catholic countries - to censor the *libertas philosophandi*. In fact, even while they were perceived as a constraint or a hindrance (which they often were), religious motives could also represent a resource for scientific and medical research, offering suggestions and even solutions to some long-standing questions, as in the case of Sennert's theory of the transmission of the soul to the embryo.

The life-matter question stood at the very heart of Leibniz's speculations, which were interwoven in a web of metaphysical ideas. For this reason historians have often placed Leibniz's views outside the development of life sciences. It is now clear that their impact on 18th-century research in life sciences was by no means marginal. The case of Charles Bonnet shows that Leibniz's view of organisms paved the way to the development of life sciences of the late 18th century.

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Articoli/*Articles*

THE REVIVAL OF LUCRETIAN ATOMISM AND CONTAGIOUS DISEASES DURING THE RENAISSANCE

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SUMMARY

This article examines the influence of Lucretius' De rerum natura *on the theory of contagious diseases which Girolamo Fracastoro developed during the second decade of the 16th century. It is apparent that the use of the concept of* semina morbi *was neither an anticipation of modern germ theory, nor a mere adaptation of the terminology of classical atomism. In fact, the combination of the humanist interest in the poem of Lucretius with a renewed attention towards direct observation resulted in the publication in of Fracastoro's* De morbo gallico *(1530), containing an innovative and effective interpretation of the notion of contagion.*

The atomism of the ancients, at least in the aspect presented to us by Epicurus and Lucretius ... was not a scientific theory, and though some of its precepts ... seem to lead to the unification of the world achieved by modern science, it has never yielded a foundation for the development of physics. Indeed, its revival by Gassendi remained perfectly sterile. The explanation of this sterility lies in the extreme sensualism of the Epicurean tradition[1].

This insightful but harsh judgement of Alexandre Koyré has exerted an influence whose consequences are still visible today in the vast majority of studies dedicated to the history of scientific atomism. For those who, like Koyré, identified the scientific revolution with the geometrisation of the universe, it was

Key words: Atomism - Lucretius - Syphilis

naturally difficult to find a relevant role for a doctrine, such as that expressed in the *De rerum natura*, which lay beyond the mathematical explanation of natural phenomena. From this point of view, it is obvious that the Russian historian's reductionism has by now run its course. However, the passage from Koyré is still relevant, because his identification of Lucretian sensualism with Gassendi's rediscovery of the Epicurean doctrine is a point on which most historians of science today still agree[2]. Especially amongst historians of Italian science[3], the diffusion of atomism in the Seventeenth century is often referred back to Gassendi's interpretation of the works of Epicurus and Lucretius[4]. By following the diffusion of the Latin poem in Italy, we might, perhaps, be able to trace out an alternative interpretative path.

1. In the fascinating story of the humanist rediscovery of the classics, the case of Lucretius' *De rerum natura* occupies a very distinctive position[5]. It was unknown to the vast majority of medieval scholars and philosophers[6], and the first manuscript of the Latin poem was only tracked down by the humanist Poggio Bracciolini in 1417, in an anonymous library not far from the city of Konstanz, the seat of the Council at the time, where the Florentine donned the garments of Apostolic Secretary. After long and laborious negotiation, Bracciolini managed, in Spring 1418, to get hold of the desired copy of the manuscript and bring it back to Florence where it was entrusted for copying to his humanist friend Niccolò de' Niccoli[7]. Niccoli's second manuscript copy was finished only in 1437[8], guaranteeing a first diffusion of the Lucretian text, and furnishing the basis for all manuscript copies commissioned in the following years. Print publication was again to experience this initial delay. The first edition came out only in 1473, in Brescia, apparently in a rather small print-run, as only three copies of this edition have survived[9]. In confirmation of this fact, it is worth noting that the *De rerum natura*'s manuscript circulation was at first confined to the Italian peninsula for the entire Fifteenth century. Michael D. Reeve, on the basis of a census which we can consider to be almost complete, has identified fifty-three Italian

codices of Lucretius' poem dating to the Fifteenth century[10]. They all lead back, directly or indirectly, to Poggio's and Niccoli's Florentine codex.

The discovery and diffusion of the Lucretian poem and the originality of its contents aroused great interest, and not only of an aesthetic nature, among the Italian humanists. Giovanni Pontano, born in Spoleto, but Neapolitan by adoption, was the first from this group to imitate Lucretius. He published, for the Aldine press in 1505, a poem entitled *Urania, sive de stellis libri quinque*, whose longlasting literary fortune was recently studied by Isabelle Pantin[11]. Pontano's astronomical poem referred to, and at times paraphrased, certain passages from the *De rerum Natura*, but what makes it particularly important is the stress it lays on poetry for the treatment of specifically scientific questions, and not only in terms of popularisation. Indeed, the editorial success of the *Urania*[12] contributed to a defence of the recognition of scientific poetry's inherent expressive power[13].

Thanks to the versions by Bracciolini and Niccoli, it was Florence which, for many decades, was the main centre of studies on Lucretius' poem. Among these, mention must be made of those of Marsilio Ficino and Angelo Poliziano. The former is said to have written a philosophical commentary on the poem, but his distaste for Epicurean materialism and atheists, whom he labelled 'Lucretiani', led him to consign it to the flames[14]. The latter, on the other hand, admired the poem so much that he imitated its style in his famous poems *Rusticus* and in the *Giostre*, passing on his enthusiasm to Botticelli who, according to Panofsky[15], depicted a passage from the Fifth Book (V, 736-745) in his famous painting the *Primavera*[16]. It is worth noting the opinion of Vasari, who reports an episode from which we may infer Botticelli's direct knowledge of the Epicurean doctrine on the mortality of the soul[17]. This demonstrates the spread of knowledge of the *De rerum natura*, even amongst those who, like the Florentine painter, did not have a humanist education.

The opposite reactions of Ficino and Poliziano inform the various contrasting vicissitudes of the *De rerum natura* down to modern times. It is a work which, more than any other, has raised irremediable controversies and astute ideological deployments.

On one point, however, Renaissance humanists all seem to agree. Lucretius' poem represents, above all, a poetic work, the philosophical and scientific contents of which should be evaluated as a function of the aesthetic context that inspired them. Epicurean philosophy, which also put up for discussion the bases of the two philosophical doctrines then in force, Platonism and Aristotelianism, was partially neutralised in a reading founded on purely humanist criteria. This attitude justified the interest in the poem expressed by one Pope, Sixtus the Fourth, who commissioned a magnificent illuminated manuscript copy, executed by Matteo de Tauris in 1483 and now conserved in the Vatican Library[18]. This interest fits in well with the cultural politics of Sixtus the Fourth, formerly Francesco della Rovere, who had summoned many humanists to Rome, protecting and encouraging classical studies. Amongst these humanists were Filelfo, Regiomontanus and Pomponio Leto. The latter was the author of a life of Lucretius, and owned one of the fifty-three Lucretius codices studied by Reeve[19].

