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Boscovich: scientist and man of letters

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Abstract. Ruggiero Giuseppe Boscovich (1711-1781) is known as one of the most important scientists of the second half of XVIII century, but he was active also as a man of letters, especially through an abundant production of poems in Latin verse. We try to interpret these two, apparently antinomic, aspects of his character in the framework of the culture of his epoch, in which science and literary productions were not considered as two separate or opposite fields, but only two different aspects of human knowledge. In particular we review the field of his poetic production in which this fundamental unity of knowledge is most evident, namely his poems with didactic-scientific subjects, which are examples of high-level popularization of the latest progresses in science (in particular astronomy and Newtonian physics) by means of elegant Latin verse.

Key words. History and philosophy of astronomy

1. Introduction

The title of this report apparently contains an antinomy. Yet Ruggiero Giuseppe Boscovich (1711-1781) was a scientist, among the greatest of his time, and a *letterato*, according to the meaning this term had in the XVIII and in the first half of XIX centuries. He was also an equally important poet, although underestimated, and a *letterato*, according to the meaning we attach today to this same term. Here I have undertaken the difficult task to solve this antinomy and present a portrait, as faithful as possible, of Ruggiero Boscovich as a scientist and man of letters within the context of his time, when no separation among the various fields of knowledge had yet occurred yet.

Leaving out any critical evaluation regarding the literary style of his poetic works, the purpose of this paper is therefore to try and sketch the contents and the forms in which the different scientific doctrines and, more generally, the fields of knowledge were understood and expressed at that epoch and in a deeply different cultural context. We aim at decomposing Boscovich's multiform activity, highligthing the meaning and the substance of his accomplishments, which have remained in the shade up to now due to a preconceived evaluation of his literary works and of the poetic form in which these works have been issued by their author. Therefore we have not explored as they would deserve all problems related to the birth, the sources and the evolution through decades of Boscovich's thought, except when this was necessary for the comprehension of his literary production; rather we have tried to analyse the historic and literary aspects of his thought as conveyed by his poetic works and his aesthetic models, referring particularly to the context in which he was operating. We have also taken into account the relations he had with other scientists skilled in the didactic exposition of scientific knowledge in poetic form. A more detailed account, with a more comprehensive bibliography and literary sources, can be found in Proverbio (2013).

2. Boscovich as a scientist: the contents of knowledge in the second half of XVIII century

2.1. Consolidated scientific areas: Boscovich's contribution

Nowadays Ruggiero Giuseppe Boscovich is recognized as one of the most important "scientists" of the XVIII century. However this definition is influenced, in a limiting sense, by the image of the "man of science", which belongs to a cultural context — positivism and scientism – started in the XIX century completely different from the one in which Boscovich and the men of his time who attended to the established fields of knowledge or to the new, emerging sciences, were active.

The first-rank advancements brought by Boscovich to established sciences, in particular to astronomy, mathematics, geometry, mechanics, geodesy and physics (the problems of motion and light) were recognized already by his contemporaries and biographers. However Boscovich himself documented the results of the studies accomplished in the first 25 years of his activity at the request of his friend and collaborator Giovan Stefano Conti from Lucca. He supplied a complete list of his works published up to 1761 in the most diverse fields of knowledge, which he divided into four categories: the *"Opere"*, namely the volumes printed by publishers of his time in Rome, Vienna and Padua; the *"Dissertazioni"*, published on the occasion of the debates *habitae*, or *publice propugnatae* at the *Collegium* or at the Roman Seminary; the works published by him in *"Giornali"* [journals], or *"Raccolte"* [collections] of pamphlets, or *"Memorie"*; and finally those specifically classified by him as poetic works, namely his heroic Latin poems, the *Eclogae*, the Epigrams, and his *"opera voluminosa"* [voluminous work] *De Solis ac Lunae Defectibus*, published in London in 1760 and then in Venice, dedicated to the Royal Society of London. Boscovich will follow this method of classification in subsequent lists that he will make at later times. It was only after his death, in 1787, that his biographers began to use a different criterion and subdivide his works according to the scientific subject, following a trend which was gaining importance at that epoch. A similar subdivision was adopted also in the *Catalogo delle opere a stampa di Ruggiero Giuseppe Boscovich suddivise per materia* contained in the *Catalogo delle Opere a stampa di Ruggiero Giuseppe Boscovich (1711-1787)* published in 2007.

2.2. Boscovich and the new disciplinary fields

In addition to consolidated scientific areas which were undergoing a process of progressive organization,new fields of knowledge were starting and establishing themselves around the midst of the XVIII century, with distinct and more and more defined physiognomies: the new optics of achromatic systems, refractometry and spherometry; the new branch of physics devoted to the study of natural and artificial electric and magnetic phenomena; and finally a new, broad area of investigation and knowledge which will develop into the new fields of chemistry and physical chemistry, related to the study of the atomic structure of matter, the theory of combustion and of fundamental elements of matter (atoms, chemical elements and compounds, mixtures and chemical bonds). The interest of Boscovich for those new fields is undisputed; in particular the studies carried out in recent years have highlighted the leading role played by him, both on a theoretical and practical level, in the development of the optics of achromatic systems, a field also studied by Euler, Klingenstierna, Clairaut and D'Alembert. His research and practical achievements in the field of applied optics set him as the founder of modern refractometry ans spherometry.

Among the new disciplinary fields, the research in natural and artificial electric and magnetic phenomena underwent a sudden development around the midst of the XVIII century. There is evidence that, as far back as in 1746, Boscovich was attending the experiments on electric phenomena conducted in Rome by the physicist Johann Winkler, and that he could possibly be the inspirer, if not the author, of the two hundred lines of verse concerning the experiments performed with an electric apparatus which were inserted in the second edition of the *Philosophiae versibus traditae, Libri sex* by Benedetto Stay, published in Rome in 1747. His interest in electric phenomena is confirmed also in his *Theoria Philosophiae Naturalis*, printed in Vienna in 1758, and the *Philosophiae Naturalis Theoria* [*Venetiis*, 1763], in which he sides with the theories about electricity of Benjamin Franklin and Gianbattista Beccaria, of which he supplies an explanation according to his own theory of fundamental forces.

In these works Boscovich attempts to explain chemical phenomena (chemical compounds and mixtures, chemical bonds) in the light of his ideas about the structure of matter and the processes of the elemental particles. At that epoch his ideas about the structure of matter did not find any direct application, and it was only in the XIX century that the fecundity of his conceptions was shown plainly by the works of the great English chemist Michel Faraday. Nevertheless he did apply his universal force law, derived by his conception of matter as composed by identical, homogeneous, indivisible, non-extended elements, to explain diverse chemical and physico-chemical phenomena, for instance the phenomenon of cohesion, independent from density, based on the combination of two or more elemental particles; he established the clear distinction between atoms, chemical elements, compounds and mixtures which lies at the basis of the principles of chemical transformations. According to these foundations he gives an explanation of the mechanism of chemical reactions associated to luminous or caloric phenomena. His ideas about fermentation differ from theories based on phlogiston and are related to his concepts on the energetic transformations occurring during chemical reactions. Boscovich will come back to these ideas and develop them further in his notes to book X of volume III of *Philosophiae recentioris versibus traditae, Libri X* [*Romae*, 1792] by Benedetto Stay.

3. Boscovich as a "letterato": the fields of knowledge in the XVIII century

3.1. Linguistic and cultural framework: unity of the "two cultures"

Recently Gennaro Barbarisi (1988) was pointing out that, up to the first decades of XIX century, Boscovich was extensively referred to in literary histories and bibliographies of Italian authors. He was quoting the writers which dealt with Italian literature, starting from the *Vite* [Lives] by Fabroni; Camillo Ugoni; Comiani, in his book *I secoli della letteratura italiana* [Centuries of Italian literature]; then Stefano Ticozzi, Antonio Lombardi and Emilio de Tipaldo, who was reproducing with few cuts the extensive biography by Ugoni. In these works Boscovich's scientific activity is amply documented.

In those bibliographies and histories of Italian literature the term *letterato* was still used in its etymological meaning, and referred not only to people interested at the poetic and literary activities or at *belles-lettres* in a broad sense, but, more generally, to people provided with the ability of reading and learning and therefore possessing knowledge in any field: from poetry and history (including sacred history) to philosophy, mathematics, medicine and natural history, and the fields related to liberal arts. Therefore those histories of literature were the mirror of the structure of knowledge and of mutual relationships between its different fields. At the same time, they were gathering individual fields of knowledge which were differentiating more and more, loosing the connections still existing among them. Within the framework of positive sciences new fields of knowledge and new specializations were emerging; they were slowly obscuring the idea that all forms of knowledge be anchored to a unique common root, establishing instead the principle of the differentiation, and later of the pre-eminence and hegemony of a "form" of knowledge over the others, and giving rise to separate cultural roles, connected to the images of the "man of science" and the "man of letters". Nevertheless, around the midst of the

XVIII century, the difference between *letterato* and *scienziato* was not yet born, and the idea of a unique "literary world" in which poetic, mathematical and philosophic works were coexisting was widely accepted by all learned men, throughout Italy and Europe. Boscovich himself confirmed this tendency when he wrote from Rome to his brother Natale on 23rd April 1748 (probably with reference to a first draft of his *Philosophiae Naturalis Theoria*, on which at that epoch he was already working): *I think that with the work I have in my hands I will multiply one hundred times the slight esteem I'm enjoying throughout the literary world*.

