaele Januario, and corroborated in 1988 by Pierluigi Baima Bollone.\footnote{81}
Moreover, it is now hypothesized that under certain conditions blood in a state of decomposition or 
combined with fatty substances could exhibit behavior compatible with the events in the historical 
record; that is, rather than coagulating, it may remain in a liquid or in an unstable state.\footnote{82}

In any case, following the decrees of the Second Vatican Council in the middle of the 1960s, 
oficial Church texts have with increasing frequency described the periodic liquefaction of the 
blood of Saint Januarius as “prodigious” rather than “miraculous.” Nevertheless, “The devil is in the 
detail” as the saying goes, because what would appear to be a mere change in terminology hides a 
genuine Copernican revolution. By using a word that expresses the perfectly natural surprise that 
one might feel when contemplating a phenomenon for which—as the Vatican is no longer afraid to
admit—it has no explanation, the Church has managed to avoid becoming the target of criticism by sceptics. It is true that in adopting this position, the status of the phenomenon has been reduced from a miracle and “proof” of the primacy of Catholicism to a spiritual “sign” that every individual is free to interpret as he or she wishes. At the same time the Church is no longer burdened with the obligation to explain the nature of this liquefaction, a task which been handed over to the scientist. But, one might well ask, with what consequences?

In 1991 Luigi Garlaschelli published to some éclat a paper in the journal *Nature* in which—ignoring some of the historical evidence (documented occasions on which the blood did not liquefy in the month of December despite shaking and upturning the phial for hours on end) and scientific data (which should have demonstrated the presence of hemoglobin in the ampoules)—he sustained that the reliquary could contain a mixture of salt, calcium carbonate, and ferrous chloride.\(^8\) Indeed, according to Garlaschelli the presumed miracle can be ascribed to thixotropy—the property of becoming less viscous that some substances exhibit under mechanical stress. It is striking that, although challenged many times, thixotropy remains the most widely accepted explanation, particularly among nonexperts. Almost every television documentary on the miracle of Saint Januarius produced in Italy or abroad includes a segment in which Garlaschelli or some other scientist holds up a container with a mixture resembling blood that, after being turned upside down, melts instantly (in contrast to eyewitness accounts of an interminable wait before the blood of the saint in Naples liquefies) and completely (whereas the blood in the reliquary liquefies gradually, beginning with the coagulated material attached to the walls of the ampoule, and on some occasions a so-called *globo* or solid mass in the center of the ampoule remains in solidified form). This demonstration, which confirms the adage “Seeing is believing,” is followed by a persuasively presented explanation, before the scene fades in a clip perfectly timed for a television audience.
What conclusions can be drawn from this case? That illusionism is a temptation into which science can fall, particularly when it makes use of modes of communication typical of the entertainment world (in itself a perfectly legitimate stratagem), which risk blurring the distinction between the representation of an event, a mise-en-scène, and the unbiased presentation of research results. Between the scientist-performer and the public there exists an unspoken pact, in which the former, who has done all the “hard work,” is expected to present his conclusions in a comprehensible and entertaining fashion, without being required to furnish too many tedious (and perhaps inconvenient) details. Neumann, for example, managed to keep his own formula secret until the end of his life and, despite this, he was cited continually in the literature as the first to have “demonstrated” the supposed fraud of the Catholics. Would one ever ask a theater director or set designer to reveal his or her secrets? For their part, the spectators agree to allow themselves to be tricked into believing an illusion (from the Latin in “at, upon” + ludere “to play, mock, trick”); this after all is how the theater has performed its magic since ancient times. Our prestidigitators as well resorted to a series of props, such as the skull used by Neumann, which probably served no real function, or de Sangro’s “machine,” which was so ornately decorated that it resembled a reliquary much more than its contents resembled blood. “Everyone draws pleasure from imitation,” Aristotle wrote in his Poetics (48b 9). The role of the spectator is to make the effort to accept and take pleasure in the verisimilitude of an event without obsessively asking himself and others how the effect was achieved.

In the case of “the miracle of Saint Januarius,” the Church has renounced any ambition to demonstrate its veracity; the phenomenon therefore has been allowed to continue to play itself out, but in a purely theatrical dimension. However, if modern science wishes to pass judgment on the credibility of this recurrent manifestation, it must not bind itself to the logical schema of the “rational re-creation” and—despite the limited access granted by the Curia (the handful of scientists
who have been allowed to study the relic have always been carefully chosen on the basis of criteria that extend beyond their professional competencies)—provide a convincing explanation of the variable behavior of a substance that appears to contain hemoglobin. This is necessary because, while one can imitate “theater” by means of “theater,” one cannot claim to have proven anything by it. Perhaps in the realm of religion it is sufficient to believe, but in science one must seek to demonstrate.