Until the end of the Fifteenth century, then, Ficino's drastic reaction to the poem's contents seems to have been an isolated incident. Lucretius, along with all the pagan authors of Antiquity, was considered one who should be studied and imitated, without posing any threat to the doctrinal authority of the Christian faith. Even if readings of the *De rerum natura* were, at least in the first decades of its diffusion, largely dominated by aesthetic evaluations, and, less often, philosophical ones, there were also those such as Pontano and Poliziano, who were able to appreciate its innovative scientific content. From our point of view, Poliziano's interpretation offers an extremely rich source of information. Indeed, the Florentine poet was one of the lucky owners of a Lucretian codex, and, in many places, he was able effectively to translate Lucretius' naturalistic mood into the atmosphere of the Renaissance. While as a young poet Poliziano admired Lucretius' style, in his maturity he developed a more profound reflection on the expressive quality of the *De rerum natura*. On the basis of contemporary sources, it seems likely that it was in 1494 that the Florentine poet, then in his forties, contracted an acute form of syphilis, whose devastating effects killed him in a few months.

Giorgio Del Guerra dates to this period a codex of a Latin poem by Poliziano entitled *Sylva in scabiem*, discovered by Kristeller[20] in the Palatine Library of Parma, and published for the first time by Perosa in 1954[21]. The poem's subject is the accurate and impassioned description of the symptoms and pathological progress of his syphilis. We know that Poliziano was interested in medicine, and that his library, in addition to the Lucretius codex already mentioned, contained twelve medical manuscripts, including the works of Galen with a commentary by Niccolò Leoniceno[22]. Poliziano's poem can be considered as the first written account of the syphilis epidemic which invaded Europe in 1493 and which only began to enter printed medical literature in 1497[23]. Even though the subject matter did not lend itself to a classical poetic *topos*, Poliziano put the authority of literary tradition into his discussion, with a definite acknowledgement of the effectiveness of the description of the plague of Athens contained in the Sixth Book of Lucretius' *De rerum natura*[24]. Moreover, Poliziano, in his description of the violence with which the disease was devouring him, did not refrain from referring explicitly to the *De rerum natura*, developing terms and categories which were Lucretian. Poliziano writes:

> *The man is run through by a hidden agent which swims in warm blood and likes to feed on the living host. It is called pelligenam: it is thin, it does not have a fierce aspect nor a large belly, but is small and short. You can touch it with a needle, while it hides in the skin and, if you look hard, you can just see that swiftly swimming executioner which spews out something infected by its bite, and vomits rot from its rabid mouth. How many corpuscles* (semina) *are there, often seen as though they were playing madly, with uncontrolled movements, here and there, in the rays of the summer sun? How many atoms are there in the universe, which the ridiculous old man [Democritus] has slipping towards the void? In his far-reaching mind he puts out and creates anew innumerable suns, imaging Phoebus to be born freshly and young each day; there are the same number of members to this haughty enemy, and they are of the same size: prodigious nature hardly ever places such furious, murderous rage in a large body*[25].

While allowing himself a little poetic licence, Poliziano embraced Lucretius' idea of the *semina mundi* as atoms endowed

with diverse natures and shapes. Some, such as those which Poliziano and his contemporaries called 'pelligenam', were able to attack the human body in depth, generating all the symptoms which, after Fracastoro, would be called syphilis. In another passage, Poliziano recognises the contagious nature of the disease: *Dear friends flee from the contagion of this terrible disease and are afraid of contact*. It is worth pointing out that the combination of the use of the concept of *semina morbi* and the awareness of the contagious nature of the "French pox" provides the starting point for Girolamo Fracastoro's views on contagious diseases, which are so often praised as an anticipation of modern bacteriology. Even if we cannot exclude it *a priori*, it seems highly unlikely that Fracastoro, born in 1478, would have come into contact with Poliziano's codex, and been inspired by it in his famous poetic work on syphilis. It is more simple and reasonable to suppose that the context of the two works was the after-effect of the rediscovery of Lucretius' poem, and the slow development of a new register of reading. Poliziano and, even more so, Fracastoro, began to read the *De rerum natura*, no longer only as an admirable poetic work, but as an extremely rich source of new scientific and medical ideas, terms and concepts.

The subtext of Fracastoro's new reading developed as he assumed a mature and systematic position. A scholar of medicine at Padua at the end of the Fifteenth century, Fracastoro[26] had studied under the guidance of Alessandro Achillini, Pietro Trampolini and Alessandro Benedetti, finishing his studies in 1502. It is possible, even though there are no extant sources to prove it, that Fracastoro might have met Copernicus, who was enrolled at Padua as a medical student in 1501, and that his later interest in astronomy, which culminated in the publication of his tract *Homocentrica* (1538), might be traced back to this meeting. Of more decisive importance was the influence of Pietro Pomponazzi, who was trained as a doctor, taught philosophy at Padua and produced an original commentary on Aristotle. In one work, which was swiftly condemned as heretical, the *Tractatus de immortalitate animae* (1516), Pomponazzi distinguished himself as the main protagonist in the revaluation of the heterodox Aristotelian commentaries of Alexander Aphro-

disias. It is interesting to note that the ideas of Alexander Aphrodisias placed the immortality of the soul under scrutiny. This thesis was also addressed in twenty-nine different arguments in book three of Lucretius' *De rerum natura*. It is not surprising, then, that the French apologist Guillaume Postel addressed Pomponazzi with the derogatory epithet *"philosophus lucreticus"*[27], and that the doctrine on the mortality of the soul incurred the swift censure of the ecclesiastical authorities. In 1517, the Lateran Council, called by Julius the Second in 1512, and concluded by Leo the Tenth, deliberated on the condemnation of the impious doctrine attributed to Alexander Aphrodisias and Pomponazzi on the mortality of the soul. The Council also condemned the work of Lucretius, underlining the lascivious aspects but also referring to the doctrine of mortality, without, however, explicitly associating it with the much more serious condemnation of Pomponazzi[28]. So it seems that the Council censors found Lucretius' repeated invitations to a dissolute sex life more scandalous than his thoughts on the ultimate composition of matter, the potential philosophical danger of which was obviously still not understood. Atomistic philosophy and the consequent demonstration of the transience of all things were not yet considered heretical.

Again in 1518, at a Synod held in Florence, the reading of the poem was condemned, but without any decisively repressive measures being taken. It may easily be inferred that at the time this condemnation was relatively mild, and that it implied no actual connection between Lucretius and any impious or heretical doctrines. The absence of the *De rerum natura* from the Index of prohibited books which followed the Council of Trent suggests that there was not an increasing awareness of the threat posed by Lucretius' doctrines. There were hints that the time had come to ban Lucretius, but in 1557, the Head Inquisitor, Michele Ghislieri[29], warned his diligent colleagues that such repressive measures would make them look ridiculous[30]. Ghislieri's moderation, however, did not prevent one classic, Lucian's dialogues, which had already been through 189 editions[31], from being put on the Roman index in 1564[32]. Thus, Lucretius slipped unharmed through the fine net of Counter-Reformation censorship.

Lucretius' materialistic doctrines were certainly unacceptable, but their slight influence in heterodox philosophical circles still placed him firmly within the neutral territory of the classical and pagan tradition, allowing one to borrow freely from him anything which could fit into the ordinary education of a Renaissance humanist.

At the same time as the humanists came by it however, the *De rerum natura* fell into the hands of scientists and naturalists who found in it unexplored ways of interpreting and viewing natural phenomena. Fracastoro was apparently the first scientist to absorb Lucretius' scientific lesson systematically. The doctor from Verona was close to Pietro Bembo, and also an intimate friend of the humanist Andrea Navagero, who edited the Aldine edition of *De rerum natura* (Venice, 1515) (Fig. 1). The friendship between the two humanists was sealed, after their deaths, by Giovan Battista Ramusio, who commissioned two magnificent bronze busts from the sculptor Cavino. These were then set, in 1552, over the arch of the door of Saint Benedict in Padua, just under a Roman altar which Ramusio had discovered in Salona in Dalmatia (Figg. 2, 3). The epigraph, dated by Theodor

Fig. 1. - Navagero's edition of *De rerum natura* (Venice, Aldus, 1518), frontispice.