3.2. Boscovich and the "Repubblica dei letterati"

Several sources indicate that Ruggiero Boscovich, like other scientists during the XVIII century, was recognized as a *letterato* and considered as a member of the *Repubblica dei letterati* [Republic of men of letters]. Boscovich himself, in a letter to Puccinelli on 5th November 1779, was a testimony of the equivalence, then commonly accepted, between "man of letters" and "man of sciences", when he indicated a scientist like Jean Baptiste Brochart de Saron, mathematician and astronomer, as well as president of Paris Parliament, as *gran letterato* [great man of letters] .

In fact, a large fraction of the works on astronomy, physics and mathematics written by Boscovich during his stay at the *Collegio Romano* up to about 1760 were published on journals whose names confirm the different meaning, from an etymological and philological point of view, of the term *letterato* and its derivatives at that epoch. I refer mainly to the *Giornale de' Letterati*, published up to 1744 with the subtitle *Novelle letterarie oltramontane* [Literary news from the other side of the Alps], printed in Rome, but also in Pisa and Florence; from 1747, it published several papers by Ruggiero Boscovich dealing with physics, terrestrial physics, mathematics, gnomonics, besides the results of the observations of lunar and solar eclipses performed by him in Rome, and of the passage of Mercury in front of the Sun in 1753. Ruggiero Boscovich and Christophoro Maire had also given the title *De Litteraria Expeditione* [Literary expedition] to the book describing their efforts for the determination of the length of the degree of meridian in the Papal State, published in 1755. We also know that Boscovich published an extended review of the first edition of Lalande's *Astronomie* on the *Abstract of European Literature for the Year 1766*. A second review of this important treatise on the astronomy of XVIII century was published by him in 1765 in the first volume of *Il Caffè* by Pietro Verri, in which he was presented as *one among the most important men of letters in Europe*. Also Clairaut defined him as *the greatest Mathematician whom Italy can be proud* and put him in the category of *"letterati"* in the letter written to George Parker, Count of Macclesfield, then President of the Royal Society on the occasion of Boscovich's journey to England (May 1760).

3.3. The Arcadia and the poetic production of the men of science

After the death in Rome, in 1689, of Christina of Sweden, who used to gather in her *Chamber Academy* scientists and poets in weekly meetings, some of them decided to continue the gatherings by founding a new Academy. The official establishment of the new Academy took place on 5th October 1690 in Rome, in the garden of *Padri Riformati* in S. Pietro in Montorio, on the initiative of fourteen promoters coming from eight different Italian regions; among them Giovan Mario Crescinbeni (from Marche) and Gian Vincenzo Gravina (from Calabria), who were supporting two different conceptions of the role of the new Academy. Vincenzo Gravina, rigorously classicist, conceived the Arcadia as the place where *the spirit of Greeks an Latin appears, clad with Dantesque solidity and Petrarchan elegance and candour* and defended this point of view in his *Ragion poetica*. For Crescinbeni the new Academy, born from a common feeling of opposition against the baroque degenerations of previous century, had to become an important point for the elaboration of new ideas, open to the contribution of men of letters and scientists throughout Italy. In his *Istoria della volgar poesia* [History of vulgar poetry], printed posthumously in 1730, Crescinbeni gave a *Short notice of ancient and modern condition of the Assembly of the Arcadians, published in year 1712. Summary of the History of the aforesaid Assembly up to year 1718*; he summarized in this way the goals he assigned to the Academy: *"In order to cultivate more the study of sciences and to awaken throughout Italy the good taste in humanistic letters, particularly in vulgar Poetry, which is now quite sleepy, some men of letters established in Rome, on 5th October of the year 1690, a literary Assembly in the form of a democratic Republic, encompassing almost all men of letters in Italy, and some also from the other side of the Alps*.

Under the guidance of Crescinbeni and in the following period, from 1728 to 1743, under Francesco Lorenzini as *Custode generale* [General guardian], the Arcadia appeared to fulfill the goals conceived by its *main author* and its meetings were attended actively by Italian men of letters, historians, philosophers and scientists. According to Isidoro Carini (1891), prefect of Vatican Library, at least up to the second half of the XVIII century the Arcadia *it was not only an academy of poetry, but an eclectic gathering of scholars, expert in any field of knowledge, and joined only for this purpose (...) to give a visible semblance to knowledge and to add to the real advances of historic, moral, physical and mathematical disciplines the pleasantness of style and the ornamentation of words: a goal, as it is clearly evident, of the utmost nobility*. Nevertheless in the following decades, starting from the end of the 1750s, under the guidance of Michel Giuseppe Morei, third *Custode Generale* (1743-1766), the Academy will undergo a slow decline, as witnessed by Saverio Bettinelli, Jesuit and member of the Arcadia with the pen name of Diodoro Delfico, in his *Vergilian letters, written from Elysium to the Arcadia in Rome, about misuses introduced in Italian poetry*, published in 1758.

Up to the midst of the XVIII century, several scientists learned in the poetic language took active part in the meetings of the Arcadia in Rome and in the *Colonie*, providing interesting contributions to the diffusion of scientific knowledge in poetic form. In the meantime several scholars tried their hands at writing poems in imitation of the works written by famous poets and men of letters in the form of *canzoni*, elegies, epistles, eclogues, sonnets and *poemi* [long poems], written for all sorts of occasions (weddings, births, deaths, honorary appointments) and dealing with the most diverse matters. During these first decades of its activity, poems written by scientists on scientific matters were very rare in Arcadia — but the same is true in general for the whole literature in the first half of the XVIII century. Their poetic output was directed towards the representation of various events concerning the domain of affections, friendships, celebrations. As an example, we can find a sonnet having the title *The lightning* among the *Poesie* by Francesco Lorenzini (member and former *Custode generale* of Arcadia with the pen name of Filacida Luciniano); but, when we read it, we realize that it contains only an allegory about the God of Love who makes use of bow and arrows like lightnings against the unlucky lover. Only later the idea that it was possible and indeed useful to express established scientific theories and scientific learning in poetic language was conceived and put into practice. Under the inspiration of classic tradition, a new production of didactic, scientific-philosophic poems was started; its most distinguished and representative examples were carried out by Ruggiero Boscovich, with his didactic poem *De Solis ac Lunae defectibus* and by Benedetto Stay with his "Cartesian poem" *Philosophiae versibus traditae libri VI* [Six books of philosophy expressed in poetic form] and later with his "Newtonian poem" *Philosophiae recentioris libri X* [Ten books about the most recent philosophy], equipped with extended and significant annotations and additions by Boscovich himself.

3.4. The rise of the new didactic poetry before Boscovich

The fourth and last volume of *On the history and reason of any poetry / Four volumes* by

Francesco Saverio Quadrio (1695-1756), man of letters and polygraph author, was published in Milan in 1749. It represented a first attempt to sketch a universal history of poetry, including a concise anthology of poets and their works, and was filled with scholarly material, divided into the Aristotelian categories. However, it contained very little information on the revival, within Arcadia and outside Arcadia, of a didactic poetry which, compared to the didactic poetry of the Renaissance and XVII century, was based on the increasing contribution by scientists, besides renowned poets and men of letters, and made use of new poetic forms (sonnets, ballads, *canzoni*, epistles in blank verse) in addition to the forms of the didactic tradition of preceding centuries. While the content of the didactic poetry of the XVI and XVII centuries was almost exclusively naturalistic, the scope of the new didactic poetry was broadening towards the new discoveries and new fields of knowledge which were establishing themselves in the XVIII century. We must also note that this change in the forms and contents of didactic poetry towards a poetic production of philosophic-scientific subject could establish itself only with difficulty, both at a practical level, due to the persistence of pre-existing traditions, and at a theoretical level, due to the permanence of Aristotelian conceptions on poetry which exerted their authority also on the founders of Arcadia and many of their successors, at least up to the first half of XVIII century.