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Figure 1. Reliquary containing the blood of Saint Januarius. There are actually two ampoules, which are kept in a tabernacle. One contains no more than a few bloodstains on its sides, while the other holds a visible quantity of blood. The phenomenon of liquefaction takes place only with the latter relic. *Acta Sanctorum Septembris* (Antwerp: vander Plassche, 1757), 6:827.

Figure 2. *For the Amusement and Entertainment of Ladies, as Well as Gentlemen*. Courtesy of Marsh’s Library, Dublin, Z1.1.13 (87).

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3 John Addison, *Remarks on Several Parts of Italy etc., in the Years 1701, 1702, 1703*, in *Works* (New York: Putnam, 1853), 2:232.


8 Chronicon Siculum, ed. Giuseppe De Blasiis (Naples: Giannini, 1887), 85.


10 On the complex history of the shifts in the annual dates of this phenomenon over the centuries, see Giovanni Battista Alfano and Antonio Amitrano, Il miracolo di San Gennaro: Documentazione storica e scientifica (Naples: Scarpati, 1950), 68–86.


18 On the sacramental meaning of the expression *ex opere operato*, see Thomas Aquinas, *Summa theologia*, 3, q. 68, a. 8.


20 On the predictability of the miracle of Saint Januarius (and other perennial miracles) as a *signum* of the superiority of the Catholic faith over all others, see in particular Sylvester Petra Sancta [Pietrasanta], *Thaumasia verae religionis [. . .]* (Rome: Mascardi, 1655), 3:80–144.


34 Alfano and Amitrano, *Il miracolo* (n. 10), 270.


37 Historical Archives of the Deputation of the Chapel of the Treasury of Saint Januarius, CA/67, _Registro del miracolo dal 1659 al 1733_, c. 2r.


42 For instance, Antonio De Luca, _Sopra una celebre controversia dibattuta in Inghilterra negli anni 1831 e 1832 intorno alla liquefazione del sangue di Gennaro vescovo e martire_ (Naples: Stamperia Tramateriana, 1836), 36.

43 Anon., _Relation du miracle de la liquefaction du sang à l’imitation de celuy qui se pratique à Naples au sang prétendu de St. Janvier_ (Berlin: Librairie de Hall, 1734), n.p.


46 The term “fetish” was introduced into the international debate by Charles de Brosses, _Du culte des Dieux fétiches_ [ . . ] (n.p.: n.p., 1760). On the relic as a vehicle for the _praesentia_ and _potentia_ of saints, see Peter Brown, _The Cult of the Saints: Its Rise and Function in Latin Christianity_ (Chicago: University of Chicago Press, 1982).


54 Hering, *Geschichte* (n. 50), 62.


57 One of these kits survived and was conserved in Braunschweig until relatively recent times. Wilhelm Roßmann, *Vom Gestade der Cyklopen und Sirenen* (Leipzig: Grunow, 1869), 141–42. The kit originally belonged to Johann Beckmann, a philosopher, naturalist, and economist who taught in Göttingen, and included an ampoule containing spermaceti colored with henna. I learned from the
staff of the Städtisches Museum di Braunschweig that this exhibit seems to have been lost or destroyed in 1927.


63 Joseph Jérôme Le François de Lalande, Voyage d’un français en Italie (Paris: Yverdon, 1786), 7:112. There is a vast, but often somewhat “fanciful” literature on Raimondo de Sangro. See, for example, Vincenzo Ferrone, I profeti dell’Illuminismo: le Metamorfosi della ragione nel tardo Settecento italiano (Bari-Rome: Laterza, 1989), 217–37.

64 Anna Maria Rao, “La massoneria nel Regno di Napoli,” in Annali della Storia d’Italia, vol. 21, La massoneria, ed. Gian Mario Cazzaniga (Turin: Einaudi, 2006), 513–42; Clorinda Donato,


Ibid., 90.


75 Davide D’Anna, *Le glorie di S. Gennaro* (Naples: D’Auria, 1912), 117.


79 The temperature records for the eighteenth century are not complete; nevertheless, to gain a rough idea of the differences in temperature between the three periods, we can use data recorded in the nineteenth century, which indicate a daily average temperature of seventeen degrees Celsius in Naples in the first week of May, about twenty degrees in mid-September, and about eleven degrees in the third week of December. Adriano Mazzarella, “Sul clima di Napoli,” *Bollettino Sezione Campania ANISN* 31 (2006): 23–40.

80 This circumstance could lead to the hypothesis that the blood, as is indeed described even in some of the older accounts, is inherently unstable, “now [modo] solidified, now [modo] dissolved” with an occult life of its own, that is, subject to phase changes outside the canonical periods that have never been monitored. Enea Silvio Piccolomini, *In libros Antonii Panormitae poetae*. (Basel: Hervag, 1538), 288–89.