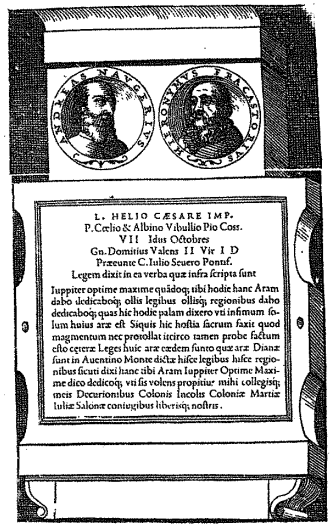

Fig. 2. - Fracastoro's *Opera omnia* (Venice, Giunta, 1555), frontispice illustrating the double medaillon (Fracastoro- Navagero) mounted upon an epigraph and put together by Giovan Battista Ramusio.

Fig. 3. - Bronze medaillon by Giovanni da Cavino (diam. 480 mm.), before 1552. Courtesy Musei Civici, Padova.

Mommsen to 137 AD, underlined the importance, typical of the Renaissance, of the rediscovery of the Ancient world, and symbolically sealed the link which had been reestablished between the Ancient world and its rediscovery and rebirth. This link, sealed by Ramusio, between the editor of Lucretius and the poet of syphilis, might be taken as an emblem of what follows.

2. The origins of the poem *Syphilis sive morbus gallicus*, the work published in 1530 which made Fracastoro famous throughout Europe, are rather obscure, even if, as Francesco Pellegrini has shown, a first version in two books was conceived around 1510-1512[33]. A third book was added by Fracastoro only after 1525, against the advice of Bembo. From 1509, when Navagero and Fracastoro were guests of the humanist Academy promoted by Alviano, it is not at all unlikely that, in these very circumstances, Fracastoro got to know the *De rerum natura*, which was being prepared for the press by his friend. Even if the reading of Lucretius had, as we shall see, an obvious influence on Fracastoro, it is still rather difficult to see why, with a medical theme and new material, such as the diffusion of the "French pox", the doctor from Verona decided to adopt such an unusual form of communication as poetry. Indeed, in classical literature, while poems of a scientific nature do exist, medical subjects were always treated in prose, or, more rarely, in dialogue form[34]. Furthermore, the *Syphilis sive morbus gallicus* cannot be considered, as the vast majority of historians of medicine have done, as a didactic poem or a highly elegant literary excursion, but as Fracastoro himself describes it in the course of the poem, an actual *"labor medicus"*[35]. In order to understand the motives which induced Fracastoro to use verse instead of prose, we are helped out by a letter written after 1530, and published by Pellegrini, in which he justified his choice in the following terms:

> *That the philosopher was a lover of myths, Aristotle did not write out of turn, nor without rational basis: for, without doubt, for natural and congenial affinity, the philosopher and the poet appear closer than any other; and one is particularly a friend of the other and interests him. A sign of such a relationship is the fact that, amongst those who are reckoned famous poets, many shewed themselves equally to be philosophers, such as*

> *Musaeus, Linus, Orpheus, Hesiod, Lucretius, Virgil and, in our own century, Pontano; and likewise of those who were great philosophers, almost all were reckoned poets, such as Empedocles, Democritus, Parmenides, Anaxagoras, who treat of physical philosophy also in verse. ... I have always greatly loved both philosophy and poetry ... It happened ... that in the past years, spurred by the epidemic which then afflicted the city*[36]*, and being withdrawn to the country, I was not so much called by the muses, as, I would say, seized by them ... Now, meditating myself on nature, on the mode of the disease's course and cause, which has mastered in little time all Europe - they call it the French pox - it seems that effectively it were a new and admirable theme and that certainly, for so much at least as it seemed to me, one might also treat of it poetically*[37].

Some years later, in a dialogue published posthumously on poetics and significantly entitled *Navagerius, sive de poetica dialogus*, he reaffirmed his own choice, claiming that the poet, in the same way as the philosopher, could treat any scientific argument without the truth of the subject-matter becoming obscured[38]. Poetry for Fracastoro could very well express a philosophical or scientific argument, and, as Poliziano had already shown, syphilis seemed to strike a particular poetic chord with the Renaissance humanist poetic sensibility (Fig. 4). The reason for this was probably due to the full aesthetic appreciation of Lucretius' beautiful and effective rendering of Thucydides' description of the plague of Athens.

3. The *Syphilis sive morbus gallicus* was dedicated to the future Cardinal Pietro Bembo - a literary figure in no way foreign to the rebirth of Lucretian studies in Italy - and it immediately met with extraordinary success. The poem was printed fourteen times during the Sixteenth century and its reception was unprecedented in Renaissance medical literature, even if, right from its first appearance, it was difficult to classify it within a single discipline[39].

The poem is divided into three books. In the first, Fracastoro illustrates the contagious nature of the new disease, syphilis, resorting to the action of invisible atoms; in the second, the most common cures are outlined and in the third, the curative virtues of guaiacum (*Hyacum*) are extolled. These subjects are inter-

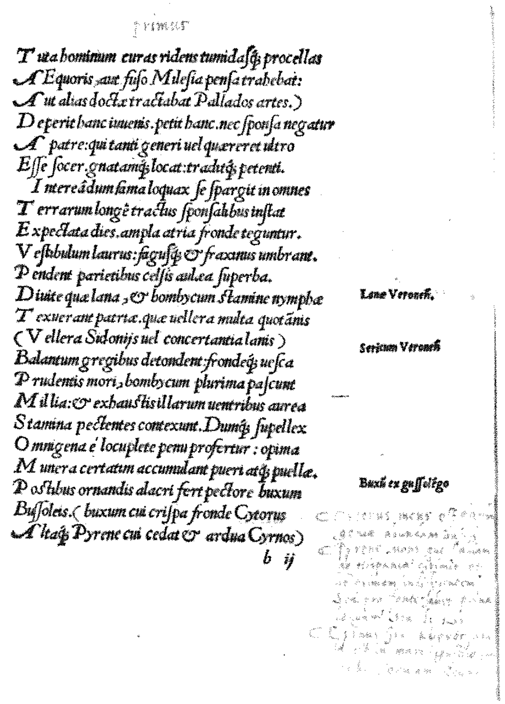

Fig. 4. - Autograph note by Fracastoro to the poem by Giorgio Bergani, *Benacus* (Verona, 1536) which imitated the *De morbo Gallico* and was dedicated to its author. Bibliotheca Walleriana, Uppsala University Library.

spersed by Fracastoro with images taken from the classics and, in the third book, from the mythological invention of Syphilus, the hero to whom we owe the origin of the name which was then given to the disease. The only truly scientific innovation of the poem is to be found in the first book, where the attempt to explain contagion resorts to the morbid action of seeds. These disease-carrying particles, which Fracastoro names, just like Lucretius, *semina, semina genitales, primordia,* and *particulae*, are

transmitted either by contact, or are wind-borne. In addition to the typically Lucretian terms, Fracastoro inserts literary *topoi* directly lifted from the *De rerum natura* into his poem. The invitation to the reader ruefully to view (*miserabile visu*) the scene of the plague to draw rational conclusions about its causes (I, 185-201) is definitely taken from numerous passages of the *De rerum natura* in which Lucretius invites Memmius to observe natural phenomena, even those which seem the most tragic, while putting his trust in the consolation of their rational explanation. Again, it is impossible not to think of Lucretius, when Fracastoro shows us, with commitment and passion, the desperation of the shepherd confronted with the epidemic which has killed his entire flock of goats (I, 265-285). The recurring stylistic *rapprochement* which links anthropological motives and scientific explanations in this and other parts of the poem fully reveals Fracastoro's dependence on Lucretius.