A confirmation of these difficulties can be found in the fact that no mention of the didactic poetry is contained in the remarks on poetic art published in 1768 by the scientist Francesco Maria Zanotti in his *Five argumentations on poetic art*, and that in his *Disquisition on Italian poetry*, published in 1780, Saverio Bettinelli, man of letters, seems to unearth the argumentations upheld by Vincenzo Gravina in the initial period of Arcadia, against the danger of introducing new poetic models and a prosaic style into poetry. However, unlike Gravina, in his *Discorso* Bettinelli does not have as benchmark Greek and Latin tradition, but the classics of Renaissance like Ariosto and Tasso, and opposes these models to the emergence of the new didactic and philosophic-scientific poetry. It seems that Bettinelli himself, who in 1744 had written *Gionata*, a tragedy in the tradition of Jesuitic theatre highly regarded by Ruggiero Boscovich and Benedetto Stay, was disturbed by the new tendency of poetic literature to deal with scientific matters; it seems that in his heroicomic poem *The world of the Moon*, published in Venice in 1754, he wished to dissociate himself from those trends which tried to reconcile the demands of the poetic form with scientific reason. The subject of the poem, the hypothetical existence of inhabitants of the Moon, had been the object of scrutiny and conjectures by Copernicus, Galileo, Kepler and Newton, based on their knowledge at their respective times. In Bettinelli's work, the same topic is transformed into a poetic fable, fittingly falling within the Aristotelian category of epic-comic poetry, surely not within the didactic-scientific literature; probably this choice, on the part of a Jesuit like Bettinelli, was also dictated by the intent of mocking the hypothesis of the existence of inhabitants on the Moon, which the Catholic Church could not accept *a priori*.

These examples highlight a delay in the theoretical elaboration of the forms and contents of poetic production by some of the representatives of the Arcadian culture even after the midst of XVIII century; on the other hand we witness, after the first decades of the Arcadian experience — and in particular right among its members, and with an important contribution by scientists — a new flourishing of a significant series of poetic works having didactic or philosophic-scientific content, and an attempt to systematize these works within a conception of poetic production going beyond the Aristotelian dichotomy between poetic and scientific works. We also note that a significant fraction of these authors belonged to the Society of Jesus.

3.5. Jesuit and non-Jesuit members of Arcadia of second generation: the development of scientific-didactic poetry

Among the Jesuits, members of Arcadia of the second generation, we have already quoted Girolamo Lagomarsini (1698-1773) as the author of the poem *De origine fontium*, read in front of the *Collegio Romano* in 1726 and published in 1749 together with the *Botanica* by Savastano (see above); he is also the author of a singular elegy in couplets: *Aleae Januensis Romam traductae ratio*, probably written in 1732-1733 to celebrate the introduction in Rome of the lottery game, occurred in 1731 under Pope Clement XII. Among the Arcadians who were participating to the discussion on the origin of water springs and sources, Ubertino Landi (1687-1770) from Piacenza, member of the *Colonia Romana* of Arcadia since 1711 with the name of Atelmo Lucasiano, played a prominent role in the activity of the *Colonia Trebbiense* of Arcadia, founded in 1715; in 1734 he published an eclogue on the *Sistema Vallisneriano dell'Origine delle Fontane* [Vallisnerian theory on the origin of sources], in which, like Lagomarsini, he upholds the hypothesis of Vallisneri on the origin of rivers *Only from rains and snows*.

Often — and particularly within Arcadia — the subject of didactic poetry was suggested by issues connected with the economic and productive environment, which were capable of exciting the poetic inspiration of poets and men of letters. As an example of this fact we may quote the works by two poets, both members of Arcadia, one from Verona and the other from Ferrara, who, similarly to their Renaissance forerunner Luigi Alamanni, showed a particular attention towards the problems of agriculture and farming of their native land. Giambattista Spolverini (1695-1762), member of the *Colonia veronese* of Arcadia (established in 1705) with the name of Libilio Telpusiense, is famous for his didactic poem in blank verse *Rice culture*, published in 1758, on which he worked for more than a decade. It describes the life in paddy fields and the activities related to the cultivation of rice. Girolamo Baruffaldi (1675-1755), member of the *Colonia Ferrarese* of Arcadia (established in 1699) with the name of Cluento Nettunio, published in 1741 the didactic poem *Il Canapajo* [The hemp craftsman] in eight books; it was written for the town of Cento which had welcomed him as a citizen, and which had as its strong point the cultivation of hemp.

In Rome several members of the *Collegio Romano* combined their contributions to research and teaching in the mathematical and physical field with the production of poetic works of scientific and didactic nature. Among them, Girolamo Lagomarsini, who taught Greek language at the *Collegio Romano* from 1751 until the suppression of the Society of Jesus in 1773. The most authoritative of these writers was the mathematician Orazio Borgondio (1679-1741), member of the Roman Arcadia since 1721 with the name of Achemenide Megalopolitano. Provided with a deep knowledge and love for Latin language and poetry, Borgondio wrote — during his autumn holidays, if we believe the account of Giulio Cesare Cordara — a series of short poems in Latin hexameters, dealing with all diverse aspects of mechanical motion; their source, it seems, was *De moto animalium* by Giovanni Alfonso Borelli (1608-1689). In his biography of Borgondio, Giulio Cesare Cordara reports: *Six of these poems, namely* de Volatu, de Natatu, de Incessu, de Motu sanguinis, de Respiratione, de Fluminibus*, are printed in volumes I and II of Latin poems of Arcadia, and another one, namely* de Lue bovina*, appears in volume III of Vallisnieri's works*. In his work *Gli scrittori d'Italia* [Italian writers], volume II, part III (1762), Giammaria Mazzucchelli reports that in the Archives of Arcadia are preserved, together with the manuscripts of *de Respiratione* and *de Fluminibus*, two fine Italian Eclogues by Borgondio, *'one dealing with light, and the other with aurora borealis*; the same information is given also by De Backer (1853) and Sommervogel (1890), who both refer to Mazzucchelli; De Backer and Sommervogel credit Borgondio also with a *Canzone sopra i sistemi della Terra* [*Canzone* on the systems of the Earth], adding that it was read by the author at the Academy of Arcadia. A subject which up to now has not been investigated with due attention is the legacy of Orazio Borgondio to Carlo Noceti and Ruggiero Boscovich, and the relationships among them, concerning two important topics as the light and the aurora borealis, since these topics were object of great interest by both Noceti and Boscovich. On the other hand a testimony to the relationship and friendly tie of Boscovich with Borgondio can be found in the lengthy passage dedicated by Boscovich to his master contained in the Eclogue read by him in Arcadia in 1753 on the occasion of the Olympic Games.

In addition to Orazio Borgondio, Carlo Noceti (1694-1759), member of Roman Arcadia with the name of Niceta Falanzio, was one of the Jesuits of the *Collegio Romano* showing a penchant for didactic poetry; in 1729 he published in Venice the didactic poem *De iride* [On the rainbow], declaimed during an Academic celebration at the *Collegio Romano*, then reprinted the following year, again in Venice, in the *Novelle della repubblica delle Lettere* [News from the republic of Letters]. We do not know how this didactic poem was received outside the *Collegio Romano*; in the work, after rejecting the hypotheses of Pliny, Seneca and other ancient authors on the origin of rainbow, Carlo Noceti supplies an explanation of the phenomenon using the laws of refraction and the Newtonian theory of the dispersion of light into seven colours, on the basis of the famous experiment with the prism. We know also from a letter by Ruggiero Boscovich that in 1746 Carlo Noceti read in Arcadia — in the course of five sessions, about 300 lines at a time — a Latin poem on the Aurora Boreali and that, during the same sessions, Boscovich was commenting on the Latin text with five dialogues in Italian, explaining and delving into the covered matter; the dialogues were printed in 1748 in the *Giornale de' Letterati* [Journal of men of letters] in Rome. Noceti's poem on the Aurora Borealis, on the other hand, was published in 1747, apparently on suggestion of Boscovich, together with a new edition of *De iride*; both poems were supplied with extensive and thorough annotations by Boscovich himself, prepared by him during the first months of 1747. Without doubt ,the source of Carlo Noceti's *De iride* of 1729 was the Newtonian theory of the light, set forth by Newton in his *Opticks* of 1704. More difficult is the search for the sources of Noceti's *Aurora Borealis*, which can be identified in the *Traité Physique et Historique de l'Aurore Boreale* by de Mairan (1731 and 1733), in the *De Aurora Boreali Dissertatio* by Boscovich (1738), and moreover — but we don't know to what extent — in the suggestions we think Boscovich could have given to him during the composition of the Latin poem. Concerning the annotations added by Boscovich to *De Iride et Aurora Boreali Carmina*, noteworthy are his knowledge of Newtonian optics and his contribution to the solution of formulae on double and multiple refraction, only outlined by Newton; as for the aurora borealis, Boscovich proves he is very well aware of all the previous astronomical literature on the phenomenon, although his main source is the work by de Mairan, to whom he pays several times a tribute of gratitude. As a matter of fact, *De Iride et Aurora Boreali Carmina* of 1747 had remarkable success, winning the approval of de Mairan, of Abbé Nollet and of other physicists and men of letters of the time, and was reviewed favourably in Italy and abroad. We have also to point out that *De Iride et Aurora Boreali* were reprinted without Boscovich's annotations within the series of *Poemata Didascalica* [Didactic poems] of 1749, and that in 1755 the two poems were published, again without notes, in a translation in Tuscan verse by Antonio Ambrogi, Jesuit of the *Collegio Romano*, pupil of Carlo Noceti. The Jesuit father Giuseppe Maria Mazzolari (1712-1786), from the same *Collegio Romano*, edited the publication in 1751 of three almost unknown Eclogues by Carlo Noceti, together with some Eclogues of French Jesuit René Papin, author of didactic poems.