From our point of view, the debt towards the Latin poet becomes meaningful only when stylistic and formal influences are transformed into doctrinal ones, capable of directing medical science without the possibility of distinguishing the old from the new. Fracastoro, as we have seen, used terms to designate the contagious particles taken directly from Lucretius, while deepening the meaning originally given them in the Latin poem. In Lucretius, the term *semina* recurs 81 times, usually in the form *semina rerum*[40] and designates the elementary particles or atoms[41]. Perhaps due to poetic exigency, Lucretius also names the atoms with the following terms: *corpora prima*[42] (66 occurrences) *corpuscula*[43](5 occurrences), *elementa* (23 occurrences), *exordia* (*rerum*) (7 occurrences), *particulae* (5 occurrence), *primordia* (71 occurrences)[44]. As we see clearly from these numbers, the terms most frequently used by Lucretius to designate Epicurus' atoms are *semina* and *primordia*. In fact, as Lucretius himself asserts (I, 501), the two terms are synonymous. If the meaning of *primordial* – the origin of bodies - does not pose particular problems, Lucretius' decision to translate Democritus' and Epicurus' atom using a term derived from *semen* is quite curious and far from obvious. *Semen* in fact means seed, food-substance, sperm, race or animal species, all meanings clearly derived from

organic nature. Moreover, it was only after Lucretius, if we follow the assertions of Egidio Forcellini, that the term *semina* began to be adopted in the Latin language as a synonym of atom or origin. Indeed, despite the fact that the concept of *semina morbi* was occasionally used before Lucretius to mean the invisible causes of a specific disease[45], it was only with the Latin poet that such terms came to designate atoms. In his famous description of the plague of Athens and its possible causes, it seems significant that Lucretius does not use the term *semina*, or at least does so only haphazardly. This statement has lead Charles and Dorothea Singer to consider the term *semina* as a mere leftover of a particular philosophy of matter, Greek atomism. This philosophy projects an exclusively inorganic nature onto the ultimate parts of matter[46]. Conversely, Vivian Nutton has shown how the use of the term might condition its change in meaning: *The aptness of the seed analogy lies in the fact that it emphasises three things: that the object posited is a living entity; that it is in origin very small; and that it contains within itself the potentiality for growth*[47]. It is in this threefold meaning that Lucretius too gives atoms the power to reproduce, organise themselves and, in more or less predictable ways, influence natural phenomena, placing organic and inorganic phenomena in nature on the same level. If the Singers' claim is true, namely that Fracastoro, far from prefiguring a bacteriological theory of contagion, in fact resorted to Lucretian *semina*, adapting them to the explanation of contagious diseases, we are unable to share their conclusion that this does not constitute a fundamental innovation[48].

While Lucretius does not identify the nature of the disease-carrying particles, Fracastoro specifies the meaning, performing a kind of translation. Lucretius resorted to various forms, weights and arrangements of the atoms to explain most natural phenomena that impinge on the senses (*De rerum natura*, II, 333-477 and 1013-1022). Setting off from this rather general and vague premise, Fracastoro adapts it to a particular phenomenon, syphilitic contagion, in order to offer an atomistic explanation. He uses Lucretius' *semina* to perform a kind of semantic transposition into an entirely new context, or, at least, one completely unknown to the ancient supporters of atomism. Firstly

Fracastoro illustrates the various characteristics of the seeds of the contagion:

> *In the beginning whatever Nature brings forth to life, either on the earth or in the lofty sky or in the mighty sea, do not all come forth with an identical lot nor by the same laws; but the majority, whose basic structure is made up of few elements, are created frequently and everywhere; yet others appear more rarely and only at fixed time or locations- their birth is more violent and their beginnings situated far away; and some before they break out of their darkness and night's gloomy prison drag out a thousand years and require the space of centuries. So great is the force needed for the seeds of their conception to unite into one. Therefore, with diseases also, for there is not one process of gestation for them all...*[49]

The contagion, too, could be presented in different ways:

> *Often the air is harmful only to trees and it infects the tender bud and flowers in their glory. Sometimes it has seized harvest crops in their happy abundance, the year's work, and has blighted the haulms with a scaly rust and mother earth has produced seeds which were ruined. Sometimes it is only the animals that pay the penalty, either many of them, or certain ones... So very varied are the seeds from the tainted heaven, so varied the world's phenomena, and yet amid the confusion of all that is moved and moves there is concealed a calculable norm*[50].

Although the ideas expressed in the poem were to some extent original, it seems obvious that it is not possible, as has often been done, to place in any easy relationship the contents of the *De morbo gallico* and the *De contagione*. But an over-conservative attitude does not seem to be legitimate. In the final phases of the poem's compilation, or in any case, not after 1525, Fracastoro, perhaps coming to terms with the constrictive limits of poetry, decided to write a prose tract on syphilis. The tract, published by Pellegrini in 1939, revisits the content of the poem, but, on a few fundamental points, not least that of the definition of the role of the *semina*, it offers fuller treatments which predate by a few years the position expressed by Fracastoro in his later tract *De contagione*. It is interesting to note that in this tract Fracastoro makes constant reference both to the poem and to the work *De contagione*, demonstrating that around 1525 the

three works were being carried out almost simultaneously. It would seem, then, despite the received view, that there exists a continual relationship between the *De morbo gallico* and the *De contagione* and that to some extent the prose tract on syphilis provides the synthesis, or rather the attempt at synthesis, between the two works.

One innovation present in the manuscript, which it is worth highlighting straight away, is Fracastoro's introduction of the neologism *seminaria*[51] *morbi*. Even if the substitution of the term *semina*, which is still used in the later works, with that of *seminaria* is never justified by Fracastoro, it is likely that he was dissatisfied with the semantic vagueness of Lucretius' usage of the first term, and wanted to emphasise the specific nature of the disease particles, while still referring back to the *De rerum natura*. In any case, it would be misguided to regard the *seminaria* as distinct from the *semina*, and the fact that Fracastoro would continue to use the two terms indiscriminately as synonyms, should not lead us, as has often been done, to exaggerate the importance and the meaning of this neologism.

Even without the use of the term *seminaria*, the tract deserves an important place in Fracastoro's scientific production. After a long analysis aimed at distinguishing syphilis from other contagious diseases, Fracastoro dedicates an extremely interesting chapter of his unpublished work to the search for the origins and causes of the disease, using as his starting point the nature of the *substance of the pustules, just as much as symptoms of pain*.

> *Because this type of scab [crusta] is the cause of ulceration, it is manifest that the matter must be formed of pungent and pointed particles [ex acribus atque acutis particulis]. And again, because this sort of scab [...] is very resistant, it is clear that just as this pungency, so also the very particles, must be dispersed in a fatty substance.*

The substance which responds to this description and supplies the action of the disease particles is none other than phlegm.

> *This phlegm, then, is very fatty, viscous* [mucilaginosum] *and tenacious* [tenax]. *And this results from a strong and lively mixing, down to the*

> *smallest parts, for in truth these pustules, too, contain the origins and seeds of the contagion* [principia et semina contagionis]. *All these things, then, consist in a certain putrefying state; the particles which escape our senses [particulae insensibiles], are pungent and humid... It is manifest that these seeds and origins of the contagion, found in the French pox, have also a particular analogy with the fatty and viscous phlegm, which, so to speak, putrefying in the skin, gives rise to...* swellings [tubercola] *and scabs*[52].

In this essential passage, Fracastoro provided a quite innovative definition of the concept of *semina contagionis*. Even though these minute particles escape the senses, by analogy with the consistency of infected phlegm, it is impossible that they are not in some way similar, in form and consistency, to the substance which sustains them. The *"food"*, phlegm, was therefore the cause of the propagation and generation of the seeds, as they were attracted to the food-source that, by analogy with their internal composition, favoured their growth and reproduction (*eo pacto pabulo quodam se propagant* 85r]. As he then went on to show in his tract *De sympathia et antipathia rerum* (1546), Fracastoro claimed that the only way to explain why some contagions were the *"cause of only local diseases"*, while others spread *"also at a distance"* was to resort to an explanatory method which differed from those used by traditional physicians[53]. This would be a method which placed the quest for analogies between the effects of natural phenomena and their causes at the centre of scientific reasoning. In the specific case of the "French pox", the analogy or sympathy of the contagious particles with the consistency of phlegm explained the tenacity and violence of the symptoms of the disease.

Fracastoro's proposed cure for syphilis fits into the same framework: *The seeds of the contagion... may not generally be removed if not by means of voiding* [evacuatione] *or annihilation* [extinctione]. *The ways by which they may be voided are then these: through the pores, or with sweat, or with vomit, or through the intestines, or with urine, or by blood-letting...* But, due to the resistance of the seeds of contagion, this method did not offer a sufficient guarantee of recovery. For this reason, Fracastoro preferred annihilation:

the annihilation of such seeds may be generally performed firstly with substances which burn, for these kill definitively, as is normal in the excellent use of fire and so-called caustics. Secondly, with strongly desiccant substances, for they [the seeds of contagion] are humid and are found in a rotting state, so to speak... Another way is with chilling substances, for these seeds are hot and pungent[54].

In order to prevent the regeneration of the seeds and, more importantly, secure their definitive destruction, it was necessary to resort to agents which were in opposition to the nature of these particles. Fire, desiccation, or intense cold were regarded as the most efficacious means.

In addition to the definition of the seeds and research into the ways of dealing with them, in the manuscript tract Fracastoro set out three types of contagion. A disease could in fact spread at a distance, as in the case, for example, of breathing in infected air; through contact with transporters of the contagion, or foments, and lastly, through direct contact, as in the case of syphilis. Fracastoro, as has been noted, again adopted this threefold division in his famous *De contagione*, to which we shall return later.

Having given a brief summary of the contents of the unpublished tract, we can now see whether it is possible to give a reasonable account of the historiographic controversy, which is made up of two directly opposed interpretations. On one side there are many who have seen in the theory of the seeds of contagion the anticipation of the modern theory of live contagion and who do not hesitate in identifying (and translating) the *semina contagionis* with modern germs[55]. This position, prevalent until 1950, was first queried by Charles and Dorothea Singer, who argued that Fracastoro *does not seem to consider that, in setting forth his seminal hypothesis, he is making any especially original contribution*[56]. Vivian Nutton has shown, more recently, how the theories of Fracastoro did not provoke particularly lively reactions amongst his contemporaries, and that his *forceful rhetoric and limpid exposition could not overcome the technological handicaps that any theory of seeds then faced*[57]. Even if philological rigour and historical contextualisation of the scientific theories are the essential instruments of any student who does

not want to indulge in the doubtful and pointless search for precursors, the case of Fracastoro has brought about a radicalisation of opinions which, in my view, has not yet reached a sufficiently balanced synthesis. If we accept that he could not, for obvious reasons, be anyone's precursor, it does not follow from this that the theory of contagion did not have innovative elements[58]. Indeed, it is Fracastoro himself who underlined what, for him, constituted the undeniable break with the past. Right at the start of the tract, in a reference to syphilis, he argued that even though he was dealing with a new and difficult theme, many useful concepts had already been drawn. In any case, when it came to the causes of the disease, he was groping in the dark: *as far as I can see, all [doctors] seem to have been ignorant of the origins of the contagion*[59].

While it was obvious that the origins of the disease were *only given by the seeds of contagion*[60] he was shocked that there were still doctors who referred its cause to the *heating of the humours of the liver*, while in reality *no organ [was] in itself the origin of this disease*.

In a later version of the preface to the tract, Fracastoro insisted again on the fact that, in his words, *all too few writings have been left us by previous doctors on the theme of contagion, and, in my opinion, even those few dealt with it inadequately*[61]. If we take Fracastoro's point of view seriously, his theory of contagion was an absolute novelty in a subject which had already received little treatment in traditional medical literature.

In 1546, the famous tract *De contagione* was finally published by the Giunta publishing house in Venice. It was preceded by the previously mentioned methodological essay on sympathy and antipathy. The tract's general subject allowed Fracastoro to address his theory of seeds more systematically, and in greater depth. In fact, the general definition of contagion depended almost entirely on the theory of seeds.

*If we allow ourselves to sketch a sort of tentative definition of contagion, we shall define as: a certain precisely similar corruption which develops in the substance of a combination, passes from one thing to another, and is originally caused by infection of the imperceptible particles [*particulis insensibilibus*]*[62]

As we have already emphasised, contagion, for Fracastoro, could appear in three distinct ways: by contact, through foment and at a distance. The first two types had already been treated quite extensively in the 1525 tract. Fracastoro dedicated a whole three chapters to the third, which was undoubtedly the most mysterious, in order to show that it was not necessary to resort to occult causes to explain such a surprising phenomenon, but that using his theory of seeds, or *seminaria,* would suffice.

> *Let us first enquire by what sort of movement these seeds of contagions are impelled, since it is clear that they are carried far and to persons far distant, a fact that many people think so astonishing. First we should consider precisely similar instances, that we may be less surprised. Who would imagine that tears could be drawn from us, even from a long distance, by onions and garlic? ... It is because from all these imperceptible bodies whose activities and powers are diverse are exhaled and carried in all directions ... The seeds can be preserved for a certain time, not only in fomes but also in the air, though longer in fomes*[63].

In the case of ophthalmia, for instance, Fracastoro resorted to the Lucretian theory of vision based on the belief that object ejected simulacra capable of impinging upon the eye. He writes:

> *When a person with ophthalmia gives the disease to another, the infection again seems to have a different nature, since visual sensation is not produced by heat or cold, but is due to the so called manifestations of images of objects [*simulacra rerum*]*[64].

After talking at length about action at a distance, Fracastoro interestingly described the way seeds of contagion spread:

> *One method of penetration is by propagation and, so to speak progeny [*sobolem*]*[65]. *For the original seeds which have adhered to the neighbouring humors with which they are analogous, generate and propagate other seeds precisely like themselves, and these in turn propagate others, until the whole mass and bulk of humors is infected by them*[66].