As far as we know Boscovich attended Carlo Noceti's class of physics in the years 1730-1731, second school year of the triennial course of Philosophy prescribed by the *Ratio Studiorum* of the Society of Jesus. It seems that in that class Noceti discussed, together with *De Coelo* and the *Meteorology* by Aristotle, also physical theories on the rainbow and in particular the theory and the optical experiments by Newton, making reference to his own *De Iride*, published in 1729. In 1748, the year in which the *Dialoghi Pastorali* [Pastoral dialogues] were published, Boscovich had been holding the chair of Mathematics at the *Collegio Romano* for eight years, and therefore was a colleague of his former teacher, to whom he was paying respect and recognition for his scientific merits. Only at the end of the 1750s, at the epoch of the death of Carlo Noceti and of the journey of Boscovich to Paris and London which represents a break-up of his relationships with the *Collegio Romano*, his assessment of the teachings imparted by his master in the fields of mathematics and physics appears to be quite unfavourable — as it is evident from the letter written by Boscovich to his brother Bartolomeo on 25th December 1759 from Paris after the death of Noceti — although Boscovich was still exhibiting towards him an unaltered esteem on a personal and human level.

4. Ruggiero Giuseppe Boscovich as a member of Arcadia: his poetic production

4.1. The Arcadia and the first poetic and literary works by Boscovich

On 15th August 1744 Boscovich, having completed his theological studies, was ordained priest and became a fully fledged member of the Society of Jesus. He had therefore the opportunity of devoting himself full-time to his favourite studies of mathematics — he had been holding the chair of Mathematics at the *Collegio Romano* for four years, as the successor of Orazio Borgondio — and physics. He could also give free rein to the production of didactic poems, a field in which he had already given significant proofs, which cleared his way for being accepted as a member of the prestigious Academy of Arcadia. By the way, the date of affiliation of Ruggiero Boscovich to Roman Arcadia has undergone some misunderstanding. As a matter of fact his application for admission as a *Pastore Arcade* [Arcadian shepherd] — made at an unknown epoch — was accepted at the beginning of year II of Olympiad DCXXIX, namely around the beginning of spring of 1738, by the *Custode Generale*Francesco Lorenzini, in Arcadia Filacida Lucidiano, who appointed him *Arcade soprannumero* [supernumerary Arcadian] with the name of Numenio [Anigreo]. Boscovich's application to the Roman Arcadia was presented by two *Pastori Arcadi*: the first one was Tirro Creopolita, namely Giuseppe Enrico Carpani (1683-1762), Jesuit, who at that epoch was *Prefetto degli studi* [master responsible for discipline] at the *Collegio Romano*; we do not know the name of the second one, but it seems he cannot be identified either with Orazio Borgondio (Achemenide Megalopolita), or with Carlo Noceti (Niceta Falantio). We have reason to think that the appointment of Boscovich in 1738 as a member of Roman Arcadia — at that epoch under the rule of Francesco Lorenzini, a close friend of Carpani — was due to his former poetic production.

It is not easy to envision the intellectual route which urged Boscovich, during his stay in Fermo in 1733-1734 — after three years of philosophical studies at the *Collegio Romano* under the direction of Orazio Borgondio and later of Carlo Noceti, during which his great skills in mathematical studies came to light — to use his natural inclination towards poetic expression and to write, in the form of elegies or epigrams, five poems, which reached us under the name of *Carmina* and that, as far as we know, were never published. It seems that Boscovich wrote part of these works in the summer of 1734, during his stay in Fermo as a teacher of grammar and humanities; probably he completed these poems after his return to Rome, starting from the end of November 1734, and read them in 1735 to the pupils of the course of humanities he was holding at Roman Seminary from 1735 to 1737. The content of these poems was related in different forms to a problem which, had been troubling the Christian world for a long time and particularly the Catholic Church: the looming danger coming from the expansionist policy of Ottoman Empire towards Europe and Italian States. This had been at the origin of the recent Ottoman-Venetian War of 1714-1717 and of the Austro-Turkish War of 1716-1718, and was going to produce the Russian-Turkish War, whose first stirrings were becoming apparent just at the beginning of 1735. In these two poems, relating to the prediction of the untimely death of Emperor Ferdinand IV (1633-1654) by the Bohemian Jesuit Stredonius, which later proved true, Boscovich expresses the hope and the prophecy of the imminent fall of the Turkish Empire; in an epigram he connects the fall with the occurrence of a lunar eclipse, while in other two elegies he sings the praises of Christian princes against the Turkish yoke, and in particular of Prince Eugene of Savoy (1663-1736), then engaged in the War of the Polish Succession.

These first, short poetic works by Boscovich, then 25 years old, show that his poetic inspiration focuses on commenting, extolling, or trying to pass a dispassionate judgement on facts and historic events touching in some way the life of single persons or of whole communities. Therefore they represent a useful document for understanding the moods, the historical events and the cultural contents of the society of that epoch. In the specific case of these poems, Boscovich himself lets us know, in the preface to the manuscript of the *Carmina*, that his interest for the complex politic-diplomatic situation of those years convinced him of the opportunity of commenting, in a poetic form, on the circumstances and the hopes for a better world, prophesying the defeat of the Turkish Empire, although he gives no hint about the intended addressees of these works. Boscovich also declares that his reference point and poetic model in writing his *Carmina* had been Virgil's Aeneid, whose first books were the subject of the lectures of humanities he was giving to his young students. I think that, if we add to these characteristics of Boscovich's poetic output his poems devoted to the communication and circulation of scientific knowledge, in particular physics and astronomy, we can sketch a picture shedding light on the role and the characteristics assigned by Boscovich and many of his contemporaries in the XVIII century to the poetic form in the transmission of knowledge, and pointing out the delicate equilibrium between the different forms of communication, which were undergoing a process of rapid modification.

Boscovich's poetic work, with an historical, social and political character, should be considered as the result of his innate interest in the events influencing the world and the society of his epoch; in this respect we can understand also his persistent attention to the events involving his native Dubrovnik, industrious independent republic which, together with the entire Dalmatia, was affected by the ups and downs of the Republic of Venice and the Ottoman Empire to which it was, although indirectly, politically subject. It is likely that his natural attitude and skill towards all forms of communication and high-level popularization of knowledge are among the motivations which prompted him to tackle physics, but mainly with astronomy and astronomical phenomena in his poems with a didactic-scientific character, a trend which was establishing itself in the XVIII century together with the development of science and new fields of knowledge.

It is likely that these *Carmina*, and the didactic-scientific poem read at the *Collegio Romano* in 1735 paved the way for the admission of Boscovich in 1738 to the prestigious Academy of Arcadia. His first scientific work, presumably under the guidance of Orazio Borgondio, related to his observations of sunspots, appeared in 1736. Later his interest and skill for mathematical research prompted him to take a leading role in the debates held in the Roman Seminary and to participate to the drafting of the essays which were the subjects of such debates. In the following four years, from 1737 to 1740, he published seven additional essays in the fields of astronomy, mechanics and geodesy; they highlighted his exceptional talent and insight in these disciplines and made him known and appreciated by the European scientific community and especially in France, clearing his way for the prestigious appointment, in the summer of 1748, as a Correspondent Member of the Paris Academy;

they also were a first step for his subsequent recognition as one of the major scientists of the XVIII century.

4.2. Boscovich's civic, epigrammatic and epic poetry

It is difficult for us to establish how and when Boscovich's poetic creativity, after his first attempts at elegiac and didactic-scientific poetry of 1735, and after his appointment as a member of Roman Arcadia in 1738, came to light in the Roman Seminary, in the *Collegio Romano* and within Arcadia through the production of other poems and essays in verse which, at least up to the second half of the 1740s, appear not to have been published. We assume that the *"breve poemetto"* [short poem] written for Christmas, about which Boscovich writes in a letter to his brother Natale in February 1739, can be identified with *In Ortu Christi Domine carmen* [Poem for the birth of Christ the Lord], preserved among other Boscovich's manuscripts at Berkeley Bancroft Library. After then, and up to the completion of his theological studies in 1744, we have no further notice of any poetic activity by Boscovich.