It is clear that this characteristic of the seeds did not allow of any analogy with infected miasma, and Fracastoro established a sharp distinction between the action of seeds, which started

contagious diseases, and miasmic vapours which, even though they produced pathological changes, did not start contagions[67].

Even if the distinction between living and organisms and non-living beings might not have the connotations of the modern separation between the organic and the inorganic, it seems to me obvious that Fracastoro's elaboration of the concept of *semina* displays many original characteristics, in comparison to both the classical tradition, especially of Lucretius, and in the context of his contemporaries. Fracastoro undoubtedly borrowed from Lucretius the ability to give life, using extremely elaborate analogies, to what happened in the invisible substrata of matter. Thanks to this ingenious use of analogy, the effort of visualising the action of morbid particles within the pathological development of contagious diseases allowed Fracastoro to work out an inherent explanation of contagion, without finding himself constrained to resort to the aid of occult causes or the hackneyed Galenic doctrine of humours. Fracastoro has often been reproached by historians for the fact that without the microscope, the theory of seeds represented a hypothesis which lacked any empirical basis, and he was far from prefiguring Pasteur. But in any case, his contribution, when seen less schematically, represents an intuition of great historical importance. The daring, which he shared with Lucretius, of looking at the visible world through the eyes of one wanting to render it material by analogy with the macroscopic world should not be treated too cavalierly. As was the case with atomism in physics, such a doctrine was filled with important consequences for Seventeenth century science. Moreover, in honing Lucretius' message, Fracastoro sought to grant a precise identity, of an eminently medical nature, to the *semina morbi*. Thanks to the progress made in the early Renaissance in the observation of contagious diseases, he was able to claim a richer experience than could be had from a mere reading of the Greek and Latin classics. But the humanist spirit and deference to ancient doctrine did not allow him to abandon the path blazed by the classics. For this reason, while he was aware of the novelty of the subject of contagion, Fracastoro chose as his source of inspiration a poet who, even a few decades earlier, had been almost completely unknown to naturalists, and a doctrine, that of atomism, which at that point had

aroused no interest. In making this typically humanist recovery, Fracastoro could not limit himself to inheriting lexical and doctrinal tradition absolutely passively, but, by adopting the viewpoint of the ancient *prisca sapientia*, he needed to plug the intellectual and linguistic gaps, and fill in the medieval void which had separated the golden age of the classics from the Renaissance world. This is why Lucretius alone was not enough, and his rediscovery, hand in hand with philological study, implied an adaptation of the meanings of the scientific terminology used by the classics to the needs of the growing observational spirit which was spreading amongst naturalists in the Fifteenth century. This translation work implied, as we have seen in the case of the *semina*, a detailed interpretation of the best sense to give to such a concept. From this apparently philological reflection derived a deepening of the role granted to atoms in the explanation of contagious diseases. Therefore, Fracastoro's *seminaria*, however intimately they may be connected to the concept of seeds introduced by Lucretius, constitute an undeniable conceptual innovation. Even without having a microscope to hand, it was possible to conceive of the existence of particles with organic characteristics which were able to transmit contagious diseases. It is interesting to note, from this vantage point, that the acute observations and discoveries made by Antoni van Leeuwenhoek with his simple microscope were entirely without atomistic explanations, even if, at the purely experimental level, they explicitly confirmed Fracastoro's intuitions.

NOTES AND BIBLIOGRAPHY

1. KOYRÉ A., *From the Closed World to the Infinite Universe*. Baltimore, Johns Hopkins UP, 1957, p. 5 and p. 278.
2. A notable exception to this consensus is the work by LENOBLE R., *Histoire de l'idée de nature*. Paris, Albin Michel, 1969.
3. See for instance the collection of essays *Ricerche sull'atomismo del Seicento*. Firenze, La Nuova Italia, 1977.
4. It is worth noting that as early as 1907 the Lucretius scholar John Masson regarded this point as a well established fact: *"It was Gassendi who rescued Epicurus's atomic theory from the forgotten science of the old world and revived it as the truest basis for a scientific study of Nature"*. MASSON J., *Lucretius Epicurean and Poet*. New York, E.P. Dutton & Co., 1907, p. 81.
5. The best survey on this topic is still that by HADZSITS G. DEPUE, *Lucretius and His Influence* (1936). New York, Cooper Square Publisher, 1963.

6. On the spread of Lucretius during Carolingian times see BISCHOFF B., *Die Bibliothek im Dienste der Schule*. In: *La scuola nell'Occidente Latino e nell'alto Medioevo*. Spoleto, Centro Italiano di Studi sull'alto Medioevo, 1972, vol. 1, pp. 385-415, especially pp. 401-402.
7. But it was only in 1434 that the original copy was given back to Poggio and, after his death, it was not recovered.
8. Today conserved in the Biblioteca Laurenziana of Florence (Ms. XXXV.30).
9. GORDON C. A., *A Bibliography of Lucretius*. 2nd ed., London, St Paul's Bibliographies, 1985.
10. REEVE M. D., *The Italian Tradition of Lucretius*. Italia Medioevale e umanistica 1980; 23: 27-48.
11. PANTIN I., *La poésie du ciel en France dans la seconde moitié du seizième siècle*. Genève, Droz, 1995.
12. DE NICHILO M., *I poemi astrologici di Giovanni Pontano: storia del testo; con un saggio di edizione critica del Meteororum liber*. Bari, Dedalo, 1975.
13. It is worth noting that in 1546 Scipione Capece, a Neapolitan jurist, who purchased part of Pontano's library and was inspired by Lucretius, published a scientific poem entitled *De principiis rerum libri duo* (Venice, Aldi Filios). This work was greatly admired by Pietro Bembo, who made the following remark: *"Poema de Principiis Rerum tuum, heoricis carminibus conscriptum, in duos divisum libros, legi sane libentissime: est enim ejusmodi ut magnopere cum Lucretii stylum & elegantiam, tum antiquorum hominum aetatem illam cultam & prepolitam redolat."* (CAPECE S., *Il poema De principiis rerum*. Venezia, 1754, p. 44). Capece was also an admirer of Fracastoro's poetic works. In addition to Capece's work is also worth reporting what Gordon adds in his bibliography when describing the Italian context: *"Lucretius was translated into Italian verse about 1530 by Gianfrancesco Muscettola or Musettola, whose knowledge of Latin is said to have been weak. The work was never printed. Musettola was the host at a supper given to the poets, for which wine was specially brought from Pontano's Neapolitan vineyard, but nothing else is known of him"* (GORDON A. C., *A bibliography*... op. cit. nota 9, p. 193).
14. KRISTELLER P. O., *Supplementum Ficinianum*. Firenze, Leo S. Olschki, 1937, p. 163.
15. *"The scenario of both compositions [Primavera and La nascita di Venere] is largely determined by the phrases found in Politian's Giostra, a poem written in celebration of a famous tournament held by Giuliano de' Medici in 1475, left unfinished when Giuliano was murdered in 1478, and replete with classical reminiscences ranging from the Homeric Hymns to Ovid, Horace, Tibullus, and, above all, Lucretius"*. PANOFSKY E., *Renaissance and Renascences in Western Art*. Stockholm, Almqvist & Wiksell, 1960, pp. 192-193; see also p. 199.
16. A more complex contextualisation is given by LEVI D'ANCONA M., *Botticelli's Primavera. A Botanical Interpretation including Astrology, Alchemy and the Medici*. Firenze, Leo S. Olschki, 1983.
17. *"Raccontasi ancora che Sandro accusò per burla un amico suo di eresia al vicario; e che colui, comparendo, dimandò chi l'aveva accusato e di che. Perché essendogli detto che Sandro era stato, il quale diceva che egli teneva l'opinione degli epicurei, e che l'anima morisse col corpo"*. VASARI G., *Le vite de' più eccellenti pittori, scultori ed architettori*. Florence, G.C. Sansoni, 1981, vol. 3, p. 321.
18. SIRAISI N.G., *Life Sciences and Medicine in the Renaissance World*. In: GRAFTON A. (ed.), *Rome Reborn. The Vatican Library and Renaissance Culture*. New Haven, Yale University Press, 1993, pp. 159-160.
19. Leto's life of Lucretius has been recently published: LETO P., *Lucrezio. A cura di Giuseppe Solaro e con una nota di Luciano Canfora*. Palermo, Sellerio Editrice, 1993.