In 1744 Boscovich wrote an *Epigramma pro recuperata valetudine Joannis V* [Epigram for the recovery of the health of John V] when John V of Braganza, king of Portugal, was struck down by paralysis; the epigram was published in 1756 in the *Rime degli Arcadi* [Rhymes of Arcadians]. This poem was followed, after the reading in Arcadia of his *Dialoghi sopra l'Aurora Boreale* [Dialogues on the aurora borealis] in 1746 and their publication in 1748, by a series of poetic works, some of which were published, others remained unpublished; they confirm that in Boscovich were not acting two distinct personalities, but that he possessed a unified understanding of knowledge which combined together scientific creativity and poetic inspiration. It seems also that Boscovich, already at that epoch, was not only aware of his own poetic skill, but was also laying claim of his capability of using the poetic inspiration as an auxiliary form of expression, complementary to his scientific production. In other words we can say that Boscovich was persuaded that the poetic form had to be preferred for conveying scientific contents in a popularized fashion (didactic poetry), and at the same time he favoured the poetic form for expressing contents different from scientific matters (civic, epigrammatic, epic, heroic and lyric poetry). During a first period, ranging more or less from 1747 to 1750, Boscovich has to be credited, as far as we know, with at least four poetic works having civic-heroic or epic-epigrammatic character. On the occasion of the solemn election in Arcadia, on 1st August 1748, of Charles III de Bourbon, then king of Naples and Sicily, with the name of Eraclidus Samius, and of his consort Maria Amalia of Saxony with the name of Olimpia Egeria, Boscovich recited a Latin poem, which he had written in the space of one morning and which was published in 1749 in the eleventh volume of the *Rime degli Arcadi*. If we believe Elisabeth Hill (1961), "in 1747 Boscovich composed an eclogue to celebrate the elevation of J. F. Albani to the office of Cardinal", but no trace of this eclogue can be found in the bibliographic catalogue of Boscovich's works compiled by Hill herself, nor in other bibliographies of published works. Some verses added to the first canto of *De solis ac Lunae defectibus* [On solar and lunar eclipses], dated at about 1757, are dedicated to the cardinals Landi and Giovan Francesco Albani but, apart from the dating, they do not seem to have relationship with the eclogue indicated by Hill. On the contrary, we know of other two short poems of that period which had been published; Boscovich himself, in his letter of 23rd May 1761 in which he was listing to Stefano Conti all his works printed up to 1760, was announcing the fact with the words: *On the occasion of the opening of the new building of the University of Vienna, in a large anthology printed there, is contained a short Latin poem of mine* (the date is uncertain, but probably between 1751 and 1754). Further on, in the same letter, he added: *A Cantatina in Italian verse on the Visitation was also printed in Viterbo, in the year 1750, which I had to prepare in the course of few hours by changing the words to six profane ariettas in such a way as to keep the music unchanged, and write the recita-*

tives so that they were linked to the ariettas, and could be inserted between them, adding a choir, and having everything distributed and sung. By now it would be possible to find out only few copies of the printed edition.

These poetic works were followed by others, much more interesting and meaningful, which can be considered as representative, in form and content, of Boscovich's poetic production in the field of heroic, lyric, epic and epigrammatic poetry and which are still waiting — together with his didactic-scientific poetic production, which will be discussed later — for an in-depth study in the framework of the activities carried out by Boscovich in parallel with his scientific research. It is interesting to point out that this production can be traced along the whole course of Boscovich's life, with the exception of two long periods in which he was diverted from it, first by his long journeys to France, England, Constantinople and Vienna and by the beginnings of his academic activity in Pavia, then in the early 1770s, with his move and stay in France; this confirms that this production represented a significant component of his activity, in parallel rather than in competition with his scientific activity. Boscovich considered didactic poetry as the most suitable mean for spreading high-level physical and astronomical knowledge to a wide audience; in his literary poetic works, geared to celebrate, solemnize, gratify or compassionate, he addresses different themes entrusting the poetic inspiration with the task of reaching the same audience for communicating facts and events worth remembering, often resorting to mythological suggestions and astronomical reminiscences.

In 1753 Boscovich published two poetic works. The first one is an eclogue presented at the convention of the Academy of Arcadia during the Olympic Games of 1753 (Olympiad DCXXXIII), celebrated in Rome in honour of deceased Arcadians, in which Michele Giuseppe Morei, then *Custode generale* of the Academy, proposed to commemorate the most renowned Arcadians of the past by creating images and portraits (*effigies formandas*). In the eclogue, Tytirus describes the new apparatus for the celebration of the Games, not used for 27 years, to Lycidas; a long list of illustrious, deceased Arcadians follows, starting from the four Pontiffs Clement XI, Innocent XIII, Clement XII and Benedict XIII, three Cardinals (Giuseppe Maria Tommasi, Giambattista Tolomei, Francesco Maria Corsini) and other famous men of letters. In the same eclogue Boscovich draws a sorrowful and reverential portrait of his master Orazio Borgondio. The eclogue created quite a sensation and concurred to introduce the name and the poetic activity of Boscovich to the contemporary cultural and literary world, well beyond the circle of Roman Arcadia, as shown by the comprehensive review in *Literary history of Italy* by Francesco Antonio Zaccaria in 1755. In the same year, Boscovich read another short poem *versibus eroicis* [in heroic verse] in Arcadia when the portrait of Stanisław Leszczyński, King of Poland and member of Arcadia with the name of Eutimio Alfireo, was presented to the assembly of the Academy. Leszczyński was living in Nancy, capital of Lorraine, which had been assigned to him by the Peace of Vienna of 1735. In the poem, which was translated and published in French in 1754 by a "Chevalier de Cogolin" — presumably Joseph de Cuers de Cogolin (1702-1760) — Boscovich, after an introductory apology of King Stanisław, gives an account in verse of the troubled life of this ill-fated prince. This poem was also well received, particularly in the French court where, during the visit of Boscovich in Paris in April 1760, was presented to the Dauphin.

After the auspicious poem on the new University of Vienna decreed by Maria Theresa (1751-54), he wrote a second poem in 1756 to celebrate the actual opening of the University on 5th April 1756; the poem was published in Vienna in the same year. It is interesting to emphasize that Boscovich wrote these two *carmina* for extolling the merits and the long-sightedness of the Empress who promoted the establishment of institutions aiming at the regeneration of education and scientific research, in the framework of the reform of teaching and of scientific faculties initiated by Maria Theresa and the government of Vienna with the purpose of removing teaching and research from the control of the Church and academic cliques, particularly for courses which were taught in Jesuit faculties like philosophy and theology, but also law and medicine; it is not accidental that the new University was built just next to the historic location of the Jesuit church and college. If Boscovich, as it is reasonable to think, was then fully aware of these projects, which involved the realization of new, big buildings for teaching and research, we must suppose that his poems in praise of Maria Theresa were also, if not mainly, motivated by the desire of gaining an increased favour with the Empress with regard to decisions which were touching the interests of the Church of Rome and the Society of Jesus.

Boscovich travelled between Rome and Lucca from the second half of 1756 to the early spring of 1757, as a consequence of his involvement in the negotiations for the controversy between that Republic and Grand Duchy of Tuscany about the "problem of waters". He was also summoned to Vienna to defend the interests of the Republic of Lucca where he stayed from the beginning of April 1757 to the end of March 1758. In late autumn of 1756 Benedict XIV was struck — it seems owing to a violent flue — by a severe form of urine retention which weakened him and led to his death on 3rd May 1758. In a letter of 18th January 1757 Boscovich informed his brother Natale of the unsteady conditions of the Pope, and told him he had written *a poem of more than 300 lines* on the recovery of the Pope; yet he confessed that the persistently awkward relationships between France and the Holy See were for him cause of embarrassment, since in the poem he had sung the triumph of Benedict XIV *over the issue with France*, probably with reference to the condemnation of Jansenism reiterated in the Papal encyclical *Ex Omnibus Christiani* of 16th October 1756. Anyway, the poem *Pro Benedicto XIV*, extolling the life and conduct of the great Pope, was printed in January 1757; Boscovich delivered personally a copy of the poem to Benedict XIV.

When Boscovich arrived in Vienna, at the invitation of Joseph II to settle the long-standing *problem of the waters*, the Seven Years' War — between Prussia and its allies and Austria, France and Russia with their allies — was in full progress. Already in the first letters to his brother Bartolomeo, Boscovich supplied him with detailed and documented news about the progress of the war in its different military sectors, manifesting his warm involvement for the victories, and his sorrow for the defeats of Imperial troops. Already since June 1757, soon after the defeat of Frederick II by the Field-Marshal von Daun, who forced him to raise the siege of Prague and quit Bohemia, Boscovich thought or had already started to write a heroic poem on the war of Maria Theresa, which he named *Pietas austriaca triunfans* [The triumph of Austrian piety]. At the beginning of September he sent his brother Bartolomeo part of the first book consisting of 934 lines, stressing the fact that he had composed it *'mostly going around alone on a coach for my own business, as I did when writing my books on eclipses, going around for the Papal States*, where the hint is at his poem *De solis ac Lunae defectibus*. This first part of the poem got an immediate warm reception and, as it seems, was also read by Metastasio, the official imperial poet in Vienna. The poem was then sent to other celebrities, including Monsignor Cristoforo Mighazzi, archbishop of Vienna, who introduced it to Maria Theresa. In December 1757 Boscovich had started to write the second part of the poem, but was discouraged by the unfavourable progress of military events, since on 5th December 1757 Charles Alexander of Lorraine was defeated in the battle of Leuthen and Frederick II regained Silesia; Boscovich only wrote 144 lines of the second book, and the poem was published in its incomplete form in 1757 in Vienna.