20. *Iter Italicum*. London, The Warburg Institute, 1965-1992, 7 vols. I have consulted the edition on CD-Rom.
21. DEL GUERRA G., *Uno sconosciuto carme sulla lue di Angelo Poliziano*. Pisa, Umberto Giardini, 1960.
22. *"His keen interest in the more technical writings of antiquity is farther illustrated by a massive edition of the Elder Pliny (Rome, 1473) now at Oxford. ...He studied and copied important medical texts, including the manuscripts of Celsus discovered by Giovanni Lamola in Milan in 1427 (Laur. 73.1)."* REYNOLDS L.D. & WILSON N.G., *Scribes and Scholars. A Guide to the Transmission of Greek & Latin Literature*. 2nd revised and enlarged edition, Oxford, Clarendon Press, 1975, p. 129.
23. JEANSELME E. (ed.), *Histoire de la syphilis. Etiologie - expérimentation*. Paris, G. Doin, 1931; on the manuscript circulation see SUDHOFF K., *Aus der Frühgeschichte der Syphilis. Handshriften- und Inkunabelstudien epidemiologische Untersuchung und kritische Gänge*. Leipzig, J.A. Barth, 1912. For a recent history of the earliest appearance of syphilis see DUTOUR O., PALFI G., BERATO J., BRUN J.P. (eds.), *L'origine de la syphilis avant ou après 1493?* Paris, Editions Errance, 1994.
24. 150 years later Thomas Sprat, secretary of the Royal Society of London, again for scientific reasons, still admired the description of the plague of Athens and imitated Lucretius in his *The Plague of Athens, which happened in the second year of the Peloponnesian War. First described in Greek by Thucydides, then in Latin by Lucretius*. London, 1688.
25. DEL GUERRA G., *Uno sconosciuto carme*, op. cit. nota 21, vv. 120-136.
26. On Fracastoro the bibliography is extremely rich; the most comprehensive biography is still that by BARBARANI E., *Girolamo Fragastoro e le sue opere*. Verona, 1897. To this must be added the useful survey by PERUZZI E., *I manoscritti fracastoriani della Biblioteca Capitolare di Verona*. Physis 1976; 18:342-348. On Fracastoro's contribution of the theory of contagion see below.
27. FRAISSE S., *L'influence de Lucrèce en France au Seizième Siècle*. Paris, Nizet, 1962, p. 40.
28. *"Prohibet legi in scholis puerorum opera lasciva, & poemata Lucretii. Ut nullus de caetero ludi magister audeat in scholis suis exponere adolescentibus poemata, aut quaecumque alia opera lasciva & impia: quale est Lucretii poema, ubi animae mortalitatem totis viribus ostendere nititur; contrafacientes excommunicari & in ducatis decem, carceribus stincharum applicandi, condemnari". Sacrorum Conciliorum. Nova et amplissima Collectio*, vol. 35, Paris, 1902, p. 270. See also, HILGERS J., *Der Index der Verbotene Buecher*. Freiburg im Breisgau, Herdersche Verlagshandlung, 1904, p. 396.
29. See PROSPERI A.,
30. *"Col proibire Orlando [Innamorato e furioso], Orlandino [del Folengo], cento novelle [Decameron] e simili altri libri faremmo piuttosto ridere che altro, perché simili libri non si leggono come cose a cui si abbia a credere, ma come favole e come si leggono anche molti libri dei gentili come Luciano, Lucrezio ed altri simili"*, Lettera di Ghislieri all'Inquisitore di Genova, del 27.6.1557 citata da DE BUJANDA J.M., *Index de Rome, 1557, 1559, 1564*. Genève, Droz, 1990, p. 32.
31. *"Dans l'ensemble le nombre d'éditions complètes ou partielles de Lucien publiées de la date de la premier édition ...jusqu'au mileu du XVIe siècle dépasse très probablement le nombre de 189"*, C.A. Mayer's bibliography of Lucianus, quoted in DE BUJANDA J.M., *Index*, op. cit. nota 29, p. 578.
32. *Index librorum prohibitorum*. Roma, Paolo Manuzio, 1564, p. 54.
33. FRACASTORO G., *Scritti inediti. Con introduzione, commenti e note a cura di Francesco Pellegrini*. Verona, Edizioni Valdonega, 1954, p. 9. A recent contribution regarding Fracastoro's poem, heavily dependent on earlier literature, is a note by Amalia Perfetti: *La Syphilis sive de morbo gallico de Jérome Fracastor: Un exemple de*

la diffusion de Lucrèce en Italie dans la première moitiè du XVIe siècle. Revue d'Histoire des sciences, 2002; 55: 263-271. The title promises more than what is actually argumented in the text.
34. On the other hand the didascalic poems on medical topics and syphilis in particular were numerous. See FINCKENSTEIN R., *Dichter und Aerzte. Ein Beitrag zur Geschichte der Literatur und zur Geschichte der Medicin*. Breslau, Maruscke & Berendt, 1864, (on poems on syphilis pp. 73-84); DUJARDIN B., *Apollon et Venus ou les poèmes consacrés à la syphilis*. Bruxelles, Union Chimique Belge, 1940.
35. *"Ne nostros contemne orsus, medicumque laborem, quicquid sit"* I, 19-20. Unless otherwise stated, here and hereafter I have used the following edition: FRACASTORO G., *Syphilis sive morbus gallicus. Introduction, Text, Translation and Notes by Geoffrey Eatough*. Trowbridge, Francis Cairns, 1984.
36. The plague broke out in Verona in 1510.
37. FRACASTORO G., *Scritti inediti*, op. cit. note 32, pp. 27-28.
38. *G. Fracastori Navagerius, sive de poetica dialogus*, in ID., *Opera Omnia*. Venice, 1555, p. 163.
39. On the fortune of the poem see BAUMGARTEN L. & FULTON J. F., *A Bibliography of the Poem Syphilis sive morbus gallicus by Girolamo Fracastoro of Verona*. New Haven, Yale University Press, 1935.
40. But also *semina genitales, semina ignis, semina aquarum*.
41. Lucretius uses the term *semina* and *semen* to designate sperm and seeds at least 24 times. He was therefore very well aware of the biological meaning of the term both in sexual reproduction and in agriculture.
42. In the first book Lucretius uses the term 35 times with another meaning.
43. *Corpuscola materiai, corpuscula rerum*.
44. Other terms such as *principiis (rerum), materies, ordia prima, genitalia corpora* (or *materiai*) and *figurae* were also used by Lucretius to designate atoms.
45. A comprehensive survey of the appearance of the term *semina* in classical literature is provided by NUTTON V., *The Seeds of Disease: An Explanation of Contagion and Infection of Contagion from the Greeks to the Renaissance*. Medical History 1983; 27: 1-34.
46. SINGER Ch. and SINGER D., *The Scientific Position of Girolamo Fracastoro (1478?-1553) with especial reference to the source, character and influence of his theory of infection*. Annals of Medical History 1917; 1: 1-34.
47. NUTTON V., *The Seeds*, op. cit. note 44, p. 3.
48. *"Fracastor's seeds of disease combine some of the qualities of the semina of Lucretius with the seeds of the species of things in the patristic writings. It is noteworthy that, in setting forth his seminal hypothesis, Fracastor does not seem to consider that he is making any especially original contribution"*. SINGER Ch. and SINGER D., *The Scientific Position*... op. cit. note 45, p. 30.
49. FRACASTORO G., *Syphilis*... op. cit. note 34, p. 43.
50. *Ibid.*, pp. 51-53.
51. In fact, although very rarely used, the term was not exactly a neologism. Fracastoro attributed to it a new meaning. In DU CANGE, *Glossarium Mediae et Infimae Latinitatis*, Niort, L. Favre, 1886, vol. VII, *seminaria* is not recorded. In the *Oxford Latin Dictionary*, Oxford, Clarendon Press, 1968 the following two meanings are given: *"nursery of young trees"* (Cato, *Agr.* 45.1 & Pliny, *Nat. Hist.* 18.230) and *"of or relating to seed"* (Cato, *Agr.* 10.5). In FORCELLINI E., *Totius Latinitatis Lexicon*. Prato, Typographia Aldina, 1871, vol. 5, p. 432 we find two interesting epigraphic testimonies first published by I. Gruter, *Inscriptiones antiquae totius orbis Romani, in corpus absolutissimum redactae, auspiciis Ios. Scaligeri ac M. Velseri*, Heidelberg, 1603, p. 79.

The meaning of *seminaria "est quae semina herbarum vendit"*. It is interesting to note that the term *seminaria* (p. 433) appeared, with a meaning extremely close to the modern one, during the Council of Trent. Fracastoro attended this Council as papal physician. In the report on one of the sessions, also published by Forcellini, we read: *"Ad hanc rationem* Seminaria *dicuntur loca reditibus Ecclesiasticis instructa."*

52. PELLEGRINI F. (ed.), *Trattato inedito in prosa di Gerolamo Fracastoro sulla sifilide*. Verona, La Tipografica Veronese, 1939, p. 83.
53. On this work, which in a few passages criticises the atomistic philosophy, see the essay by PERUZZI E., *Antioccultismo e filosofia naturale nel De Sympathia et antipathia rerum di Gerolamo Fracastoro*. Atti e Memorie dell'Accademie Toscana di scienze e lettere 'La Colombaria' 1980; 31: 42-131. Peruzzi's study, though extremely well documented, aims at demonstrating that Fracastoro's support of classical atomism rests on a positivistic reading of his work. A more balanced position is given in G. Weidmann's commentary to his recent German translation: FRACASTORO G., *De Sympathia et Antipathia liber unus. Inaugural-Dissertation... vorgelegt von Gerhard Emil Weidmann*. Zuerich, Juris Druck, 1979.
54. *H. Fracastorii De contagione et contagiosis morbis et eorum curatione, libri III. Translation and notes by Wilmer Cave Wright*, New York, G.P. Putnam's Sons, 1930, pp. 198-199.
55. Karl Sudhoff, for instance, went so far as to say: *"Sein Werk hat ein volle Revolution bewirkt durch die Klaerung der Eigenschaften der Krankheitskemie in ihrer Taetigkeit und Entfaltung, als habe Fracastoro schon die pathogenen Microorganismen mit dem inneren Auge des Geistes geschaut, auf deren Zerstoerung seine Behandlung und seine Verhuetung det Infektionskrankenheiten ausghet."* (SUDHOFF K., *Girolamo Fracastoro und Bernardino Ramazzini*. Fortschritte der Medizin 1932; 50: 466).
56. SINGER and SINGER, op. cit. note 45, p. 30.
57. NUTTON V., *The Seeds*, op. cit. note 44, p. 34; see also NUTTON V., *The Reception of Fracastoro's Theory of Contagion. The Seeds That Fell Among Thorns*. In: MCVAUGH M. R. & SIRAISI N. (eds.), *Renaissance Medical Learning. Evolution of a Tradition*. Osiris, Second Series, 1990; 6: 196-234.
58. Although dependent on the historiographic quest for precursors, one of Arturo Castiglioni's essays is still worth reading: CASTIGLIONI A., *Gerolamo Fracastoro e la dottrina del contagium vivum*. Gesnerus 1951; 8:52-65. Castiglioni was the first to both emphasise Fracastoro's debt to Lucretius and his original development of Lucretius' concept of semina.
59. *H. Fracastorii De contagione*, op. cit. note 53, p. 150.
60. *Ibid.*, p. 176.
61. *Ibid.*, p. 225.
62. *Ibid.*, p. 5. I have substituted Wright's translations of *seminaria*. While he uses 'germs' I have preferred to use 'seeds'.
63. *Ibid.* pp. 29-31.
64. *Ibid.* p. 19.
65. Interestingly, in order to diminish the importance of the organic meaning of this term, NUTTON V., *The Seeds*... op. cit., note 44, translates *sobolem* with multiplication.
66. *H. Fracastorii De contagione*, op. cit. note 53, p. 35.
67. *Ibid.* p. 89.

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Articoli/*Articles*

FORMAZIONE E CONSERVAZIONE DELLA VITA TRA SPECULAZIONE ED ESPERIMENTO, NEGLI SCRITTI DI FRANCIS BACON

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SUMMARY

FRANCIS BACON ON THE ORIGIN AND PRESERVATION OF LIFE: THEORY AND EXPERIMENTS

The paper analyses Bacon's views of life, as contained in De Sapientia Veterum, Historia vitae et mortis, *and in a newly published manuscript, entitled* De vijs mortis. *Bacon saw the prolongation of life as one of the main goals of science and medicine. According to him, life is the result of the action of spirits on matter. In order to preserve life, it is necessary to investigate various kinds of generation, notably, those which occurr without seeds. The study of putrefaction is also crucial for the prolongation of life.*

Il pensiero di Francis Bacon viene generalmente analizzato e colto negli aspetti teorici che emergono dalla sua opera più conosciuta, il *Novum Organum*. Eppure Bacon ha concentrato gran parte delle sue riflessioni teoriche e dei suoi intenti operativi sull'indagine sui fondamenti della vita, organica ed inorganica, e sull'aspettativa di risultati straordinari ed innovativi in questo campo. Anche in base alla recente pubblicazione di testi baconiani del tutto o in parte sconosciuti fino a pochi anni o mesi fa, si conferma come siano predominanti in Bacon gli interessi concernenti i fondamenti delle scienze della vita, con i loro concreti risvolti 'istorici' e sperimentali relativi alla conservazione ed al prolungamento della vita, quella umana in particolare.

Key words: Bacon - Life prolongation - Generation