After his return to Rome in the summer of 1758, Boscovich had to face the drafting — we don't know whether on commission or not — of a poem for the wedding of Giovanni Francesco Correr with Adriana Pesaro. Giovanni Francesco Correr was the son of Pietro Correr, ambassador of the Serenissima Republic of Venice in Rome, whom Boscovich had met in Vienna; in a letter to Stefano Conti in January 1761, before their journey to Constantinople, Boscovich called him '*ambassador Correr, my good mas-*

ter and friend. The wedding was celebrated on 17th July 1758 and the poem was written in one go by Boscovich within few days and published around the end of July 1758, with the title *In Nuptiis Joannis Corrari et Adrianae Pisauriae e nobilissimis Venetae Rep. Senatoriis Familiis, Carmen* [Poem for the wedding of Giovanni Correr and Adriana Pesaro from the most noble family of a senator of the Republic of Venice].

In the second half of 1759 Boscovich began his long journeys to France, England, Constantinople and then Austria; later he was in Italy, in Pavia, where in April 1764 began teaching mathematics; these engagements took him away from an orderly application of his poetic skill. Only in 1767 he offered himself for translating in Latin verse a sonnet written by Count Tommaso Medini on the occasion of the recovery of Maria Theresa, struck by smallpox. By the way, Boscovich himself — together with other more famous poets as Metastasio — wrote and published few Latin couplets on the same subject, addressing them to Count Firmian.

During his stay in France, starting from 1773, he tried his hand at poetry in Latin verse mainly by writing short poems of lyrical, elegiac and epigrammatic character, which have reached us only partially in his manuscripts or through his correspondence. In 1779, when he was busy with the translation of his poem *De solis ac Lunae defectibus* into French, presumably in Paris, Boscovich wrote and — according to what he reports in his letters — published two Latin poems: *In nuptiis Principis de Ligne cum filia Principis Masalski ad Sponsae Patruum vilinense Episcopum* [For the wedding of Prince de Ligne with the daughter of Prince Massalski, to the Bishop of Vilnius, uncle of the bride] and *Quinquagesimo exeunte anno pontificatus E. Cardinalis Luyni primum baiocensis episcopi tum Senovensis Archiepiscopi ac Galliae et Germaniae primatis* [For the fiftieth year of pontificate of Cardinal de Luynes, previously Bishop of Bayeux and then Archbishop of Sens and Primate of France and Germany]. Very likely the poem for the wedding of Prince Charles Antoine Joseph de Ligne (1759-1792), son of the Prince Charles Joseph de Ligne (1735-1814), Imperial Field-Marshal, with Helena Apollonia (1763-1815), Princess of the illustrious Russo-Lithuanian family Massalski, celebrated in Paris on 29th July 1779, was written in a very short timespan, as it was usual for Boscovich. We cannot dismiss the possibility that he was writing the poem during the period, preceding or immediately following the wedding, in which Ignazio Massalski — Jesuit and bishop of Vilnius in Lithuania, uncle of Princess Helena, whom Boscovich had met in Warsaw in 1762, and who had come to Paris expressly for celebrating the wedding of his niece — was a guest in Boscovich's house. The topic and the aim of the poem was extolling the history of the two great families, Massalski and de Ligne, ending with the narration of the events which led Ignazio Massalski to celebrate the wedding of his niece.

In September of the same year 1779 Boscovich wrote and published a Latin poem for the episcopal golden jubilee of Cardinal Paul d'Albert de Luynes. Indeed in that month de Luynes celebrated in Sens the 50th anniversary of his first appointment in 1729 as Bishop of Bayeux, and on that occasion we have to presume that Boscovich read his poem. However the relations between the two should have dated back several years, at least to the epoch of the election of Clement XIII in the Conclave of July 1758; in the following month, during a meeting of the Academy of Arcadia, Boscovich read some lines in verse, addressed just to Cardinal de Luynes, acclaimed member of Arcadia with the name of Ermodoro Liconeo. The common interest in astronomy should have favoured meetings among the two, as on the occasion of the observation of sunspots performed in the personal observatory of the Cardinal in Noslon near Sens in 1777. The friendly relations between Boscovich and Cardinal de Luynes are highlighted by two unpublished Latin poems, preserved in the Boscovich collection of the Bancroft Library of Berkeley, which would deserve an in-depth study.

A further confirmation of the way in which Boscovich was alternating the involvement in poetry with the scientific production is represented by his last four elegiac poem which he published in 1782-1785, in the same period in which he was preparing the publication of the most important of his scientific works, the five volumes of the *Opera pertinentia ad Opticam et Astronomiam* [Works pertaining to optics and astronomy], whose last volume appeared in Bassano in 1785.

On 24th October 1781 Boscovich, guest in the mansion of the ex-Minister of the Navy de Boynes, was informed that Queen Marie Antoinette had given birth on 22th to the Dauphin Louis Joseph of Bourbon. On the same day he wrote in her honour an elegy in 35 couplets and delivered it to Charles Gravier, comte de Vergennes, who just in the same year had been appointed Foreign Minister, and was a great patron of Boscovich. On 5th November Boscovich was in Sens, at Cardinal de Luynes'; here, celebrating again the happy event, completed the poem by adding other eleven couplets. The elegy, with the title *In recenti ortu regii Galliae Delphini* [On the occasion of the recent birth of the Dauphin of the King of France], was printed during the same night and distributed the following day, together with a translation in blank verse by Onorato Caetani. The previous year Boscovich had written a Latin poem with the title *Virgo sine labe concepta* [Virgin conceived without blemish], which he had offered to the Academy of Immaculate Conception, based in Rouen, during the public session of 21st December 1780. According to a contemporary account, the Latin poem was composed of more than 200 lines, which Boscovich wrote in one go in the course of 24 hours. Sommervogel (1890), who was the first to catalogue this poem, reports that it was referred to in the *Recueil de piéces lues dans les séances publiques de l'Academie etabli a Rouen sous le titre de l'Imm. Conception, pou les années 1776 à 1781* (Paris et Rouen, 1784, 8°), adding that *"le poème du P. Boscovich n'est pas reproduit, mais indiqué à la page 176. Il est donc probablement inédit"*. Elisabeth Hill (1961), resting on Sommervogel, makes reference to Boscovich's poem in the catalogue attached to her biography, adding: *"Publ. in Paris et Rouen, 1784"*, apparently neglecting Sommervogel's annotation on the likelihood that the poem remained unpublished. On the contrary Vladimir Varićak (1912), who certainly knew Sommervogel's *Bibliothéque*, states explicitly that *this poem was not published anywhere*. Actually the first 19 lines of Boscovich's poem were published in the *Esprit des Journeax (Mai, 1781)*, and perhaps we are still missing a thorough search among the publications of the Academy of Immaculate Conception of Rouen and other coeval publications which could have contained the poem. By the way there is another enigma related to this work, since the manuscripts of the poem, on which a modern (1995) printed edition is based, contains only 142 lines out of the 200 and more reported for its original reading at the Academy of Rouen.

The last two poetic works by Boscovich of which we have news from the bibliographies are those printed during the same period — from April 1783 to May 1785 — in which he was busy with the publication of the five volumes of the *Opera pertinentia ad Opticam et Astronomiam* by the printing house of brothers Remondini in Bassano. At that epoch Bassano del Grappa was a very lively city; it possessed a good tradition in the literary and poetic field in which were active, among the others, the Jesuit Giambattista Roberti (1719-1786) and Giacomo Vittorelli (1749-1835); Giuseppe Remondini (1745-1811) had inherited from his father a big and famous printing house and was managing it together with his brother Antonio (1754-?) and his son Francesco (1773-1830). In Bassano Boscovich, as we know from his letters, met Roberti and Vittorelli, whom he was friendly calling *"magno vate"* [illustrious poet], and to whom he dedicated two graceful epigrams in couplets. The following year — with Roberto Roberti, father of Giambattista, as editor — an unusual pamphlet written by Giacomo Vittorelli for the wedding of count Francesco Pietro Brazzà with the countess Giulia de' Piccoli was printed, with a charming Latin couplet added by Boscovich to each of the seven sonnets contained therein.

4.3. Boscovich's didactic-scientific poetry

Together with a considerable and wide poetic production of epic, lyric and epigrammatic character, Boscovich wrote also, as we already said, a number of important works in Latin in the field of didactic and scientific poetry, which enjoyed a similar or even greater success and appreciation. We mentioned already Boscovich's contribution (in 1746) to the diffusion and understanding of the poetic works published by Carlo Noceti, dealing with the phenomena of rainbow and aurora borealis. Noceti's work on the aurora borealis was published in 1747, equipped with Boscovich's precious explanatory notes; to the same work Boscovich will dedicate — at an indeterminate epoch, but probably about at the time of the publication of *De Iride et Aurora Boreali carmina* — a sonnet in Latin couplets, entitled *Ad Nicetam / Pro carmine de Aurora Boreali* [To Niceta, for the poem on the aurora borealis], presumably never published, in which he extols Carlo Noceti and his work. To the Latin poem Boscovich adds another sonnet in Italian, in which he summarizes the former, ending with the lines: *Urania is astonished and deafens the empty aether / shouting: Oh learned tongue of Virgil / Oh great mind of the Sicilian Hero*.

If up to now the attention devoted by the historians of science to the figure and the scientific activity of Ruggiero Giuseppe Boscovich — apart from his production in the field of natural philosophy — has been inadequate, the consideration for his observational activity has been almost non-existent, with the exception of recent work on his observations, experiments and measurements related to applied optics, spherometry and refractometry. In fact Boscovich was also a skilled observer of astronomical phenomena: his observations of comets, of solar and lunar eclipses, of the transits of Mercury on the Sun in 1737 and 1753, the unsuccessful observation of the transit of Venus in 1761, and his considerations on the meaning and cognitive value of observational activity and on the role of instruments in astronomic observations are aspects of his production which deserve further investigation. His essay *De Cometis dissertatio* [Dissertation about comets] of 1746 is a demonstration of his observational activity and, as acknowledged by Boscovich himself, is the starting point of all the following works on the problem of cometary motion. In these works Boscovich is still forced to accept the dogma of the immobility of the Earth but on the other hand, by demonstrating the validity of Newtonian laws of motions, surreptitiously lays the foundation for overcoming that hypothesis. We must also note that Boscovich was driven to write the *De Cometis dissertatio* and to tackle the theoretical problem of cometary motion by the observations of the passage of the great comet of 1743-1744 he performed in Rome at the *Collegio Romano*. These observations were preceded in June 1739 by the observation — again performed by Boscovich — of the passage of another comet, whose discovery is ascribed to Eustachio Zanotti, astronomer from Bologna and nephew of the Arcadian poet Francesco Maria Zanotti. Around the end of the same year 1739 and the beginning of the next one, Boscovich observed the solar eclipse of 30th December 1739 and the lunar eclipse of 13th January 1740, both observed also by Eustachio Zanotti from Bologna; he reported these observations to his brother Natale, sending him also the exact times of immersion and emersion and other data about the solar eclipse. We must also mention that Boscovich participated actively in the observations of the solar eclipse of July 1748 and of the lunar eclipse of the following month, performed in Rome by Boscovich himself, by Cristoforo Maire and by the fathers Le Seur and Jacquir, and published in the *"Giornale de' Letterati"*. During the same year 1748 a new comet, designated 1748 I, was discovered and observed by Gian Domenico Maraldi, who previously had observed also the solar eclipse of 25th July from Paris. We cannot exclude that the passage of this comet was the occasion in which Boscovich wrote the epigram *Quid novus cometes protenda* [What is the new comet announcing], read in Arcadia in 1748 and later translated by himself into Italian. On the other hand we can reasonably suppose that when Boscovich was writing, in a letter without date to his brother Bartolomeo, about the observations he was performing, with *"gran fastidio"* [big trouble], on the occasion of the passage of a comet, he was referring to the great comet of 1743-1744, which he observed up to March 1744; therefore we can probably date back to this period his idea (expressed in the same letter) of writing a poem about comets, a project which, as far as we know, he never realized.

We can say therefore that Boscovich's poetic works, written or announced, on the subject of comets are always related in some way to an observational activity, performed by Boscovich himself or by others; on the contrary, much more complex is the relationship between his several observations of solar and lunar eclipses, or his considerations on the technique for determining the exact moment of the end of a lunar eclipse — written in September 1744, after the observation of the lunar eclipse of November 1743 — and the long development of his vast and important poem on eclipses.

As we have seen, starting from November 1729 Boscovich was following the class of mathematics held at the *Collegio Romano* by Orazio Borgondio; we can suppose that at that epoch — if not earlier — Boscovich started also an assiduous cooperation with his master, to whom above all he was indebted for the development of his deep interest towards mathematics and astronomy. Around the midst of 1720s also Borgondio had shown, beside his commitment to theoretical mathematics, astronomy and computation, a clear interest for observation activity, as it is demonstrated by his observations of the solar eclipses of 25th September 1726 and 14th September 1727, of the lunar eclipses of 7-8th August 1729 and 1st December 1732, and of the transit of Mercury over the Sun of 11th November 1736; by the way the essay *De Mercuri novissimo infra Solem Transitu* [About the latest transit of Mercury under the Sun] in which these observations are reported and which was published in Rome in 1737, is attributed by Sommervogel to Ruggiero Boscovich, who probably was cooperating in the drafting of some of Borgondio's papers. We can also imagine that Boscovich took part in some way also in the observations of the lunar eclipses of 1729 and 1732, performed by his master.

As we said already, Boscovich was prompted to write his Latin poems of the years 1740s-1750s by the example of Carlo Noceti and Benedetto Stay, but there is no doubt that the reference point for his first works in Latin verse, starting from his poem on eclipses, were the Latin classics from Lucretius to Virgil rather than Noceti's *Iris* of 1729 or Borgondio's Latin poems. Certainly the argument of his major poetic work was suggested to Boscovich by the observations of solar and lunar eclipses performed by him at the *Collegio Romano*, by the great importance and interest for these phenomena throughout the scientific community, and also by the fact they presented interesting and spectacular aspect for a wider audience of learned public. As a matter of fact Boscovich began to write the first lines of his '*'Poema degli Eclissi"* [Poem on eclipses] already in 1734, when he was teaching grammar and humanities in Fermo, one year before the publication of his *Carmina*; he read about three hundred lines of the poem at the *Collegio Romano* in November 1735, on the occasion of the opening of the academic year. In the *preface* contained in the manuscript of those lines of verse preserved at the Bancroft Library of Berkeley — the first draft of his great poem on eclipses, to which in 1735 he was giving the reductive title of *De Solis, ac Lunae defectibus Carmen* [Poem on solar and lunar eclipses] — Boscovich confirms that the stimulus to deepen and develop further the argument of that first *Carmen* was the very shallow partial lunar eclipse of 2nd October 1735, which he had the opportunity to observe before reading his verse at the *Collegio Romano* in November of the same year; this event reminded him of the line about solar and lunar eclipses (*defectus Solis varios, Lunaque labores*) contained in Virgil's Georgics, which have been the model for Boscovich's poetic production since his *Carmina*.

After these first lines Boscovich will write, in different stages and at different epochs, the books of his big poem and will finish it, apart from small corrections and additions, between the end of 1752 and the beginning of 1753. It seems that — we don't know to what extent — he was devoting to the drafting of the poem also the time he could spare during his journeys by coach through the Papal State when, in 1751-1752, he was busy with the measurement of the arc of meridian passing through that region. Boscovich will read several sections of the poem, after the lines declaimed in 1735, during the solemn assemblies of Roman Arcadia, although the order of the lines, read on those occasions, in the final version of the poem does not correspond with the order they had in the preliminary versions, and with the order in which he was presenting them. For this reason it is difficult to identify in the printed editions of *De Solis ac Lunae defectibus*, either in the London edition of 1760 or in the Venetian edition of 1761, the 47 lines of *my first book of eclipses*, written during Lent, which he anticipated to his brother Natale in a letter of 5th April 1746, few days before Easter, and which he had read during the same Lent, probably in Arcadia. Again in Arcadia he was planning to *declaim everything in the correct order* in 1753, when he had already finished all five books of the poem but the second one; and on 26th December 1752 he sent to his brother Natale a *small piece* of the second book, which will appear as lines 486 – 524 of the printed volume. Again in Arcadia he read, at the end of 1756, a section following the enumeration of celestial bodies at line 207 of the first book, consisting of 78 lines written in honour of Cardinals Francesco Landi and Gian Francesco Albani, both illustrious members of Arcadia with the names of Antistio Trochio and Alcindio Elideo. It seems also that in August 1758, again in Arcadia, Boscovich read about 60 lines of verse in honour of his friend and patron Cardinal Luynes, as he wrote to his brother Natale on 22nd August 1758, but we don't know whether these lines were ever published.

At the beginning of 1753 Boscovich had almost completed the drafting of the five books of his poem on eclipses, which — if we give credit to his own words — he read at the weekly meetings of Arcadia, even though at the end of 1756 he was still writing and reciting in Arcadia 78 new lines in Latin verse in honour and in presence of Cardinals Landi and Albani. After that, as far as we know, his many engagements in Lucca and in Vienna — where in 1757 he wrote the most famous of his works, the *Philosophiae Naturalis Theoria* — and later, from the midst of summer of 1759, his journeys to France and England, diverted him from taking due care of the most representative of his poetic-scientific work. Boscovich remained in France from the beginning of November 1769 to the midst of May of the following year; in Paris, in March 1760, during one of the many meetings and parties to which he was invited, he met and became friend of M. Boulogne, uncle of Claude Henri Watelet, man of letters and *excellent poet*, who volunteered to try and translate into French his poem on eclipses. It seems however that Watelet's attractive proposal, after few trials of translation of sections of the fifth book, did not produce any result.

Already while in Paris, Boscovich was considering to publish his poem on eclipses in England, but only after his arrival in London, in June 1760, he started to think in earnest about printing his Latin poem which, in consideration of his appointment as a member of the Royal Society, he wished to dedicate to the Society itself. In a letter to his brother Bartolomeo of 12th June 1760, Boscovich explains that among recent friends, including the archaeologist James Stuart, he met John Nourse, well-known bookseller and expert in London literature, who put him in touch with a dependable printer, whose name however Boscovich never mentions. After participating actively to the meetings of the Royal Society, supporting the project of organizing campaigns for the observation of the transit of Venus on the Sun of 6th June 1761, Boscovich met Lord Macklesfield, president of the Society, and presented him the dedication in Latin of his poem on eclipses, addressed to him and to the Society. On 15th July he informed his brother Bartolomeo that the printing process was going to begin soon, and started to write the annotations in Latin; however after three weeks the print had not started yet and he was complaining about that with M. Nourse, ordering him to begin the job immediately, otherwise he would have contacted other printers. After this discussion with Nourse, Boscovich was away from London for two weeks, during which he visited with great profit Cambridge University; upon his return he was not satisfied with the work the printer had begun and broke off the relationship with Nourse; thanks to the help of Charles Morton, one of the secretaries of the Royal Society, and of Thomas Hollis, great supporter of the idea of printing the book in England, he contacted other printers interested at his poem. Boscovich does not mention the names of the new publishers or of the printer; however we know — from the cover of the London edition of *De Soli ac Lunae defectibus* — that the publishers were Andrew Millar and the brothers Robert and James Dodsley, among the most appreciated London publishers of XVIII century, and the printer was William Bowyer, with whom Boscovich was later in correspondence. As a matter of fact the new printer started printing the first pages of the poem by the beginning of September and finished it presumably around the end of December 1760, just before Boscovich left for Brussels, after having completed the notes of the poem and corrected the proofs.

Without doubt the reception of Boscovich's poem on eclipses, both in England and abroad, was positive, as documented by the influential review and extended abstract published on the *Journal Etranger* of July and August 1761. Since the book was an important treatise on astronomy and physics and gave prominence to the essential contribution of Newton in these two sciences, it was bound to meet with success among the scientific community; it is worth noting, however, that it received a warm welcome also by the great literary critic and poet Samuel Johnson — who wrote that Boscovich's learning and talent had "laboured Science into Poetry, and have shown, by explaining Astronomy, that Verse did not refuse the ideas of Philosophy" — and by London literary circles gravitating around him, among which stood out, at the time in which Boscovich stayed there, the figures of the painter Joshua Reynolds, of Edmond Burke and of John Douglass, who will become later Bishop of Salisbury.

As a matter of fact Boscovich, probably encouraged by this warm reception, was driven to consider the possibility of a new edition of his poem. After his return to Italy, passing through Verona on his way to Venice, he met his friend Saverio Bettinelli, a brother in the Society of Jesus and an acknowledged poet; in a letter sent to Boscovich in April 1761, Bettinelli, making reference to the issues discussed during their encounter, volunteered to look for a printer adequate for the publication of the poem. Finally *De Solis ac Lunae defectibus* was reprinted in Venice, from May to the midst of June, by the printer Antonio Zatta, we don't know whether upon Bettinelli's suggestion. Anyway Bettinelli, in a letter sent to Boscovich from Verona — a letter without date, but almost certainly written while Zatta was working at the reprint of the poem — congratulated him for the choice of the printer and for the fact that the responsibility of the edition had not been given to *"Sig.r Pindemonti"*, almost certainly Marcantonio Pindemonti, man of letters from Verona, who had given hospitality to Boscovich during his stay in the city; in the same letter Bettinelli also mentioned a translation of the poem from Latin which should have been entrusted to the poet Pellegrino Salandri, but about which we do not have any further news.

Almost twenty years later, when Boscovich had been in France for more than five years, during a period of crisis of French finances, he was planning to publish all of his works written in France dedicating them to King Louis XVI, with the purpose — as we understand from the letter he sent to his brother Natale on 17th December 1778 — of printing his works at the expense of the Royal Printing House. In the same letter Boscovich writes he has *in preparation the translation in poetic prose of my great poem on eclipses*, with the original Latin text and the French translation of text and notes. The poem had to be published together with the translation of his *Philosophiae Naturalis Theoria* and other three or four volumes containing his latest works, mainly on astronomy and optics. The French translation, *"in prosa poetica"*, of the poem, and of the notes, was made — we don't know precisely when — by abbot Augustin de Barruel, a former French Jesuit, who was tutor of two of the sons of Prince Francis Xavier of Saxony, friend of Boscovich, at whose home in Point sur Seine Boscovich was often spending his holidays, and where presumably he met abbot Barruel. Since the printing of the translation of the poem started around the midst of June 1779, after the King had accepted the dedication in Latin verse written by Boscovich, we must think that Barruel made the translation during the first half of the same year. By the end of July 1779 the structure of the new version of the poem was already defined and at the end of November the poem had been printed in six books; Boscovich could distribute the first copies of it to his influential friends and acquaintances in Paris, and was eager to personally hand a copy to the King, which he managed to do before the Christmas holidays of the same year. The poem *Les Eclipses*, printed at Boscovich's expense, had a favourable reception in spite of the *"sedicenti filosofi"* [self-styled philosophers] — how Boscovich was complaining — in particular d'Alembert, who anyway was not as influential as he used to be; however the progress of the sales of the volume in France, about six months after its publication, was not so propitious. By the way it is interesting to note that Boscovich had planned the French edition of his Latin poem on eclipses together with the translation, never to be realized, of his *Philosophiae naturalis Theoria* as a mean to stimulate French readers and entice them to accept also the rest of his works, still written mostly in Latin and *filled with geometry and computations*. The events connected with the French edition of the poem on eclipses reveal the subservient character of this enterprise, which probably Boscovich had thought as a way to prepare the ground for the publication in France of all of his works written in France, although mainly in Latin, which finally appeared in 1785 in the five volumes of the *Opera pertinentia ad Opticam et Astronomiam*. Anyway these considerations should not conceal the role played by *De Solis ac Lunae defectibus* and other minor poetic works by Boscovich in the framework of the production of didactic-scientific poems in Latin verse in the second half of XVIII century. We have already talked about Boscovich's poetic production during his stay in France; he was recalling the most recent part of this production in a letter to his young friend Francesco Puccinelli in July 1779, when he was starting the publication of *Les Eclipses*, and was perhaps thinking of coming back to Italy.

We do not know of any didactic-scientific work in verse of some importance written by Boscovich during his stay in France. Therefore we have to acknowledge that *De Solis ac Lunae defectibus* represents perhaps the highest attempt, together with the Newtonian poem by Benedetto Stay — to which by the way also Boscovich gave an important contribution — to popularize in Latin verse the new optics and astronomy, based on the principles of Newtonian physics. Within the same poem on eclipses Boscovich tries once again — as he had already attempted to do in his *De Cometis* in 1746 — to establish a fundamental harmonization in order to uphold and explain the motion of the Earth in the framework of a new cosmology, going beyond the Newtonian conception of absolute, infinite and immovable space and introducing the idea of an interstellar space in motion with respect to the absolute space, within which the motion of the Earth is possible; we can say therefore that also through his poetic works Boscovich contributed to the defence and popularization, using the weapons available to him at that epoch, of the new ideas of Copernicus, Galileo and Newton, in the same way as he did with his scientific treatises in prose. I think that also some of his poetic works devoted to comets, which he presented in Arcadia, should be considered in this perspective. In 1756 he read two Latin epigrams in Arcadia which will caused some interest and which he will later insert, together with their Italian translation, in the first and third book of *De Solis ac Lunae defectibus*; they are *"De Solis maculis"* [On sunspots], and *"In planetarum dispositione Terra inter Martem, et Venerem"* [On the location of planet Earth between Mars and Venus]. It turns out that the latter epigram, which Boscovich read in London in 1760 to his friends of Johnson's literary circle, was received with particular appreciation, since Cornelia Knigth, who at the epoch was a child, writes in her autobiography: "His epigram on the planets is deservedly admired, as it scatters flowers on a subject which did not appear susceptible of them"; in this statement she is clearly echoing memories of her parents, who knew Boscovich; she had met him in Paris in 1776.

The poem on eclipses is the most evident demonstration of the role Boscovich was assigning to the poetic means, not only a way for communicating moods and emotions but also, and above all, as an alternative way for spreading knowledge. He was a poet and, at the same time, a scientist; these are the two, highly synergistic, aspects from which we have to appreciate his works which today, quite incorrectly and simplistically, are labelled as poetic. For Boscovich the main problem related to the usage of the poetic form, namely of verse, was not the application of a stylistic canon, to which nevertheless he was referring, but the inspiration, that is the ability to convey in verse, in a genuine form and with the best style, information and knowledge. This is the criterion, I think, according to which today we must evaluate and appreciate his poetic works, and the other several poetic productions with didactic-scientific character which underwent a flourishing development in the second half of XVIII century.

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